Advanced Building Monitoring by InnoRenew CoE—User manual

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Description

This document serves as the user manual for the **Advanced Building Monitoring system** developed by InnoRenew CoE. The system consists of modular sensor units, each combining a data logger with specific sensors. In this manual, we provide detailed guidance on the setup, operation, and error codes for modules designed to monitor:

- In-wall temperature and relative humidity
- Wood moisture content
- Sound pressure level
- Indoor air quality (IAQ)

Each module is built on a unified data logger, supporting straightforward Wi-Fi setup, robust sensor data acquisition, and over-the-air updates. The manual also includes guidance on accessing and exploring the collected data through the web-based data visualization dashboard.

1. Modules

All sensor modules require a USB-B power adapter that supplies 5V and can handle up to 2 amps of current. The power input is located at the center of the bottom side of each module. We recommend using the adapter that the supplier provides.

Each module is labeled with its MAC address on the back, just above the power input. The modules also feature a reset button that clears the Wi-Fi credentials; this button is located to the left of the power input, inside the largest hole.

An RGB LED provides color-coded status indication and shines through the logo on the front of the module.

Provided Power Adapter

Each module comes with a USB-micro B 5V power adapter rated at 2A.

2. Module Types

Indoor Air Quality (IAQ)

The Indoor Air Quality module measures particulate matter (PM1, PM2.5, PM4, PM10), temperature (T), relative humidity (RH), VOC index, NOx index, and CO_2.

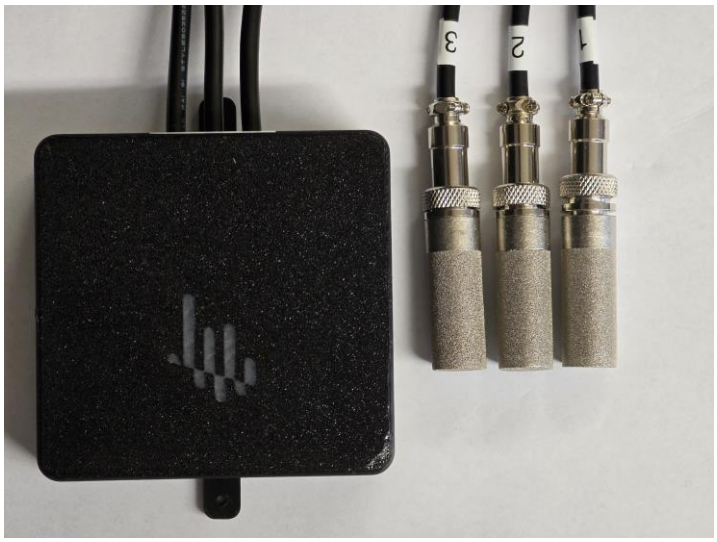
The table below summarizes the measured parameters, ranges, and accuracy.

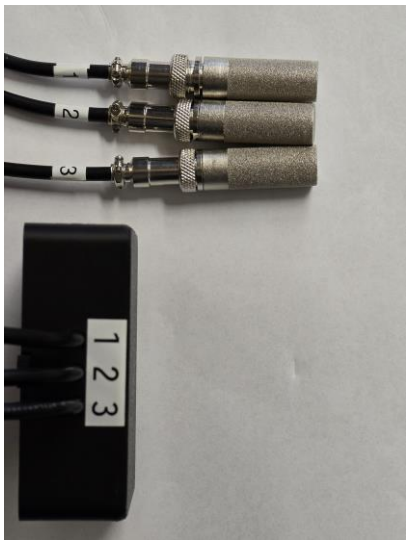
Parameter	**Range**	**Accuracy**
PM1	0 – 100 µg/m^3	±5 (%)
	100 – 1000 µg/m^3	±10 (%)
PM2.5	0 – 100 µg/m^3	±5 (%)
	100 – 1000 µg/m^3	±10 (%)
PM4	0 – 100 µg/m^3	±25 (%)
	100 – 1000 µg/m^3	±25 (%)
PM10	0 – 100 µg/m^3	±25 (%)
	100 – 1000 µg/m^3	±25 (%)
Temperature	0 – 65 °C	±0.45
Relative Humidity	0 – 100 %	±4.5 (%)
VOC (volatile organic compounds)	1 – 500 index	±15
NOX (nitrogen oxides)	1 – 500 index	±50
CO2	400 ppm to 1000 ppm	±2.5 (%)
	1001 ppm to 2000 ppm	±3 (%)
	2001 ppm to 5000 ppm	±5 (%)

VOC and NOX sensing elements are based on the Sensirion's metal oxide sensor, further details for output interpretation are available at: VOC index and NOX index.

In-wall temperature and relative humidity

This module includes 3 probes that measure in-wall temperature and relative humidity.





The table below summarizes the measured parameters, ranges, and accuracy.

Parameter	**Range**	**Accuracy**
Temperature	0 – 65 °C	±0.2
Relative Humidity	0 – 100 %	±2 (%)

Wood Moisture Content Sensor

This module includes two wood moisture content probes that measure wood moisture based on electrical resistance. Each probe also provides temperature and relative humidity readings in the internal cavity of electrodes and on the external side of the probe.

The table below summarizes the measured parameters, ranges, and accuracy.

Parameter	**Range**	**Accuracy**
Temperature	-40 – 125 °C	±0.3
Relative Humidity	0 – 100 %	±2 (%)
Moisture Content	7 – 30 %	±2 (%)

Decibel Detection Module

This module includes a sound pressure level sensor that measures sound levels in decibels (dB).

The table below summarizes the measured parameters, ranges, and accuracy.

Parameter	**Range**	**Accuracy**
Sound Pressure Level	30 – 120 dB	±0.5

3. Module Installation

All modules, except the IAQ, are designed for wall mounting. They include two feet that can be screwed into the wall for secure installation. The IAQ module offers multiple installation options thanks to its additional accessories. It can be mounted on a wall, suspended from the ceiling, or positioned at an angle on a desk.

4. Changing Wi-Fi Credentials

If the Wi-Fi credentials of the network covering a sensor module are going to change, or if the module needs to be connected to a different Wi-Fi network, please contact InnoRenew CoE support **before making any changes.** This allows us to perform a preventive over-the-air (OTA) update with the new credentials.

Important: During the transition, the sensor module will stop reporting data until the new Wi-Fi settings are applied. If the network changes occur before the OTA update, the sensor will be unable to reconnect and will require a manual update of the Wi-Fi credentials, as explained in the *Manual update of Wi-Fi credentials* section.

To request the over the air update of network credentials please contact the InnoRenew CoE support at ceo@innorenew.eu providing the following details:

- Sensor location
- Sensor type (air quality, wood sensor, temperature humidity probes, SPL sound)
- New Wi-Fi credentials (SSID, password)

Manual update of Wi-Fi credentials

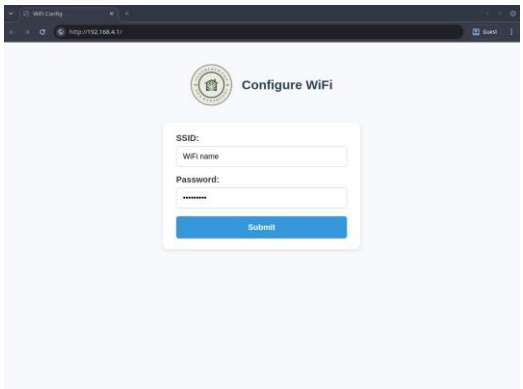
The manual change of Wi-Fi requires physical access to the sensor module requiring a reset procedure comprising the following steps.

1. Disconnect the power.
2. Press and hold the reset button using a pen or any pointed object. The button is located inside the small hole to the right of the USB power port. (check picture bellow)
3. While holding the reset button, reconnect the power.
4. Wait for the module to show a purple light.
5. Release the reset button and wait for the module to reboot.

The reset button location is shown in the following figure:

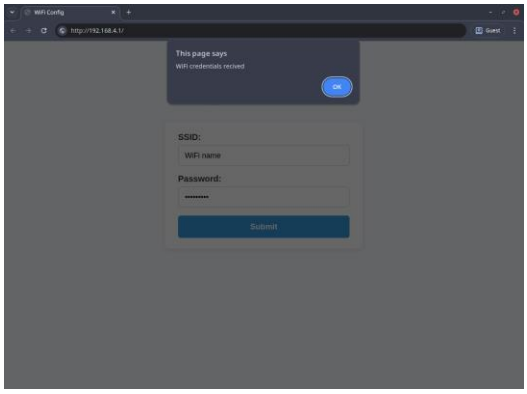
After rebooting, the module will enter Access Point mode, and you the following steps shoulod be followed to setup the new Wi-Fi credentials:

The sensor module opens an access point with SSID: ESP32_Config, and the password: configure123
Once connected, open a web browser and go to http://192.168.4.1/ — this is the configuration page hosted by the module. There, you can enter the new Wi-Fi SSID and password.



If the module receives the credentials successfully, it will:

1. Blink a blue light,
2. Display a confirmation message, and
3. Reboot automatically.



After rebooting:

- A green blinking light indicates a successful Wi-Fi connection.
- A red blinking light means the connection failed.

5. Light Indicator and Log Codes

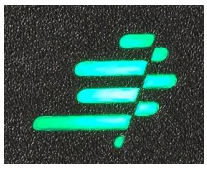
All modules use the same system of light codes for status logging. The IAQ module includes additional colors to display air quality.

Startup and Status Codes:

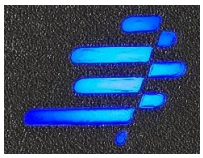
Light Blue – Booting

Light Green – Booted successfully, system is functioning normally

Blinking Green – Connected to Wi-Fi



Blinking Dark Blue – Wi-Fi credentials received



Blinking Light Blue – Updating firmware

Purple – Rebooting to reset credentials and open Access Point mode

IAQ-Specific Air Quality Indicator

The IAQ module displays real-time air quality using color:

- Green – Good air quality
- Red – Poor air quality
- Gradient from Green to Red – Varying levels of air quality between good and bad

Error Codes

Blinking Red – Failed to connect to Wi-Fi
(If it blinks after an update attempt, the update has failed)

Blinking Yellow – Failed to send data to the server

Blinking Orange – Failed to send data to the server, and internal storage is full

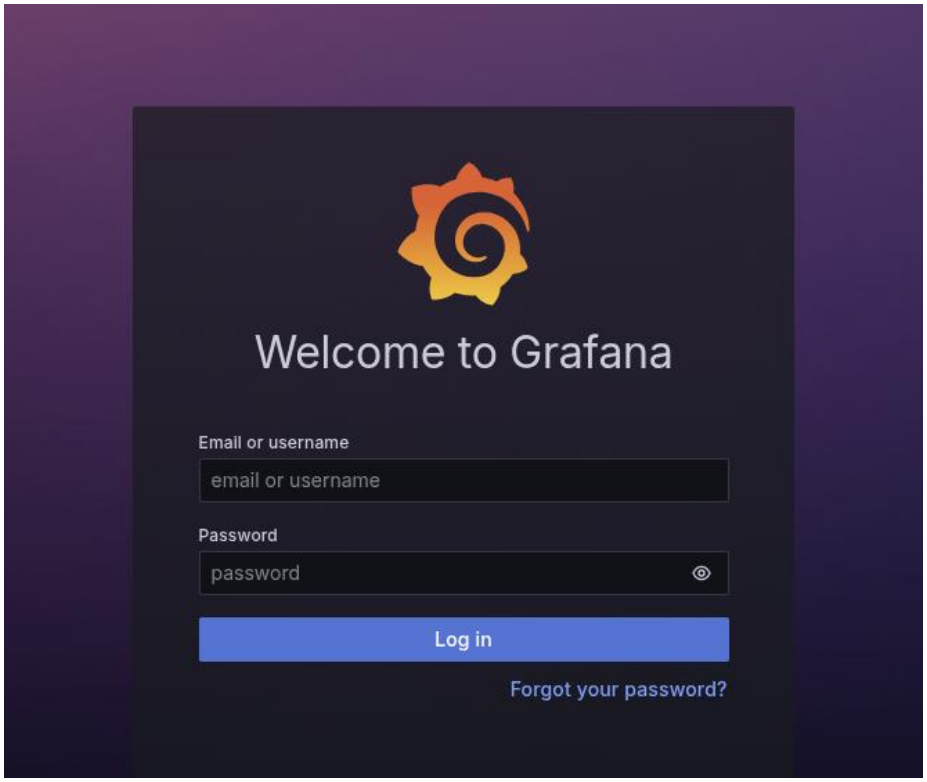
Important Note:
Do not confuse error codes with the IAQ air quality indicators.
Error codes always blink, while air quality indicators glow steadily and change gradually based on air quality.

6. Data Visualization Dashboard

Sensor data can be accessed through the Data Visualization Dashboard accessible at: ctfc.innorenew.eu

Login

Login is required to access the dashboard. To create additional users, please send a request via e-mail at ceo@innorenew.eu



Access the dashboard

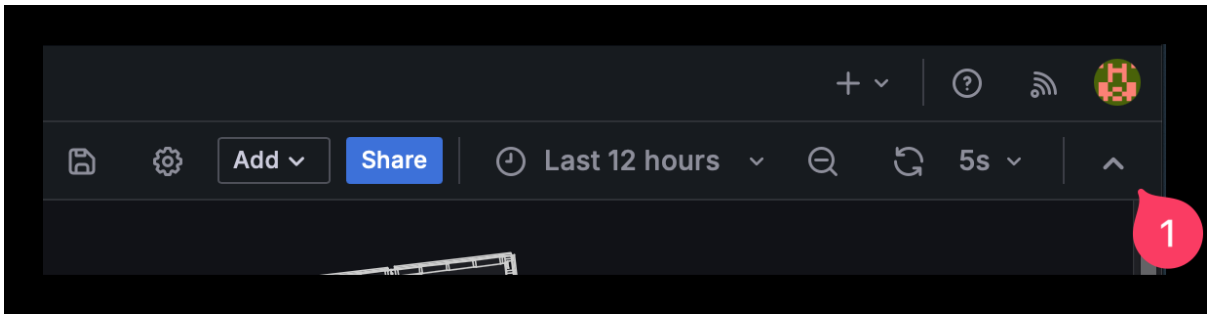
Navigate to the dashboard list by clicking the three horizontal lines in the top-left corner of the page. This will open a list of building floors, buildings, and the weather station. Selecting an item from the list will open a data viewer for that specific location, where you can explore both live and historical data.

Kiosk mode

To open the dashboard in **Kiosk Mode**, follow these steps:

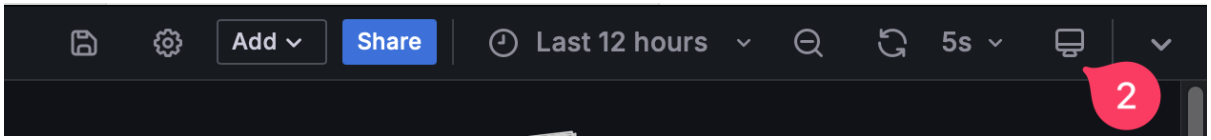
1. **Collapse the Navigation Bar**:

Begin by clicking the **collapse icon** on the left side of the screen. This is labeled as **(1)** in the photo. Collapsing the navigation bar allows for a more streamlined view of the dashboard.



2. **Enter Kiosk Mode**:

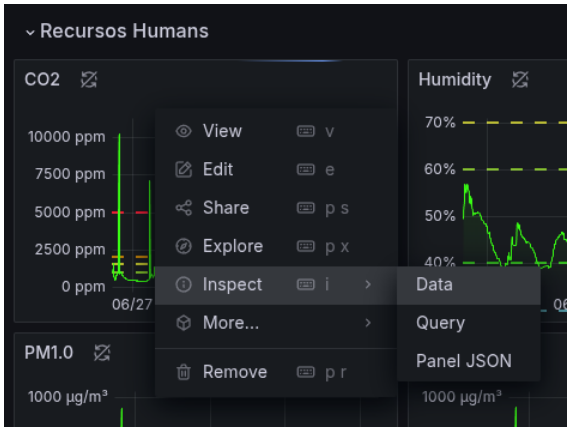
After collapsing the navigation, click the **Kiosk Mode icon**, labeled as **(2)** in the photo. This will expand the dashboard to full screen, hiding unnecessary UI elements and providing a cleaner display—ideal for presentations or wall displays.

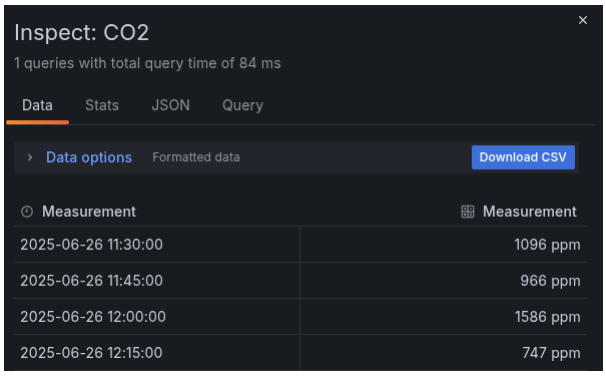


To **exit Kiosk Mode**, simply press the **Esc key** on your keyboard. This will return the dashboard to its normal view.

Data export

The dashboard provides an option to export data in CSV (Excell supported format). To export data, hover over the selected sensor chart, click the three vertical dots, select Inspect, then choose Data (left picture). This will open a preview window with the option to download a CSV file (right picture). The time range for the exported data can be set by clicking the clock icon in the top-right corner of the dashboard.





If you need to download large amounts of data from multiple sensors in bulk, please contact us at ceo@innorenew.eu. In such cases, we will retrieve the data directly from the database, as the dashboard does not support large downloads.

When requesting bulk data, please specify sensors, time interval, and time resolution.

7. Support

If you experience issues with the sensors or dashboard, please contact us at ceo@innorenew.eu