

OY1500 LoRaWAN[®] Radon gas sensor

Product manual

version 1.0

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OY1500 LoRaWAN® Radon gas sensor

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1 Disclaimer

This document represents information on products at the time of publication and is subject to change without prior notice due to product improvements or other reasons. Nordic Propeye makes no warranties based on the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Nordic Propeye reserves all rights to this document and the information contained herein.

1.1 Technical support

Please visit www.nordicpropeye.com for additional information, or contact support@propeye.se

EC DECLARATION OF CONFORMITY

certify that the design and manufacturing of this product
WIRELESS TEMPERATURE SENSOR /
FUNK-TEMPERATURSENSOR /
TRÄDLÖS TEMPERATUR SENSOR /
TRÄDØS TEMPERATUR SENSOR /
DRAADLOZE TEMPERATUURSENSOR
OY1110 EU868

conforms to the following directives and standards

The Radio Equipment Directive (2014/53/EU),
EN 300 220-1 V2.4.1, EN 300220-2 V2.4.1,
EN 301 489-1 V1.9.2, EN 301 489-3 V2.1.1,
EN 60950-1:2006+A11+A1+A12+A2
EN 62479:2010

RoHS Directive 2011/65/EU

This product was CE marked in year -18



2018-12-01
Managing Director

Stefan Lindgren

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2 Warnings

The following safety precautions must be observed during all phases of the operation, usage, service or repair of this Nordic Propeye product.

- Read the product manual.
- Do not modify the product.
- The product should not be exposed to extreme heat or open flame.
- The device must not be exposed to harsh chemical agents or solvents.
- The labelling of the product may not be changed, removed or made unrecognizable.

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3 Environmental



This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste by taking it to a collection point designated for the recycling of electrical and electronic appliances. Separate collection and recycling of your waste at the time of disposal will contribute to conserving natural resources and guarantee recycling that respects the environment and human health. For further information concerning your nearest recycling center, please contact your nearest local authority/town hall offices, your household waste collection company or the shop where you bought the product.

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4 Product Description



The OY1500 LoRaWAN Radon gas sensor is designed to measure radon gas, temperature, humidity and pressure. It also has an accelerometer to detect movement of the device. The device is designed to operate indoors powered by cable or with a battery life length of 60 days, with rechargeable batteries. It reports every 10 minutes, allowing for quick adjustments of ventilation systems when radon levels get too high.

The device uses a semiconductor detector to detect energy from alpha particle which decays from radon particles. The detector is capsulated in a high voltage chamber which forces the charged radon daughter particles upon the semiconductor area in the bottom of the decay chamber. The decay energy is measured when an alpha particle hits the detector surface. The number of detected decayed particles for a set time period is stored internally in the device as an energy spectrum. This makes it possible to distinguish between different decay types, since all alpha particles have a different decay energy. SPIRIT detects alpha decay from Rn-222, Po-214, Po-218 and Po-210.

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5 Instrument operation

5.1 LoRaWAN Configuration

Configuration on the network server is done with

AppEUI: 70-B3-D5-D7-2F-F8-18-00 (a.k.a. JoinEUI)

It is possible to order a batch of devices configured with a customer unique AppEUI from the Nordic Propeye OUI range.

The device is configured with device unique DevEUI and AppKey. The DevEUI is printed on device box and the AppKey is distributed by the sales team. The device is default configured for OTAA provisioning. Contact the Nordic Propeye team for ABP configuration. The device follows the LoRaWAN standard related Join configuration parameters, such as RX1 and RX2 windows, RX2 downlink frequency etc.

The default setting is ADR enabled.

If you are not experienced with LoRaWAN, contact support@propeye.se to get started.

5.2 Start and stop of measurement

The instrument is started and stopped using the power-button on the device. The button must be pressed for three seconds until the measuring LED lights up in blue, then release. The instrument starts measuring immediately when the it is started.

5.3 Measure series

Each time the device is started with the power button, a new measure series is started.

This can be used to distinguish between different measurement locations. When retrieving and analyzing the data, it will be grouped by measurement series.

5.4 LED indicators

The device has three status-leds which will light upp each time the status button is pressed.

5.4.1 Battery indicator

Indicates battery level. The LED is flashing when the battery of the device is charging.



● > 60%

● 30 - 60%

● < 30%

● Charging

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5.4.2 Network indicator

Indicates network status. It usually takes a few seconds for the device to connect to LoRa-network if it is available.

Note: once the device is connected, a network connection check is only performed every few hours. This means that if the device is losing connection after it has been successfully connected, it might still indicate as connected until a network check is performed by the device.



● **Connected**



If the device is moved to a new location and you are unsure about the network status, we recommend to reconnect to the LoRa network by pressing and holding down power and status button. By doing so, you will get an immediate up-to-date indication on the device LED if it is connected or not.

5.4.3 Measurement indicator

Indicates if a radon measurement is active or not.



● **Measuring**

○ **Not measuring**

5.5 Buttons

5.5.1 Power button

Requires to be pressed for three seconds. Turns on and off the device.

5.5.2 Status button

A simple press turns on the status led indicators

5.5.3 Combinations

By holding both status- and power button for three seconds when turning off the device, the device will also disconnect from the LoRa network. Can be used to save power when storing the device, or to force a reconnect to the LoRa network.

5.6 Battery and charging

The battery can be charged using micro usb. It is recommended to charge the battery when the battery indicator is red.

If required, the device can also be supplied with 10-28V AC/DC. See section 6.3.3.

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6 Instrument installations

6.1 Wall mount

The instrument comes with a wall mount. The device can easily be installed with a snap on mount to the wall. Use the supplied snap on bracket and mount it to the wall using four screws.

6.2 Lock the device

The device can be locked using a standard locking cable.

6.3 Powering the device

6.3.1 Battery

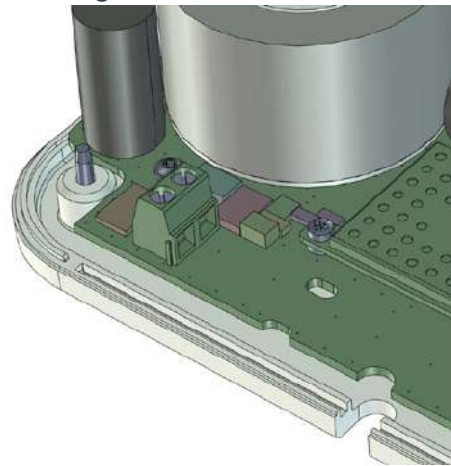
The device has a built-in battery (3.7V Li-ion) which is used to power the device. When the battery status indicator is red, it is time to charge the device.

6.3.2 Micro-USB

The device can be charged using the supplied micro usb cable. The device is fully charged when the battery status led is green and is no longer flashing.

6.3.3 10-28V AC/DC

If a more permanent solution is required, the device can be supplied with 10-28V AC/DC. To do installation, the encapsulation lid first needs to be removed. Remove the four screws on the back of device and install the power cable in the socket on circuit board. See figure to the right.



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7 Instrument technical details

7.1.1 Technical specification

Measurement principle	Semiconductor detector with alpha spectroscopy
Measurement range	0 – 100.000 Bq/m ³
Measurement uncertainty	<15% after 6h at 200Bq/m ³
Minimum Detectable activity	25Bq/m ³ at 1 hour integration time
Connectivity	Wireless data transfer LoRaWAN
Temperature range	-10°C – 60°C
Humidity range	0-95%
Usage height above sea level	0 – 2000m
Power connection	5V Micro USB or 10-28V AC/DC
Battery time	>60 days
Weight	360g

7.1.2 Transfer of data

The OY1500 LoRaWAN Radon gas sensor transfers data wirelessly using the IoT protocol LoRaWAN. This is the only way to transfer data from the device. When the device is connected to a LoRaWAN network, the device will transfer data every 10-minutes.

7.1.3 Resending of lost data packages

Data packages sent from the device can be lost in the transmission. This can be due to multiple reasons, but the most common one is that the device is too far away from a gateway, or that the device has been moved to a new location and the network signal strength modulation has not adjusted the signal strength yet.

For data packages that are lost, the OY1500 features automatic resending of them. Each time a data packet is successfully received to the server, a check is performed to see if all previous data packages have been received correctly (each data packet has a sequence number). If not, a request queue is initiated. The request queue will prioritize the most “important and recent” packages first. It is important to retrieve the lost data packages in order to correctly calculate the radon values.

Note: Resending of packages might take some time. Approximately 8 data packages can be resent for every 10 minutes.

Second note: Not all packages are resent. The network will only request data packages with a minimum time distance between packages of 1 hour. This means that the time resolution of each data point will be 1 hour for resent packages, instead of 10 minutes as for “real-time” streamed data packages.

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Important! In order for the device to be able to transfer “lost” data packages, the device needs to be in measuring mode and not turned off.

7.2 Processing of data

Post-processing of the raw sensor data is done by Radonova, via Nordic Propeye’s application server. It converts the raw sensor data to an actual radon level value presented in Bq/m³. The unique ‘smart’-algorithm switches between different integration periods by analyzing the energy decay spectra. For example, if the radon level is analyzed as stable, a longer integration period is used in order to get a more accurate radon value with lower error. If rapid changes in the radon level are detected (for example due to the start of a ventilation system), a shorter integration period is used. The integration period varies from 1h-3h.

Factory calibration is always carried out for each device. The calibration data is stored on the server and is compensated for in the post-processing of the data. Compensation for climate data from the sensors on the device is also done in the post-processing. Post-processing is always done in real time. As soon as new sensor data is sent from the device, post processing is carried out.

7.2.1 Connection to Nordic Propeye’s application server

Connection to Nordic Propeye’s application server is done with an API by MQTT. In order to set up your connection to Nordic Propeye’s application server, please contact support@propeye.se.

7.3 Calibration

It is recommended to let the device be calibrated every year. However, requirements of calibrations might differ between authorities in different countries. To learn more about how you can let your device get calibrated, reach out to support@propeye.se.