User manual

Nubo Sentry sensor node

Intrinsically safe close-proximity methane sensor

Version 1.0 from October 24, 2025

SENSIRION
connected solutions

IMPORTANT Safety Information

This device is certified as intrinsically safe for use in potentially explosive atmospheres. Refer to Chapters 3 and 8 for details. Special care must be taken to ensure compliance with these certifications throughout the device's life cycle.

Before operating or installing this equipment, please read this manual thoroughly. Follow all prescribed procedures to avoid personal injury, damage to the device, or violation of safety regulations.

Caution
Caution indicates that incorrect use may result in damage to the device. Failure to follow the procedures outlined in this manual may cause irreversible harm to the equipment and compromise its certified safety status.

Warning
Warning indicates that unsafe use may result in personal injury, damage to the device, or hazardous consequences in explosive environments. Do not tamper with or modify the device. Unauthorized repairs, alterations, or misuse may invalidate the certification and create serious safety risks.

Contents

1 Introduction

Nubo Sentry is an intrinsically safe, battery-powered IoT methane sensor designed for close-proximity monitoring in hazardous environments. It combines Sensirion's proprietary photoacoustic spectroscopy technology with battery-driven power management, enabling continuous methane detection onshore and offshore without the need for wiring or external power sources.

The system delivers exceptional sensitivity with a detection limit below 10 ppm—significantly lower than conventional alternatives—allowing operators to identify smaller leaks earlier and reduce the number of sensors required for effective coverage. This capability improves safety, minimizes product loss, and supports compliance with stringent environmental and ESG requirements.

Compact, robust and designed for a wide range of environmental conditions, Nubo Sentry adapts to diverse deployment scenarios, from offshore platforms and simple well sites to confined indoor spaces. It can operate as a standalone solution or in combination with other Sensirion products such as Nubo Sphere or the Kuva camera, providing extended coverage for complex sites and supporting faster root cause analysis. This integrated approach reduces LDAR program costs and enhances operational safety.

Communication is handled via LoRaWAN, offering secure, long-range connectivity and flexibility for operators to either manage their own infrastructure or leverage cloud-based analytics for advanced insights.

2 System description

2.1 System operation overview

The Nubo Sentry system consists of a sensor node including a mounting bracket, with an integrated LoRaWAN communication module. It operates autonomously using non-rechargeable primary batteries with a lifespan of five years at 20-second measurement intervals, ensuring maintenance-free performance and eliminating the need for external power wiring.

The sensor employs low-power photoacoustic laser spectroscopy for precise methane detection and continuous 24/7 operation in both onshore and offshore environments. This optical principle converts absorbed light energy into acoustic signals, enabling highly selective methane detection even at trace levels. Measured methane concentrations are reported in parts per million (ppm), along with health parameters, via LoRaWAN. For local access and configuration, the system supports Bluetooth Low Energy (BLE) connectivity, allowing field service staff to interact with the device using mobile tools or handheld terminals. Data can remain local through operator-hosted LoRaWAN infrastructure or be transmitted via a LoRaWAN gateway to the cloud for enhanced data fidelity and integration with other Sensirion solutions.

Designed for intrinsic safety, the electronics, battery, and optical components comply with ATEX Zone 0 (Gas Group IIB, Temperature Class T4) and Class I, Division 1 requirements (Gas Groups C and D). The rugged, corrosion-resistant enclosure meets IP65/IP67 and NEMA 4X standards, ensuring reliable operation in harsh conditions from -40 °C to +65 °C (-40 °F to 149 °F) and up to 100% humidity.

Deployment options range from dense sensor networks to strategic placement at high-priority locations. Nubo Sentry can be combined with wind sensors for local wind speed and direction measurements, enabling advanced analytics and improved emission localization and quantification. When integrated with Nubo Sphere or the Kuva camera, the system provides comprehensive coverage and accelerates root cause analysis for methane events.

2.2 Nubo Sentry system components and accessories

Each Nubo Sentry node package contains:

- 1 IoT sensor node
- 1 Mounting bracket including screws for attachment to sensor node

For a typical installation, multiple sensor nodes are required. The exact numbers depend on the specifics of the installation site (e.g. its size), the installed equipment and the performance requirements. For additional details, please contact our support team or your local sales representative. Our experts can help you determine the optimum number of devices for your project.

3 Safety information

3.1 Intended use

This device is intended for continuous monitoring of methane concentrations in air in industrial environments, including indoor and outdoor installations, particularly in the oil and gas sector. It is certified for use in explosive atmospheres.

Applicable standards:

- For ATEX/IECEx: The device is intended to be used in explosive atmospheres as defined in the scope of IEC 60079-0 or equivalent national standards.
- For Class I, Div.1, Groups C and D: The device is intended to be used in hazardous locations as defined in the Canadian Electrical Code, Part I or the National Electrical Code (NFPA70).

Ex-marking:

- ATEX: II 1G Ex ia op is IIB T4 Ga
- IECEx: Ex ia op is IIB T4 Ga
- North America (MET C/US): IS Cl.I Div.1 Gr.C,D T4, ZN 0 AEx/Ex ia op is IIB T4 Ga

Refer to Chapter 8 for full certification details.

Warning

- Do not use this product as a safety or emergency stop device, or for any application where failure could result in personal injury.
- Use the device only for its intended and authorized purpose as described in this manual and the accompanying certificates.
- The manufacturer is not liable for damage caused by improper or non-intended use.

3.2 Personnel requirements

The following requirements apply to all personnel performing installation, commissioning, diagnostics, or maintenance:

- Trained and qualified for the specific function and task.
- Authorized by the plant owner/operator.
- Familiar with applicable federal/national regulations.
- Have read and understood this manual and the certificates before starting work.
- Follow all instructions and comply with site conditions.

Operating personnel must:

- Be instructed and authorized by the facility's owner/operator according to task requirements.
- Follow the instructions in this manual at all times.

Caution

- Only qualified and authorized personnel may install, commission, or service this device.

Note: For general misuse limitations and legal notices, see Section 3.1 and Chapter 9.

3.3 Workplace safety

When working on and with the device:

- Wear the required personal protective equipment (PPE) as per national regulations.
- Ensure the work area and procedures comply with IEC/EN 60079-14 and applicable local codes for hazardous areas.

Note: Always follow site-specific safety procedures in addition to these general requirements.

3.4 Operational safety

Repair and accessories

- Only use original accessories and approved parts.

Warning
• Operate the device only if it is in proper technical condition, free from errors and faults. The operator is responsible for ensuring that the device is in good working order. • Do not open the device. Do not modify or alter the device in any way. Unauthorized changes can impair explosion protection and lead to unforeseeable hazards. Any changes must only be carried out by Sensirion Connected Solutions AG. If a modification is required, consult the manufacturer beforehand.

Caution
• Avoid mechanical damage: do not touch or clean device surfaces with pointed or hard objects.

3.5 Hazardous-area compliance

- It is the operator's responsibility to verify whether installation is permissible by local laws and the owner of the infrastructure.
- Verify that the device is suitable for the intended hazardous-area classification by checking the nameplate and certification documents.
- Installation, commissioning, operation, and maintenance must follow IEC/EN 60079-14 and applicable national codes (e.g., NEC/NFPA 70, CEC).

Warning
• Only install and operate the device in hazardous areas for which the nameplate and certificates explicitly permit its use. • Unauthorized installation or use outside the certified hazardous-area classification can impair explosion protection and lead to severe hazards.

3.6 Electrostatic and temperature hazards

Warning

- Electrostatic discharge can impair explosion protection. Do not rub plastic surfaces (e.g., the enclosure) with a dry cloth and avoid sources of strong electrostatic fields near the device (≤0.5 m (1.6 ft)).
- Do not exceed the maximum ambient temperature of –40 °C to +65 °C (-40 °F to 149 °F) at the enclosure.

3.7 Laser safety

Warning

- Nubo Sentry is a Class 1 laser product according to the international standard IEC 60825-1:2014. Do not attempt to open or modify the device. Opening the enclosure or tampering with optical components can lead to exposure to laser radiation and impair explosion protection.

3.8 Battery safety

Warning

- The device contains lithium-metal batteries and electronic components.
- Do not store or operate the device or battery in temperature conditions outside the specified range.
- Do not crush, puncture, or disassemble the device or its batteries.
- Do not dispose of the device or batteries in fire or expose them to high temperatures.
- Do not expose the device or batteries to extremely low air pressures.
- Do not replace the battery with any other type.

3.9 Applicable standards

For installation, selection, and erection in explosive atmospheres, observe:

- IEC/EN 60079-14 – Explosive atmospheres – Part 14: Electrical installations design, selection and erection
- EN 1127-1 – Explosive atmospheres – Explosion prevention and protection – Part 1: Basic concepts and methodology

4 Installation and commissioning

Note: Before installation, read Chapter 3: *Safety information* carefully.

4.1 Installation instructions

The device comes pre-assembled with the mounting bracket attached, ready for mounting to vertical surfaces or equipment. No further configurations or steps are needed to prepare the Nubo Sentry sensor nodes. They can be deployed directly in the field, as described below.

4.1.1 Node placement

For the entire system to operate correctly, it is important to ensure that the Nubo Sentry sensor nodes are placed at the correct positions on your site. Please check with your sales representative before installation to determine exactly where the Nubo Sentry units should be placed and if any additional accessories are required.

Nubo Sentry sensor nodes should be placed either directly at or downwind of potential emission sources. The distance depends on the specifics of the installation site (e.g. its size), the installed equipment and the performance requirements. The units can be installed either on new poles or on existing infrastructure. In the latter case, ensure that no other equipment is directly blocking the node in upwind direction (i.e., closer than 10 m (33 ft.).

Caution
• All devices should stay within the designated areas, determined during siting with the sales representative or customer support team for optimal performance. • After siting and installation have been completed, any reconfiguration of the Nubo Sentry positioning or changes to the site should be updated in the site configuration in the app. Failing to do so may yield incorrect results of the Nubo Sentry data analytics. • The lateral position and installation height of each Nubo Sentry node need to be correctly entered into the site configuration in the app. Write these parameters down during installation and if possible, take pictures of each final installation position. Inform your local sales representative or customer support team after installation is completed.

4.1.2 Installing Nubo Sentry nodes

The device can be mounted on horizontal or vertical flat surfaces, pipes, or poles with a diameter up to 300 mm (12 in) using the included mounting bracket. Rotate the bracket by 90° as needed, see images below.

Ensure that the inlet faces downward and remains unobstructed, leaving a minimum clearance of 50 mm (2 in) below the inlet. For optimal performance, we recommend placing the device at a height of at least 1 m (3.3 ft) above the ground to allow for unobstructed air circulation and effective methane detection or at roughly the same height as the particular emission source of interest. The mounting surface or structure must withstand expected wind forces and support the system's weight (total approx. 1.7 kg; please compare specifications in the Nubo Sentry data sheet). The device and mounting structure must not rotate after installation.

Install the device using certified mounting hardware. Ensure proper vertical orientation (inlet facing downward at an angle of ±10°) and secure all connections. Two screws on the side clamp the device into the mounting bracket; permissible tightening torque is 3 ± 0.3 Nm (2.2 ± 0.2 lb-ft). The bracket can be secured using two metal hose clamps or two screws (max. diameter 4 mm (0.16 in)). Tighten hose clamps securely and shorten protruding parts with a strong wire cutter. Smooth sharp edges with a file and wear protective gloves.

Warning

- Avoid sparks caused by impact and friction during installation.
- Do not install or operate the device without tightening the lateral mounting screws. Always check that the device and accessories cannot be removed.
- Installation of Nubo Sentry sensor nodes may result in scratch marks or abrasion on the chosen mounting surface or structure. By installing and using Nubo Sentry, you accept that Sensirion Connected Solutions AG is not liable for any damage resulting from the installation and use of the mounting bracket.
- Plastic zip ties might age or break due to environmental influences. Only use metal bands or similarly reliable mounting bands.
- Cut surfaces can have sharp edges. Always wear gloves and safety glasses when cutting metal band ties and smooth edges with a file.

Caution

- Use only approved accessories and follow all installation guidelines.
- Avoid installation during adverse weather conditions.
- The system is designed to be water resistant to rain or spray and can withstand temporary immersion in water up to 1 meter for 30 minutes, in accordance with its IP67 certification. Do not immerse the device in water beyond these limits or use it for prolonged underwater applications.
- Install the device with the inlet facing toward the ground at a maximum angle of ±10°. Incorrect orientation may impair performance.
- Do not overtighten screws beyond the permissible torque (3 ± 0.3 Nm; 2.2 ± 0.2 lb-ft).

4.1.3 Post-installation activation procedure

After installing the Nubo Sentry sensor node, activate the device to establish connectivity. First, press the button once to wake up the device—this is confirmed by a short cyan LED blink. Within 10 seconds, press and hold the button for 5 seconds to initiate the LoRaWAN join procedure. The device will provide haptic feedback and blink green five times to indicate the start of the connection process. A successful connection is confirmed by three short green blinks, followed by two short cyan blinks indicating time synchronization with the network server. If a long red blink appears instead, the join attempt has failed.

Note: Nubo Sentry communicates via LoRaWAN, supporting periodic transmission of sensor data using configurable payloads. The device is pre-configured for standard operation, and no user-side adjustments are typically required. For advanced configuration options, please contact Sensirion support or your local sales representative.

5 Technical specifications

Refer to the Nubo Sentry data sheet for detailed specifications including dimensions, weight, power requirements, and environmental ratings.

6 Maintenance

The device requires minimal maintenance. Periodically inspect the device for physical damage. Replace the device every 5 years or as needed.

Caution
• The housing is made of polycarbonate. Do not use aggressive cleaning agents (e.g., solvents, alcohols, or abrasive materials) as they may damage the housing.

7 General handling

The push-button is the primary user interface of the device. Please carefully observe the LED indicator, when interacting with the device.

7.1 Waking up the device

To wake up the device, press the button once. A single short cyan LED blink (70 ms) confirms that the device is now awake.

If no further interaction occurs, the device will automatically return to sleep mode after 10 seconds. This transition is indicated by another short cyan LED blink.

Note: While the device is asleep, pressing the button does not result in any haptic feedback.

7.2 Activating the device

To activate the device:

1. Wake it up as described in Section 0.
2. Press and hold the button for 5 seconds.

The device will provide haptic feedback, followed by five consecutive short green LED blinks, indicating that the LoRaWAN join procedure has started.

If the join is successful, the device will blink three times in short green. After successful time synchronization with the network server, the device will blink twice in short cyan.

Note: If a long red LED blink appears instead, the join procedure has failed. Ensure the device is within LoRaWAN coverage and repeat the procedure. If the join procedure fails again, please contact our support team for assistance.

7.3 Activating Bluetooth advertising

To enable Bluetooth Low Energy (BLE) for configuration or troubleshooting, perform two quick button presses (each between 50–1000 ms).

The device will enter Bluetooth advertising mode, indicated by a blinking blue LED.

Note: BLE advertising remains active for 15 seconds or until a connection is established. If no connection occurs, the device returns to sleep mode automatically.

7.4 Rebooting the device

To reboot the device:

- Ensure it is awake.
- Press and hold the button for 10 seconds.

The device will provide two short LED blinks during the press:

- One after 4 seconds
- Another after 8 seconds

These indicate the long-press duration and confirm the reboot sequence.

7.5 Activating shipping and storage mode

To prepare the device for transport or long-term storage, place it into shipping and storage mode. First, ensure the device is awake (see Section 7.1), then press and hold the button for 5 seconds. A short cyan LED blink confirms that the device has been deactivated and is now in shipping and storage mode.

Note: In this mode, the device is sleeping to prevent battery drain during transport or storage. Reactivate the device before deployment by following the activation procedure in Section 7.2.

7.6 Storage

When storing the device, ensure it is placed in shipping and storage mode (see Section 7.5) to prevent battery drain. Always store the device in a clean, dry, and non-condensing environment within the specified temperature range.

Warning

- The device contains lithium-metal batteries.
- Do not store the device outside the specified temperature range: −40 °C to +65 °C (-40 °F to +149 °F). Store in a noncondensing environment.
- Do not store the device for more than 2 years, as prolonged storage may degrade battery performance and reduce operational lifetime.

Caution

- Store the device in its original packaging or equivalent protective material to avoid mechanical damage.

7.7 Shipment

Before shipping the device, ensure it is in shipping and storage mode (see Section 7.5). Use the original packaging or equivalent protective materials to prevent mechanical damage during transport.

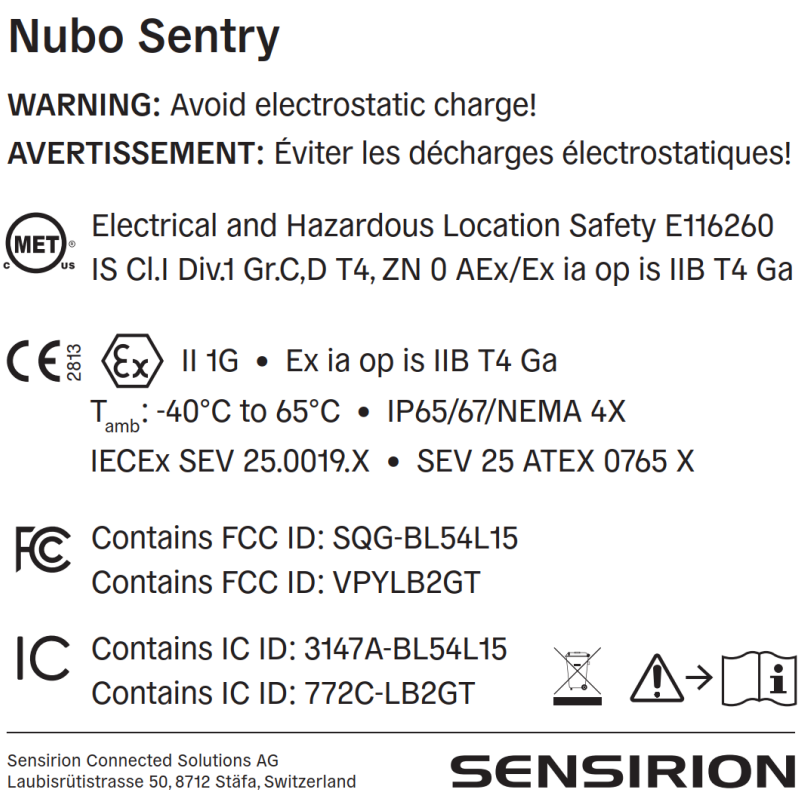
Warning

- The device contains lithium-metal batteries.
- Handle the package with care and avoid exposure to extreme temperatures or mechanical shock.
- Do not ship the device if battery damage is suspected.
- Ensure the shipment (e.g., labelling of the box) complies with applicable local and international regulations for transporting lithium-metal batteries.

8 Conformity information

8.1 Product labeling

The type label on the back of the lower housing includes product name and certification marks (ATEX, IECEx, cMETus), see below:



In addition, serial number and device identification parameters for LoRaWAN communication are included on a round device identification label.

8.2 Certifications

This section should always be verified against the latest version of the Nubo Sentry data sheet to ensure accuracy.

IECEx	ATEX	$_{c}$MET$_{us}$
IEC 60079-0: 2017 IEC 60079-11: 2023 IEC 60079-28: 2015	EN IEC 60079-0: 2018 EN 60079-11: 2012 (based on IEC Ed. 6) EN 60079-28: 2015	CAN/CSA-C22.2 No. 60079-0:19 ANSI/ISA/UL 60079-0:2019 CAN/CSA-C22.2 No. 60079-11:2014 ANSI/ISA/UL 60079-11:2018 CAN/CSA-C22.2 No. 60079-28:2015 ANSI/ISA/UL 60079-28:2015 FM 3600:2022 FM 3610:2021 UL 931:2022
Ex ia op is IIB T4 Ga -40 to +65 °C	II 1G Ex ia op is IIB T4 Ga -40 to +65 °C	IS Cl.I Div.1 Gr.C,D T4, ZN 0 AEx/Ex ia op is IIB T4 Ga -40 to +65 °C
IECEx SEV 25.0019.X	SEV 25 ATEX 0765 X	E116260

8.3 European conformity information

CE

Hereby, Sensirion Connected Solutions AG declares that this radio equipment is compliant with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at https://sensirion-connected.com/resource/eu-declaration-conformity-nubosentry.

8.4 FCC notice

Warning

- Changes or modifications not expressly approved by Sensirion Connected Solutions AG may void the user's authority to operate this equipment.
- To comply with FCC RF exposure guidelines, maintain a minimum distance of 20 cm (7.8 in) between the device and nearby persons during operation.

FC

Contains FCC ID: SQG-BL54L15
Contains FCC ID: VPYLB2GT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

8.5 IC regulatory statement

Warning

- Changes or modifications not expressly approved by Sensirion Connected Solutions AG may void the user's authority to operate this equipment.
- To comply with FCC RF exposure guidelines, maintain a minimum distance of 20 cm (7.8 in) between the device and nearby persons during operation.

IC

Contains IC ID: 3147A-BL54L15
Contains IC ID: 772C-LB2GT

This device complies with ISED's licence-exempt RSSs. Operation is subject to the following two conditions:

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

8.6 Disposal and recycling

This device contains lithium-metal batteries and electronic components. Dispose of the device in accordance with local environmental and electronic waste regulations. Do not incinerate, crush, or disassemble the device. For guidance on proper disposal or recycling, contact Sensirion Connected Solutions or your local waste authority.

9 Important legal notices

Warning: personal injury
Do not use this product as safety or emergency stop devices or in any other application where failure of the product could result in personal injury. Do not use this product for applications other than its intended and authorized use. Before installing, handling, using or servicing this product, please consult the manual and data sheet. Failure to comply with these instructions could result in death or serious injury. Please also consult local laws and regulations, in particular with regard to hazardous-area compliance and the radio frequencies used by this product.
If the buyer purchases or uses SENSIRION CONNECTED SOLUTIONS (SCS) products for any unintended or unauthorized application, the buyer shall defend, indemnify and hold harmless SCS and its officers, employees, subsidiaries, affiliates and distributors against all claims, costs, damages, expenses and reasonable attorney fees arising from, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if SCS is allegedly negligent with respect to the design or the manufacture of the product.

Ancillary services required
This product is part of the SCS continuous methane emission monitoring solution "Nubo Sentry" and unless otherwise agreed upon requires the "Environmental Monitoring as a Service" (EMaaS) subscription available from SCS for proper functioning. SCS reserves the right, without further notice, (i) to change the product specifications or the information in this document, (ii) to improve the

reliability, functions and design of this product and (iii) to modify the cloud service and data analytics algorithms.

10 Revision history

Date	Revision	Page(s)	Changes
2025-10-24	1.0	All	Initial release

11 Contact information

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