Prevent-iON® Detection Technology

OFF-GAS

User manual for the DAISY-GAS-VOC off-gas sensor: daisy-chain installation, Base Unit setup, thresholds and alerts, Modbus TCP integration and periodic testing.

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Table of Contents

1 Introduction

The DAISY-GAS-VOC is a specialized sensor solution designed for monitoring off-gas emissions in battery systems. It provides reliable detection and measurement of Volatile Organic Compounds (VOC), while also tracking temperature and humidity to ensure comprehensive environmental monitoring. For expanded coverage, the system supports daisy-chaining of multiple DAISY-VOC sensors, with capacity depending on the DAISY-STARTER firmware version—up to 25 DAISY-GAS-VOC sensors for firmware 1.7 and above, and up to 13 DAISY-GAS-VOC sensors for firmware 1.4 and below. This makes the DAISY-GAS-VOC highly scalable and adaptable for large installations.

With its ability to combine gas, temperature, and humidity sensing in a single platform, the DAISY-GAS-VOC delivers a robust and adaptable solution for maintaining safety and performance in critical environments.

2 All About DAISY-GAS-VOC

2.1 Certifications and Calibrations

UR61010 - UL Recognized
IEC 61000, CE and EMC certified
ISO17025 certified for temperature sensor

2.2 Sensor Metrics

VOC measurement output range	0–500 VOC Index
VOC repeatability	<±5 VOC index points or % mass volume W (m.v.)
Temperature measurement range	-40°C to 125°C
Temperature accuracy	± 0.48 °C (0.86 °F)
Relative humidity measurement range	0 to 100 % RH
Relative humidity accuracy	2 % RH

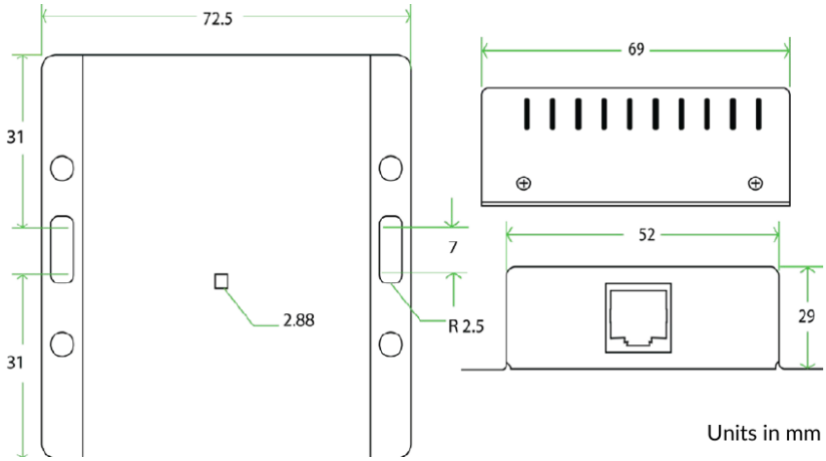
2.3 Technical Specification

Powered by and communicates with	Base Unit (BASE-XX) (required) Requires the optional BASE-FW-SSLS firmware add on only for the Base Unit with FW version 9.1 below DAISY-STARTER(required) serves as the controller for the daisy chained sensors
Connectivity	RJ45 cable transmitting data & power from Base Unit to Sensor
Cable specification	RJ45 CAT 6/7 recommended Up to 100m (330ft) subject to cable quality & interference
Sensor power usage	120 mW

2.4 Environmental Specification

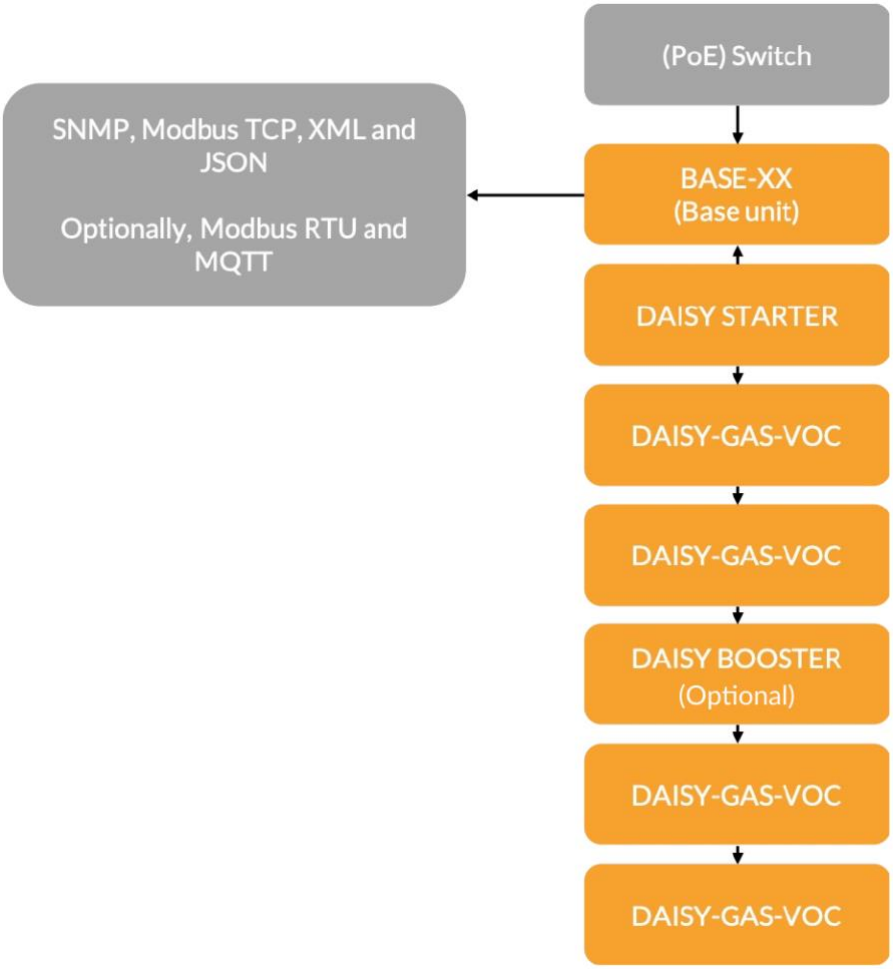
Operating temperature range	-10°C to +50°C (14°F to +122°F)
Humidity (operating and storage)	0 to 90% RH (non-condensing)

2.5 Physical Specifications



Sensor enclosure	Steel enclosure, industrial grade
Mounting option	0U rack, DIN rail, magnetic, or wall mountable sensor
Dimensions	72.5mm (2.85”) x 69mm (2.72”) x 26 mm (1.02”)
Weight	193g (0.43lb)
Maximum length of daisy chain	DAISY-STARTER FW version 1.7 above can connect up to 25 DAISY-GAS-VOC sensors FW version 1.4 and below can connect up to 13 DAISY-GAS-VOC sensors.

3 System Architecture



The DAISY-GAS-VOC system architecture is built around a modular and scalable design. At the core, the DAISY-STARTER connects directly to the BASE-XX unit, which serves as the central hub for communication with external systems using SNMP, Modbus TCP, XML, and JSON, with optional support for Modbus RTU and MQTT.

From the DAISY-STARTER, a DAISY-GAS-VOC sensor is connected, and additional sensors can be daisy-chained in sequence. The number of DAISY-GAS-VOC sensors that can be connected in sequence depends on the **DAISY-STARTER firmware version**. Systems running **firmware 1.7 and above** support up to **25 DAISY-GAS-VOC sensors**, while systems with **firmware 1.4 and below** support up to **13 sensors**. Installations requiring more sensors can be expanded with an optional **DAISY BOOSTER** to maintain reliable performance.

This sequential architecture ensures simple expansion, reliable communication, and efficient monitoring of VOC, temperature, and humidity across multiple points within battery systems.

4 Implementation

In this section, you will gain insights into the practical aspects of deploying our sensor technology. We provide detailed information on how the sensors are installed, including their integration, testing, and commissioning processes. Additionally, you'll find valuable guidance, ensuring that your team is well-prepared to maximize the sensor's capabilities effectively. This section serves as a hands-on guide to put our technology to work in your environment.

4.1 Preparation

Prior to initiating the installation procedure, it is crucial to ensure that you have all the essential materials and devices readily available.

- Devices Needed
  - BASE-XX
  - DAISY-STARTER
  - DAISY-GAS-VOC
  - DAISY-BOOSTER (optional)
- Tools Needed
  - RJ45 Cables
  - PoE Cable (Optional)
  - Screwdriver
  - Screws, bolts and nuts – for mounting purposes
- Things to check
  - Ensure that there is no visible damage on any of the devices
  - Check the functionality of all network cables and ensure that they are free from any defects that could affect the quality of results.
  - Prepare the location or area where you intend to place or install the devices.

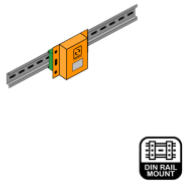
Adhering to these guidelines will contribute to a successful and trouble-free installation process.

4.2 Mounting Installation Guidelines

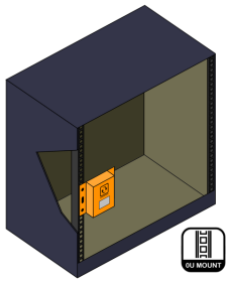
Our sensors offer flexible mounting solutions, providing you with various options for installation:

Important Note:

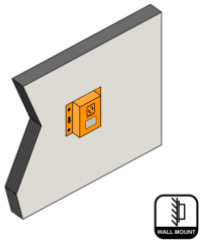
To ensure proper safety and functionality, the unit must be grounded to an earth ground during installation. Connect the grounding wire to one of the enclosure mounting holes, using a screw and washer to secure it firmly and provide a reliable connection. Proper grounding is essential for Electrostatic Discharge (ESD) protection and optimal device performance. Ensure the connection complies with local electrical and safety codes and test it before powering the unit.



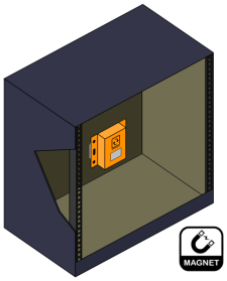
DIN Rail: Ideal for secure, space efficient mounting with compatible enclosures or control panels.



0U Rack: Allows for efficient and organized rack-based installation, conserving valuable rack space.



Wall Mount: Perfect for affixing units to walls, optimizing placement within your environment.



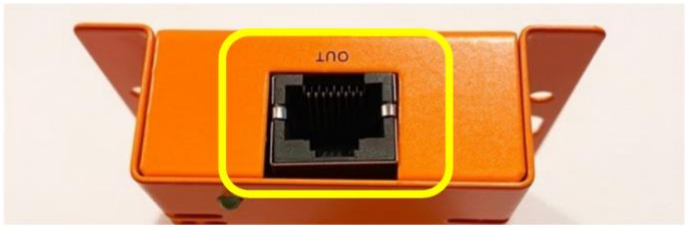
Magnetic: Offers the convenience of magnetic attachment.

5 Setting up

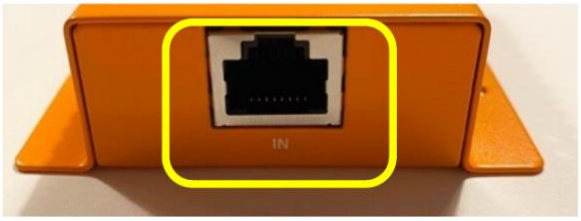
5.1 Connecting Daisy Chain Sensor

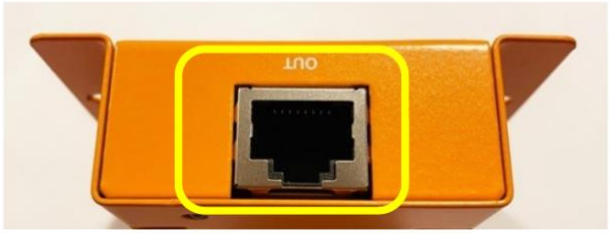
The ports on DAISY-STARTER and DAISY SENSORS are labeled “IN” and “OUT”. This is to ensure that you are connecting each device accordingly. See images below for reference.

DAISY-STARTER



DAISY-GAS-VOC



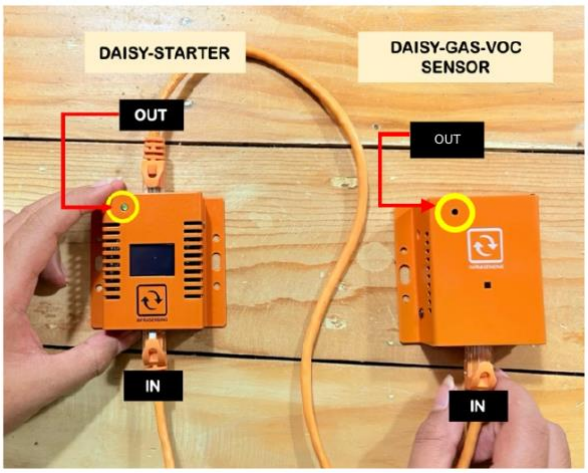


Images above shows the IN and OUT ports labeled on your sensors.

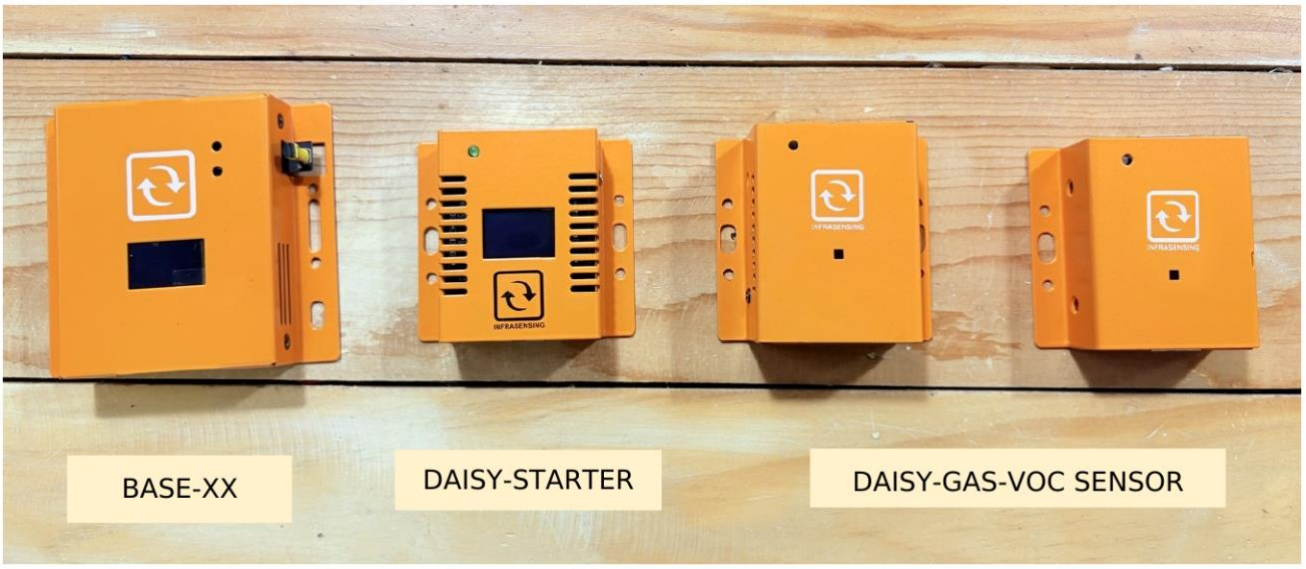
IMPORTANT NOTE:

The port positioned next to the LED indicator should always be treated as the **OUT port**. If a label indicates **IN** but the port is beside the LED indicator, the label should be disregarded—its function remains **OUT**.

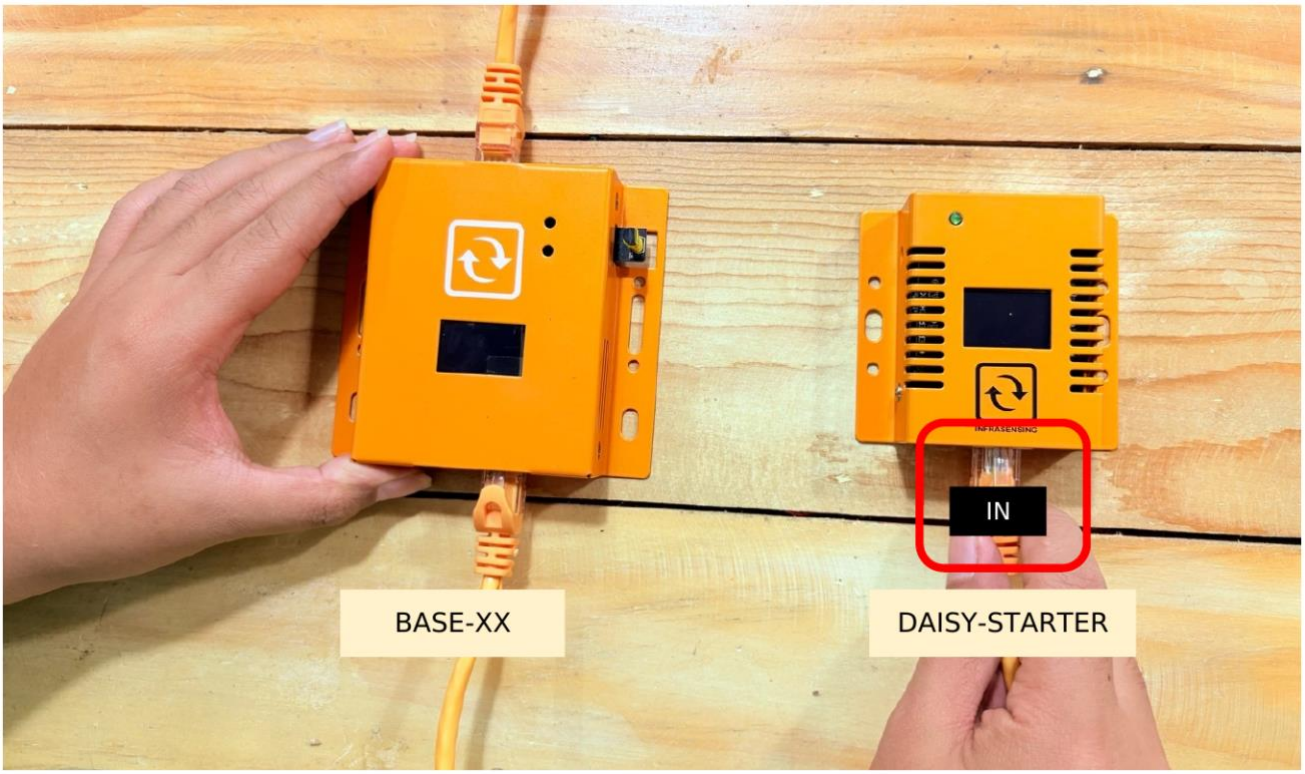
It is a must to follow the connection pattern exactly as shown in the diagram above. Always connect the **OUT port** of one device to the **IN port** of the next device. Never connect **OUT to OUT** or **IN to IN**, as doing so will cause the sensors to stop working and may result in permanent damage. Always double-check all connections before powering on the system. **Failure to follow this may damage your sensors and the entire system.**



Before proceeding, it's important to prepare all the necessary devices. Ensure that you have both the BASE-XX and DAISY-STARTER devices on hand. Keep in mind that each BASE-XX can only connect to one DAISY-STARTER. Please see the example below.



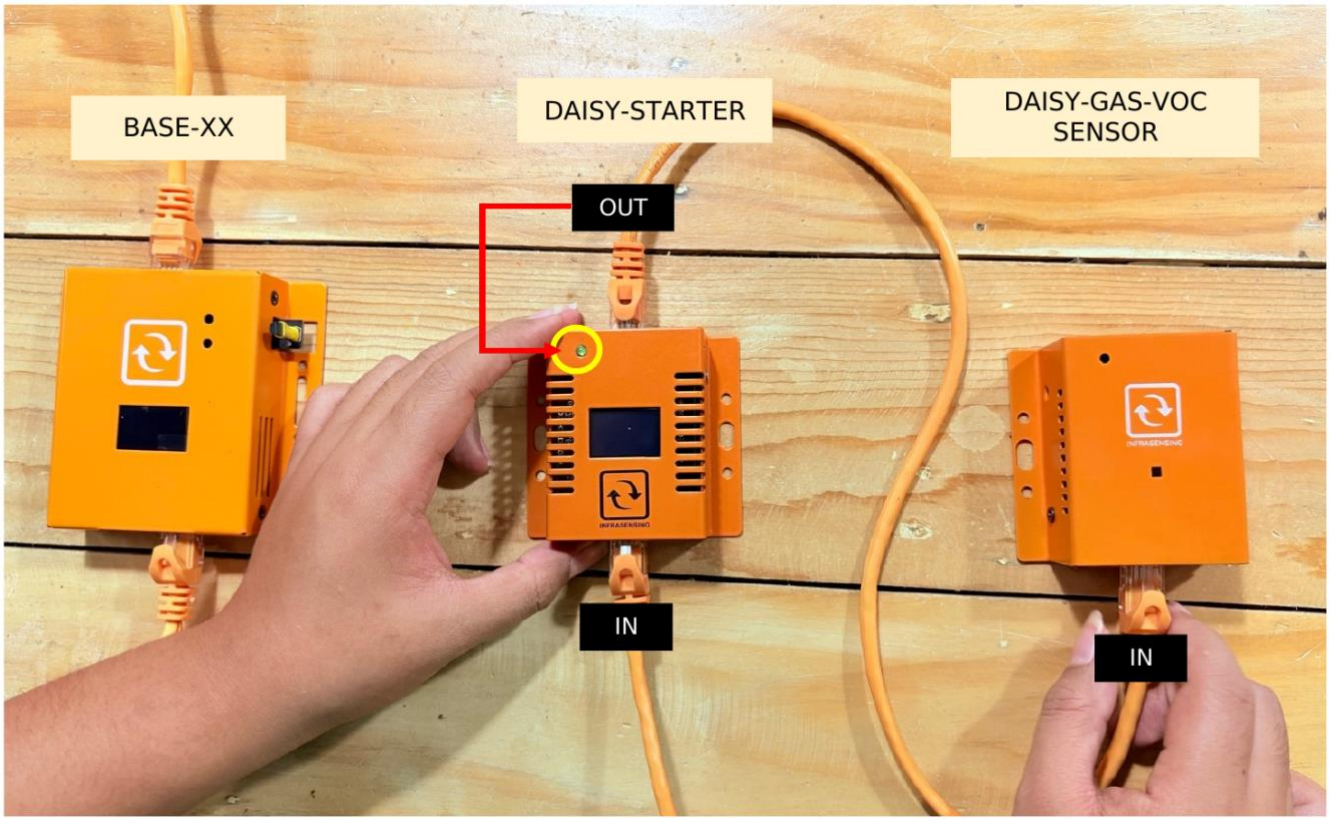
First, connect your BASE-XX to your DAISY-STARTER using a regular RJ45 cable. Refer to the image below for reference :



Once you have connected the BASE-XX and DAISY-STARTER, it's time to connect the DAISY-GAS-VOC sensor. Begin by locating the OUT port on the DAISY-STARTER and the IN port on the DAISY-GAS-VOC sensor. These ports are typically labeled for easy identification.

Next, take a regular RJ45 cable and connect one end to the OUT port on the DAISY-STARTER and the other end to the IN port on the DAISY-GAS-VOC sensor. Ensure that the cable is securely plugged in on both ends to establish a stable connection. Please refer to the image below for reference.

Take care not to force the cable into the ports, and avoid pulling on the cable once it is connected. Once the connection is established, you're ready to move on to the next step.



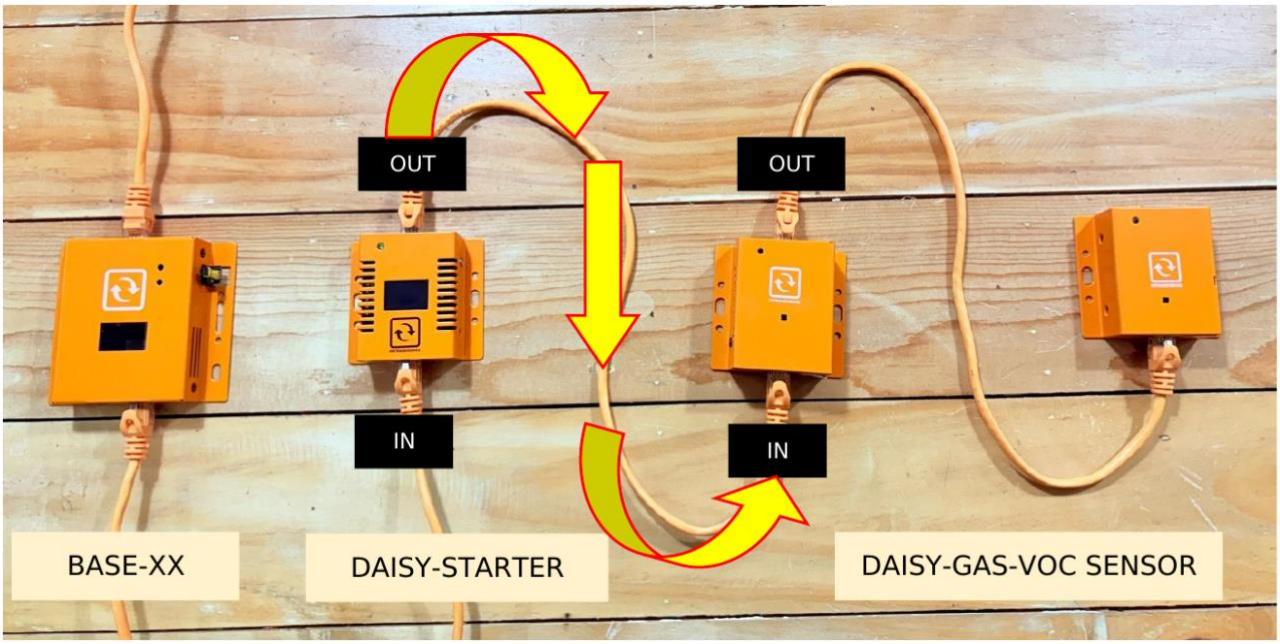
IMPORTANT NOTE:

- **Never connect the DAISY-STARTER or DAISY-GAS-VOC sensor directly to a PoE switch.** Doing so may supply the incorrect voltage and **cause permanent damage** to the unit.
- Direct connection of the DAISY-GAS-VOC to network equipment (switches, routers, PoE injectors, Base Unit) may lead to irreparable damage.
- The DAISY-GAS-VOC sensor must **only be connected through the DAISY-STARTER and Base Unit** as described in the manual.

Now that you've successfully connected the first DAISY-GAS-VOC sensor, you can repeat the same

process for any additional sensors you have. Remember to locate the OUT and IN ports labeled

on each sensor.



Using a regular RJ45 cable, connect the OUT port of the first sensor to the IN port of the next sensor. Keep repeating this process until all of your sensors are connected.

Make sure to refer to the diagram below for guidance. It's important to ensure that all sensors are securely connected and that the cables are not tangled or stretched too far.

NOTE:

The number of DAISY-GAS-VOC sensors that can be connected in sequence depends on the **DAISY-STARTER firmware version**. A DAISY-STARTER running firmware **1.7 and above** can connect up to **25 DAISY-GAS-VOC sensors**, while firmware **1.4 and below** supports up to **13 sensors**. Installations requiring more sensors can be expanded with a **DAISY BOOSTER** to maintain reliable performance.

5.2 Powering up

Once the **daisy-chain connection of your DAISY-GAS-VOC sensors** has been properly set up, the next step is to power up the system. The **BASE-XX unit** serves as the central hub, and it must be powered on before the sensors can begin operation.

There are several options available for powering your Base Unit, depending on your setup and available resources:

For BASE-5:

1. **PoE (Power over Ethernet):** Power the Base Unit directly through the Ethernet cable.

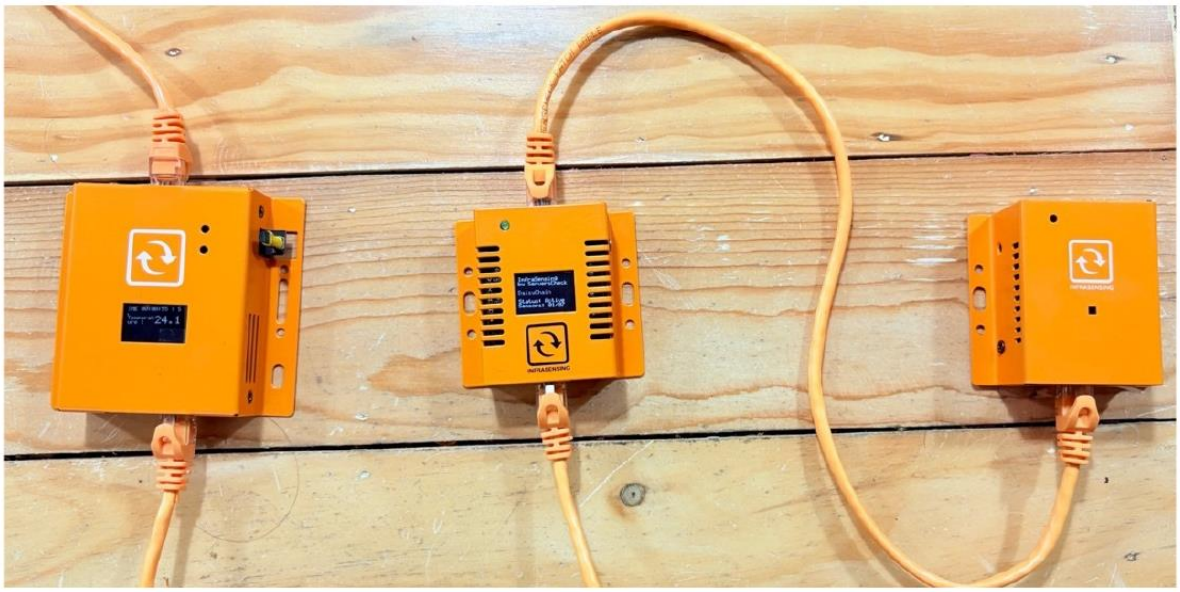
2. **BASE-PWR:** Use a power adapter to connect the Base Unit to a standard electrical outlet.
3. **BASE-PWR-USB:** If no outlet is available, power the Base Unit using a USB cable connected to a computer or other USB-enabled device.
4. If you are going to use your own power adapter, it should have 12V output 1A.

DISCLAIMER: For installations requiring more than 10 sensors, the use of a BASE-PWR unit is mandatory to ensure proper power distribution and reliable operation.

For BASE-PI-5-24V:

1. **PoE (Power over Ethernet):** Power the Base Unit directly through the Ethernet cable.
2. **24V DC Source via Terminal Block:** Connect the Base Unit to a regulated 24V DC power supply. Ensure the polarity and voltage match specifications to prevent damage.

This flexibility ensures that the system can be deployed across different environments while maintaining reliable operation.



NOTE: The **connecting cable** between the Base Unit and the DAISY-STARTER must not exceed **2 meters (6.6 ft.)**. Additionally, the **total length of the daisy chain**, including the DAISY-STARTER and Base Unit should not exceed **100 meters**. For longer distances, a **DAISY BOOSTER** may be added to extend the chain while maintaining reliable performance.

5.3 Accessing Daisy Chain connection

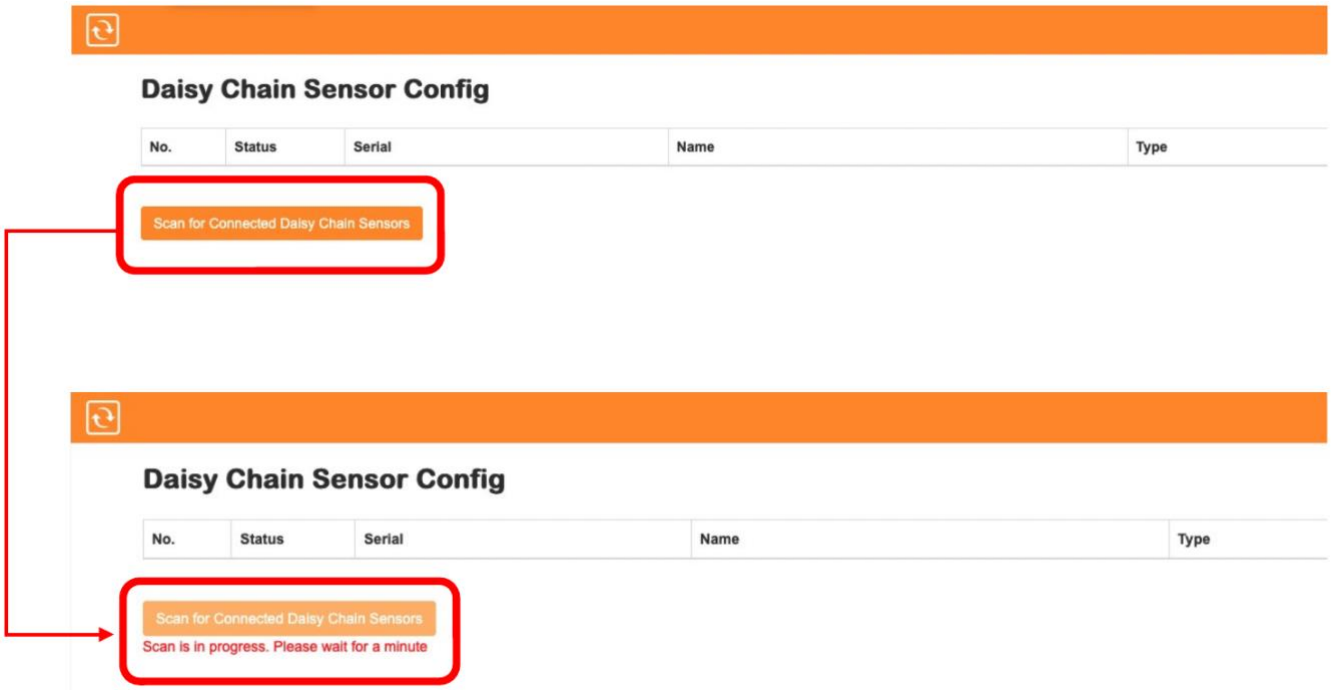
Now that your setup is complete and the **Base Unit is powered on**, you can access the Base Unit through its **IP address**. Refer to the device manual or packaging for instructions on how to locate the assigned IP address.

Once you have the IP address, enter it into the address bar of your web browser. This will open the **Base Unit's user interface**, where you can monitor connected sensors, manage configurations, and adjust system settings.

If you have daisy-chained sensors, you may see a new menu that displays all of your connected sensors. Refer to the image below for an example of what this menu might look like. To view details and identify the sensors in your daisy chain, click on **Daisy Chain Information**.

5.4 Scanning for Connected Daisy Chain Sensors

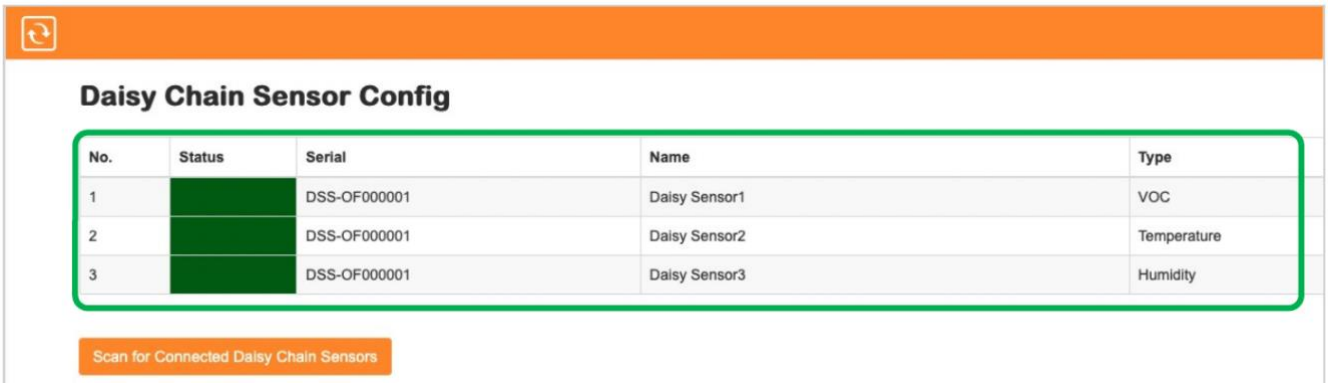
After you click on **Daisy Chain Information**, a pop-up window will appear with the option **"Scan for Connected Daisy Chain Sensors."** Selecting this option will prompt the Base Unit to scan for all connected sensors, and the process typically completes in less than a minute. If you need to refresh the list, you can perform another scan by clicking the same button again after one minute.



IMPORTANT NOTE:

When scanning more than 3 daisy chain sensors, allow at least 3–5 minutes for the process to complete, as additional sensors may take longer to be detected. If the scan appears too slow or becomes unresponsive, simply reboot or refresh the Base Unit and try again.

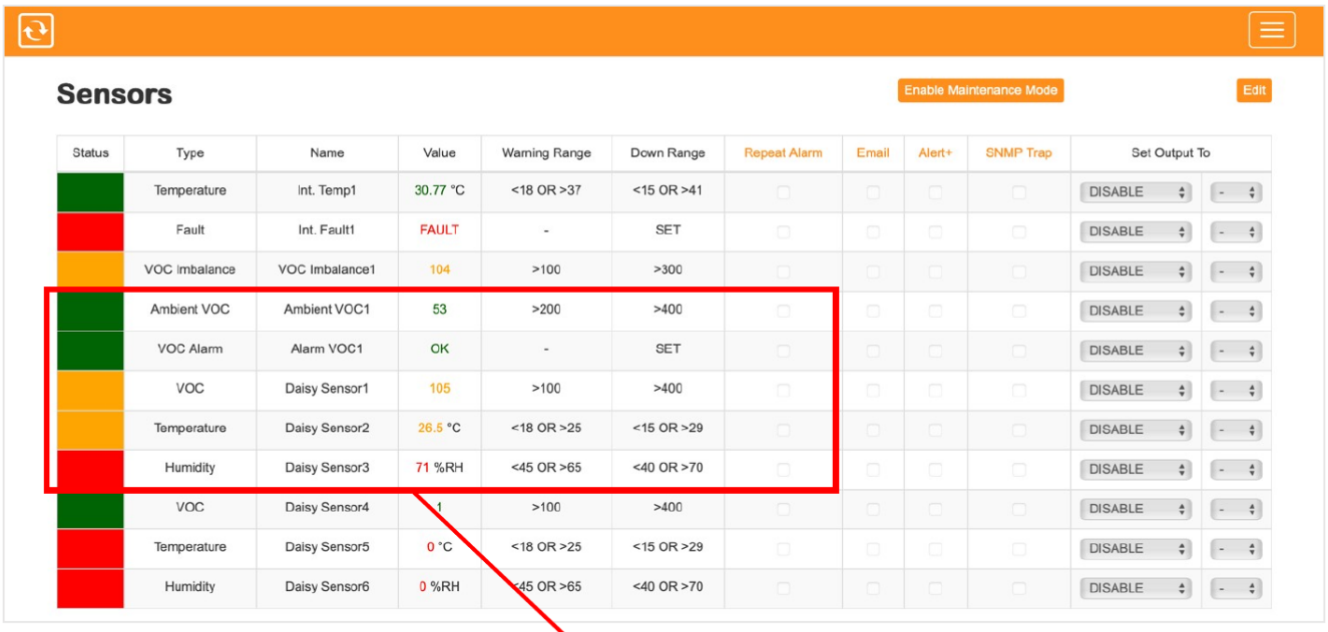
–– Once the scanning is complete and you return to the Sensor Home page, you will now see all of your connected Daisy Chain sensors listed. Each sensor will appear along with its corresponding values, allowing you to easily monitor their status and confirm that the devices are properly detected and operational. Based on the example image below, only one DAISY-GAS-VOC sensor is connected, but your setup may display multiple sensors depending on your configuration.



Daisy Chain Sensor Config

No.	Status	Serial	Name	Type
1		DSS-OF000001	Daisy Sensor1	VOC
2		DSS-OF000001	Daisy Sensor2	Temperature
3		DSS-OF000001	Daisy Sensor3	Humidity

Scan for Connected Daisy Chain Sensors



Sensors

Enable Maintenance Mode | Edit

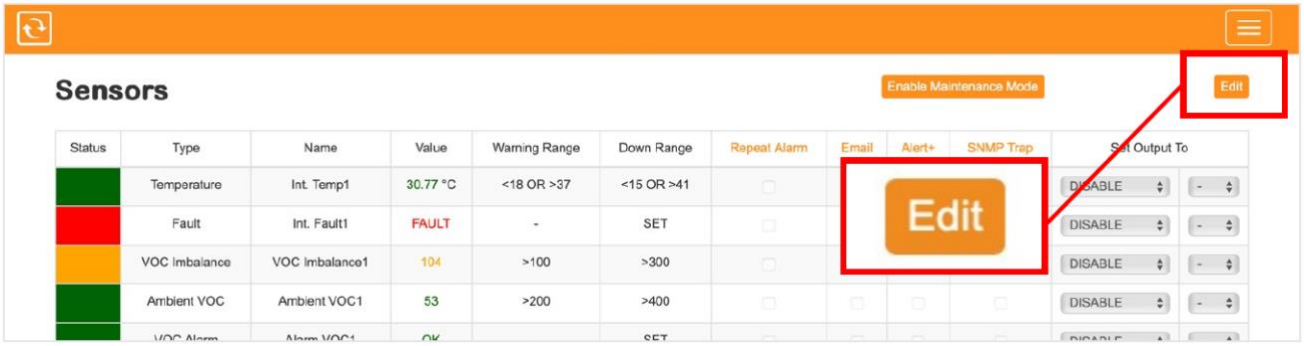
Status	Type	Name	Value	Warning Range	Down Range	Repeat Alarm	Email	Alert+	SNMP Trap	Set Output To
	Temperature	Int. Temp1	30.77 °C	<18 OR >37	<15 OR >41					DISABLE -
	Fault	Int. Fault1	FAULT	-	SET					DISABLE -
	VOC Imbalance	VOC Imbalance1	104	>100	>300					DISABLE -
	Ambient VOC	Ambient VOC1	53	>200	>400					DISABLE -
	VOC Alarm	Alarm VOC1	OK	-	SET					DISABLE -
	VOC	Daisy Sensor1	105	>100	>400					DISABLE -
	Temperature	Daisy Sensor2	26.5 °C	<18 OR >25	<15 OR >29					DISABLE -
	Humidity	Daisy Sensor3	71 %RH	<45 OR >65	<40 OR >70					DISABLE -
	VOC	Daisy Sensor4	1	>100	>400					DISABLE -
	Temperature	Daisy Sensor5	0 °C	<18 OR >25	<15 OR >29					DISABLE -
	Humidity	Daisy Sensor6	0 %RH	<45 OR >65	<40 OR >70					DISABLE -

	Ambient VOC	Ambient VOC1	53	>200	>400	
	VOC Alarm	Alarm VOC1	OK	-	SET	
	VOC	Daisy Sensor1	105	>100	>400	
	Temperature	Daisy Sensor2	26.5 °C	<18 OR >25	<15 OR >29	
	Humidity	Daisy Sensor3	71 %RH	<45 OR >65	<40 OR >70	

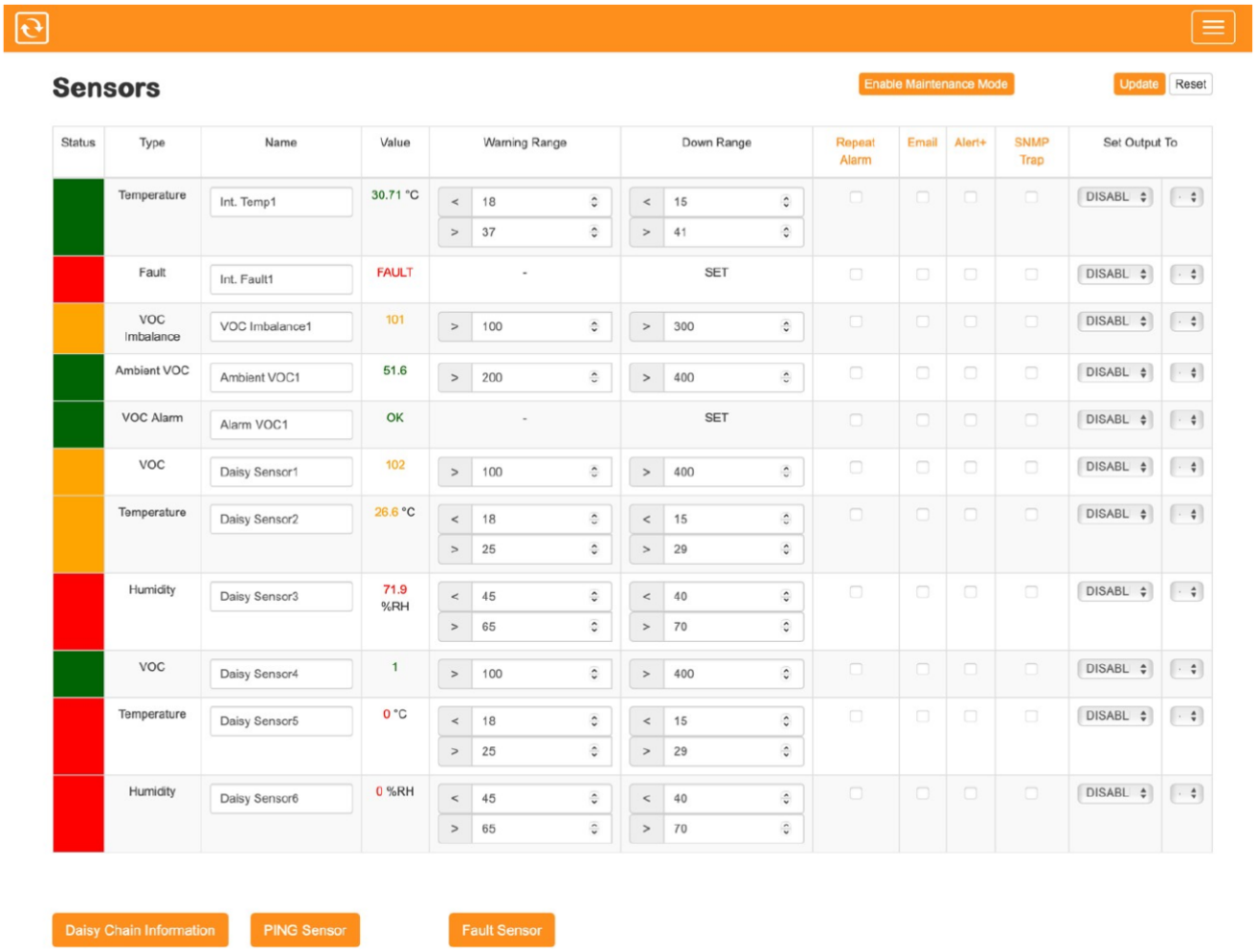
6 Setting threshold values and alert configuration

6.1 Setting Threshold

To set the threshold values for alerting, connect to the Base Unit and navigate to the home page. Click on the Edit button located next to the sensor where you wish to apply this option under Live Sensor Data.



These are the options that you will see for each device once you click the 'Edit' button.

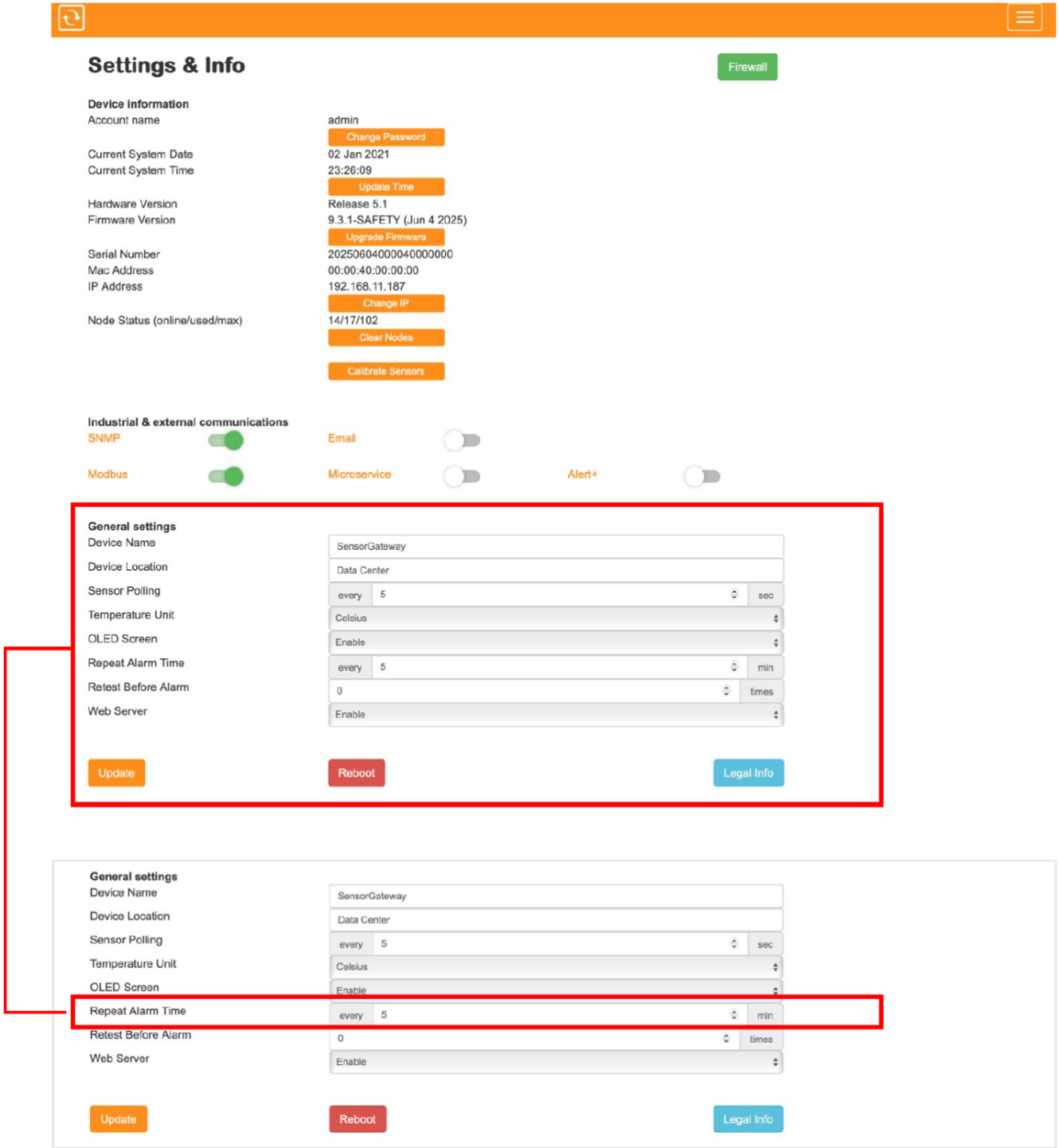


6.2 Alarm Settings

6.2.1 Repeat Alarm Time (seconds)

If this option is enabled, it will repeat the alert messages at the interval of the time you set.

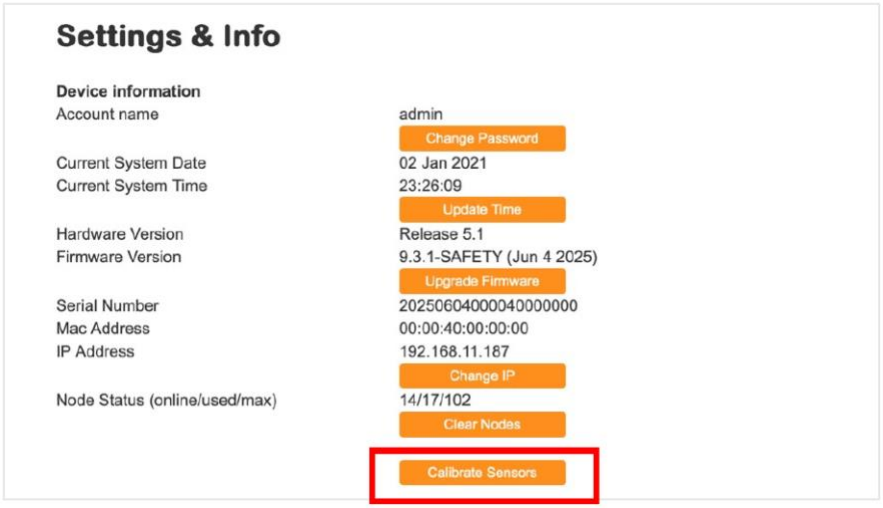
To access this option, navigate to the Base Unit settings and under General settings, you will see the option Repeat Alarm Time.



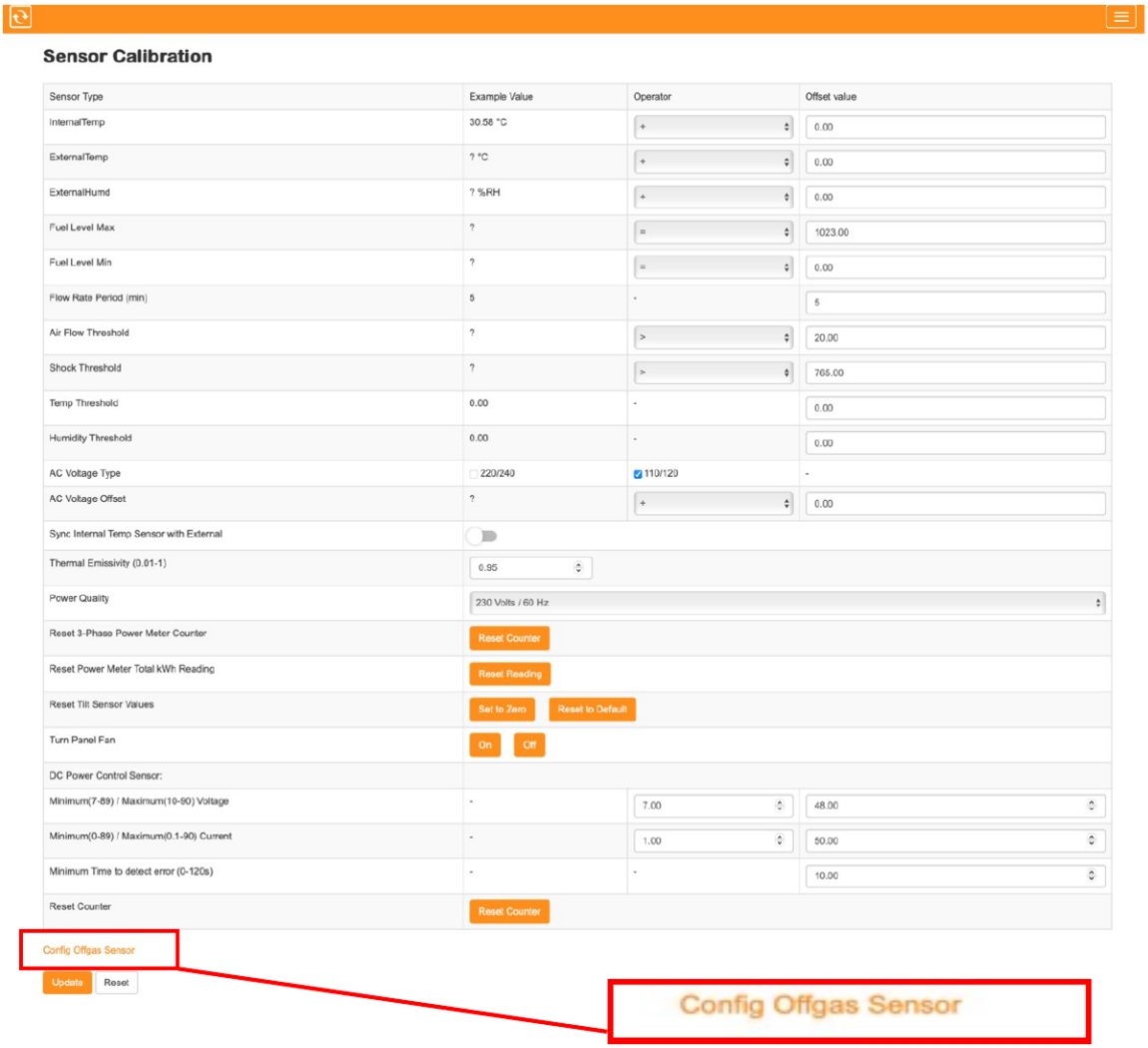
7 Off-Gas Sensor Settings

The **Off-Gas Sensor Settings** menu allows you to configure and manage off-gas monitoring for your system. Within this section, you can define detection thresholds, enable alarms, and fine-tune sensor parameters to ensure accurate and reliable operation.

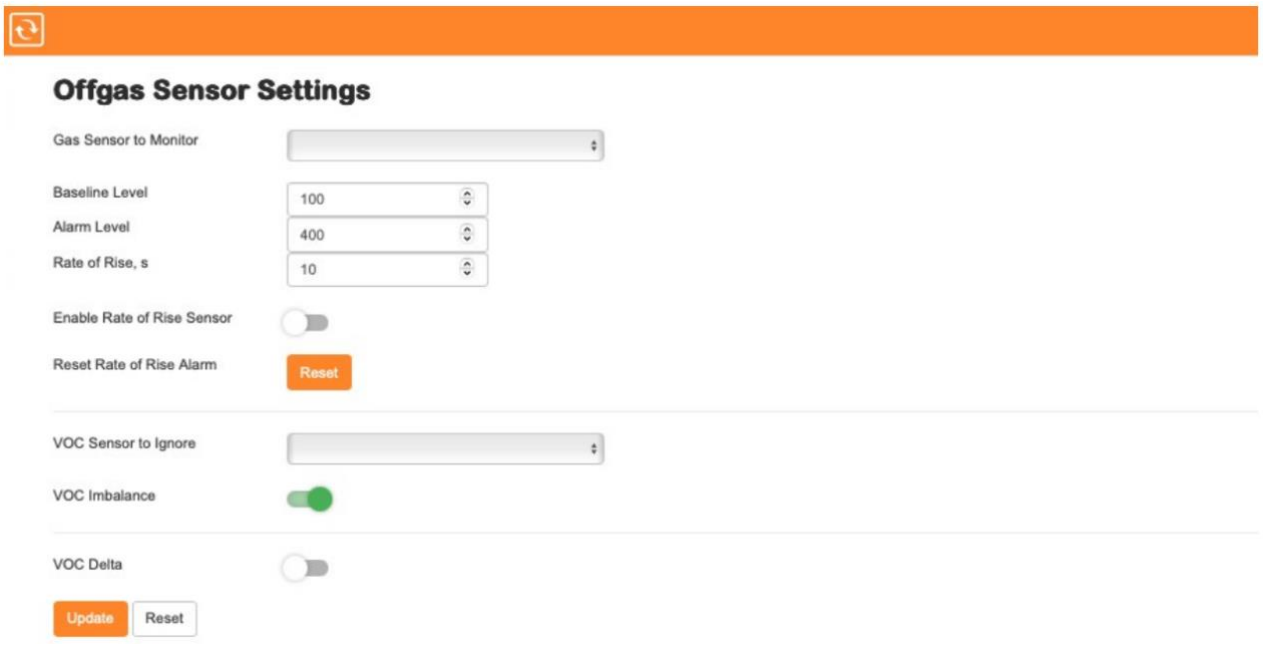
To access the configuration menu: Navigate to **Settings**, then under **Settings & Info**, click on **Calibrate Sensors**



Scroll to the bottom of the page and select **Config Off-Gas Sensor** to access the off-gas sensor settings.



Once you click **Config Offgas Sensor**, you will be routed to the Off-Gas Sensor Settings page, where all configuration options are displayed



Configuration Options

The following parameters can be configured:

- **Gas Sensor to Monitor** – Select the connected gas sensor that will be used for off-gas detection.
- **Baseline Level** – By default set to **100**, this value defines the reference level considered normal for the monitored gas. It is user-configurable.
- **Alarm Level** – By default set to **400**, this value defines the gas concentration threshold that will trigger an alarm. It is user-configurable.
- **Rate of Rise (s)** – By default set to **10 seconds**, this setting determines the sensitivity of the sensor to rapid increases in gas levels. It is user-configurable.
- **Enable Rate of Rise Sensor** – Activates or deactivates the monitoring of sudden gas concentration changes. It is recommended to enable this setting for early warning capability.
- **Reset Rate of Rise Alarm** – Allows manual reset of a triggered rate-of-rise alarm. Use only after verifying that conditions have returned to normal.
- **VOC Sensor to Ignore** – Specifies which VOC sensor(s), if any, should be excluded from detection, useful for sensors placed in areas prone to nuisance readings.
- **VOC Imbalance** – Enables monitoring of abnormal differences between multiple VOC sensors. The Off-Gas Sensor is capable of measuring VOC imbalances, defined as the difference between the **highest maximum** and **lowest maximum** VOC values detected across connected sensors. This helps identify uneven gas distribution within the system.
- **VOC Delta** – Enables detection of VOC deviations beyond a configured threshold. Use this option when closer monitoring of sensor variation is required.

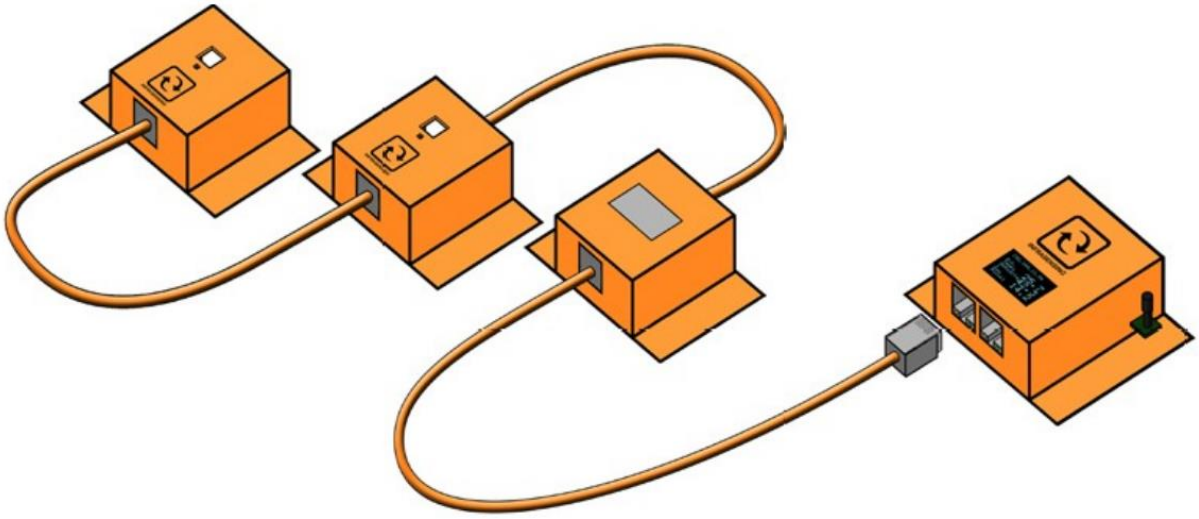
At the bottom of the page, you can choose to either save or discard your configuration updates. Select **Update** to apply and save the new settings, or select **Reset** to cancel any modifications and restore the previous configuration.

8 Limitation

DAISY-GAS-VOC Daisy Chain sensors are designed to support multiple sensors connected to a single Base Unit, but there are key limitations to consider. The maximum number of sensors per chain depends on the DAISY-STARTER firmware version—up to **25 DAISY-GAS-VOC sensors for firmware 1.7 and above**, or **13 sensors for firmware 1.4 and below**.

Each sensor requires a **minimum power supply of 9V**. If the voltage drops below 9V, a **DAISY-BOOSTER is required** to maintain stable operation. Failure to meet this power requirement may lead to sensor malfunction or unreliable performance.

For cable runs longer than 10 meters, **CAT6 cables** are strongly recommended, as lower-quality cables can cause voltage drops that affect sensor stability. For extended installations or larger chains, integrating a **DAISY-BOOSTER** helps ensure consistent power delivery and reliable communication across all connected sensors.



9 Testing

9.1 Periodic Bump Testing of Sensors

To confirm proper operation and ensure full integration with safety and other systems, periodic bump testing of sensors shall be performed. In the absence of specific code requirements specifying the testing interval, it is recommended to conduct bump testing at least annually as a precautionary measure. This testing may be conveniently carried out during scheduled fire safety inspections. Additionally, bump testing shall be performed during the initial setup of the system

Required equipment:

- Gas sensor
- Gas puff bottle

Procedure:

- Prepare the Workspace:

- Ensure the testing area has adequate ventilation to prevent gas buildup.
- Secure Gas Puff Bottle:
  - Place the gas puff bottle in a stable, upright position.

- Verify that it is securely mounted to prevent accidental movement or leakage.

- Perform the Bump Test:
  - Open the gas puff bottle to release gas toward the sensor.
  - Allow gas to flow until the sensor registers detection.
  - Observe sensor readings on the monitoring device in real time.
- Verify the Sensor Response:
  - Check the sensor readings. The values should respond to the gas exposure.
  - Ensure that the sensor triggers an alert if configured to do so.
- Maintenance:
  - If the sensor passes the bump test, consider it operational.
  - If any issues are identified via the status register during the test, make sure to note

what error or value is showing before contacting the manufacturer.

9.2 Testing via Modbus TCP

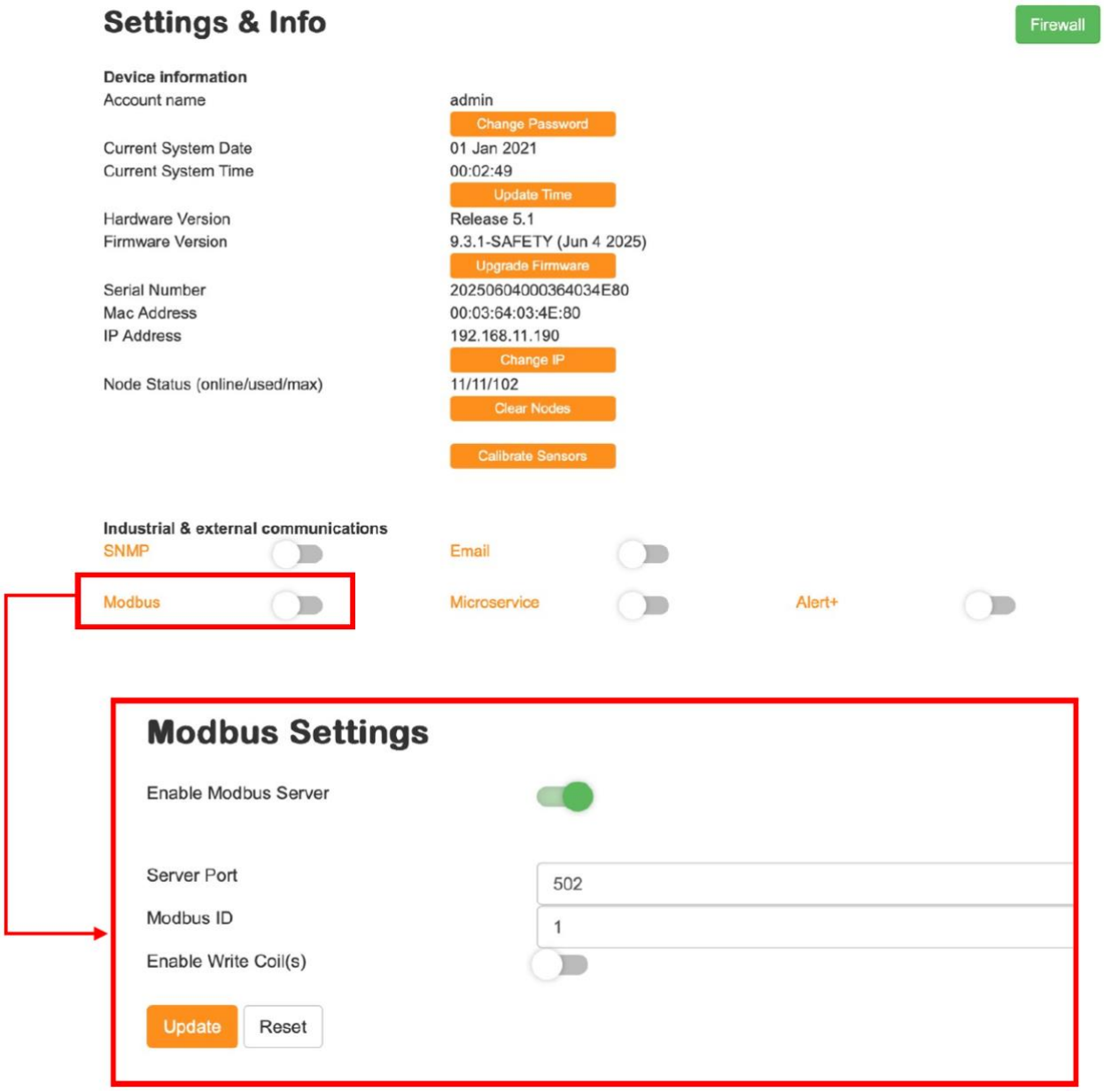
It is advisable to conduct regular assessments of the gas sensor's performance in critical environments. It plays a crucial role in ensuring the dependability, functionality, and security of systems utilizing Modbus communication.

Modbus TCP is an open standard protocol that uses regular Ethernet cables and switches to communicate with each other. It provides data acquisition and control, through query and response within the IP network.

Default Modbus Port – 502

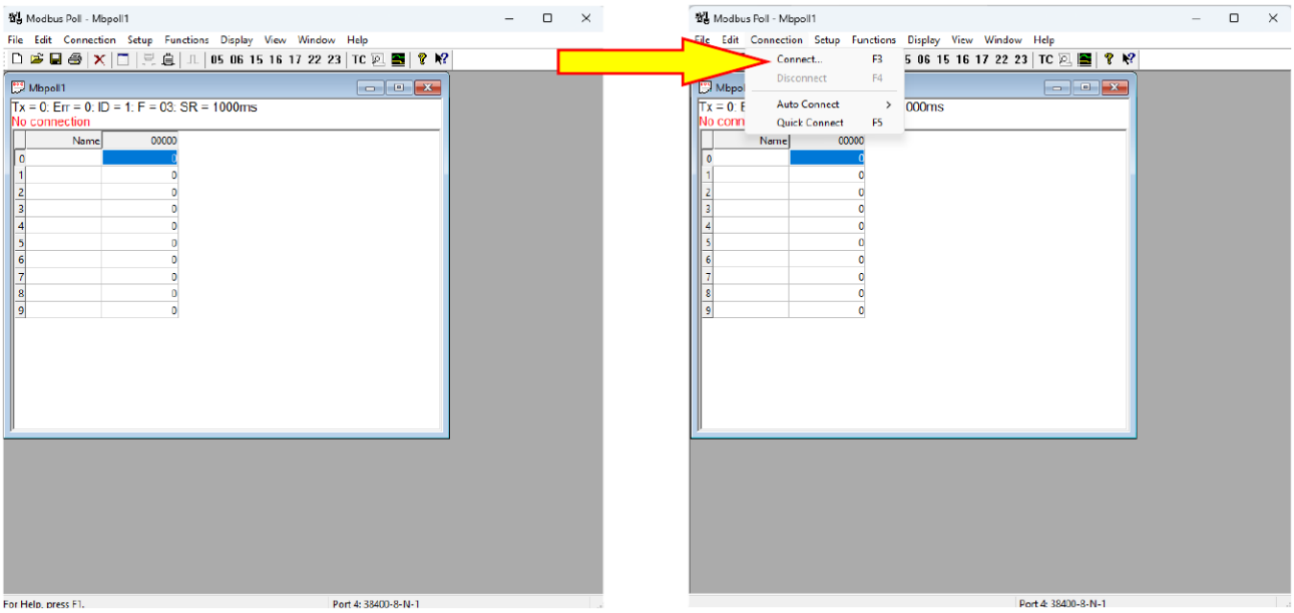
With the firmware 9.2 and above, Base Unit Modbus TCP can now be polled by 4 Modbus masters.

1. **Preparation**
   - Ensure the DAISY-GAS-VOC is properly connected in the daisy chain and powered.
   - Base Unit must have a unique Slave ID (Node ID) to avoid conflicts.
- Confirm the Base Unit has Modbus TCP enabled (default port: 502)



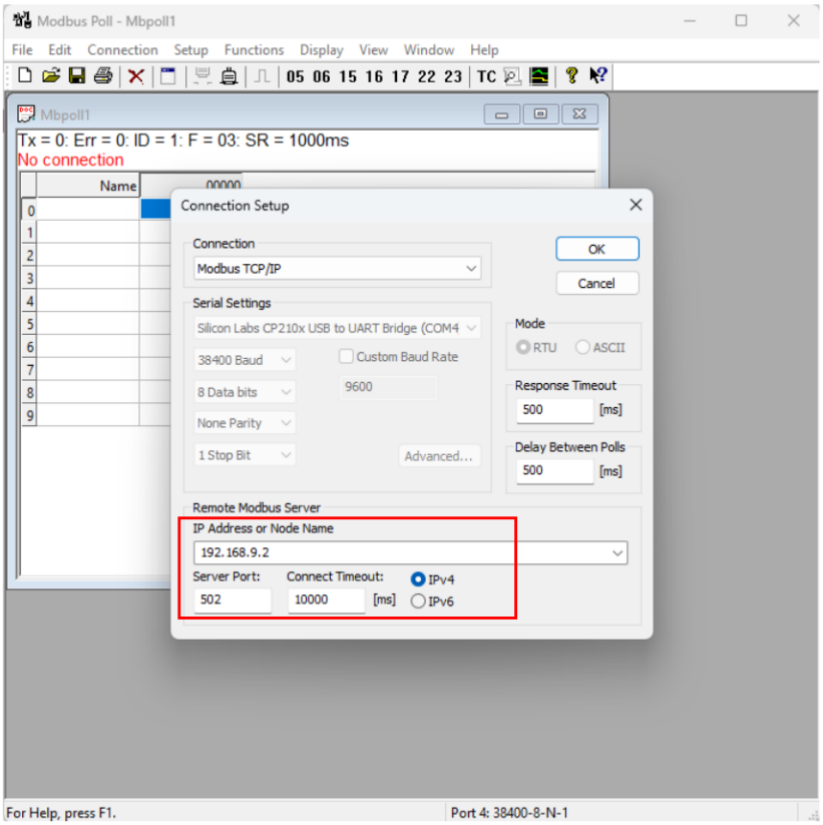
2. **Establish Modbus TCP Connection**
   - Open a Modbus TCP client (e.g., Modbus Poll, QModMaster, SCADA platform) and connect.

connect.



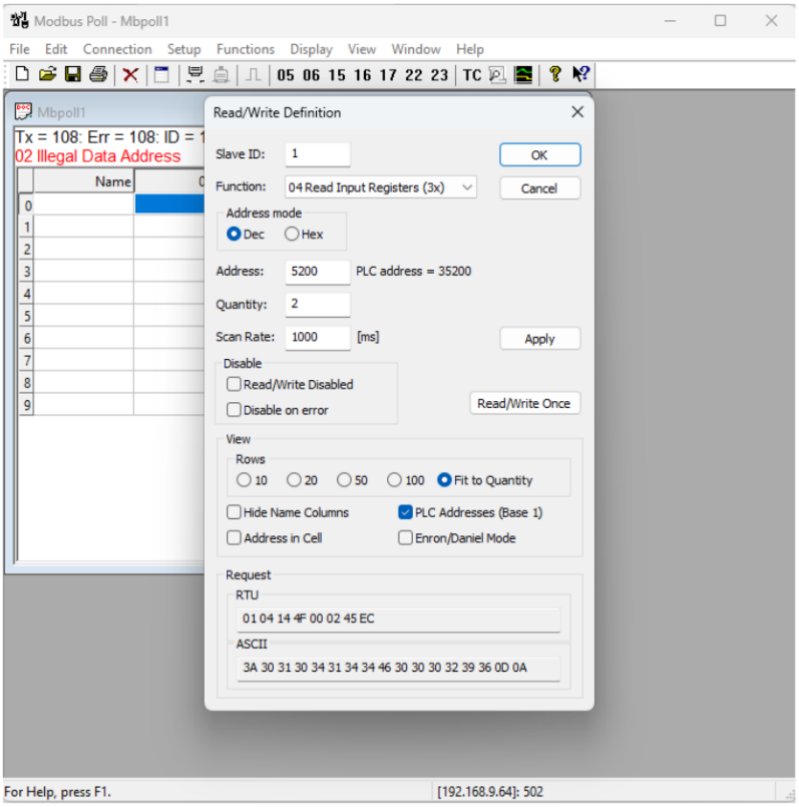
- Enter the IP address of the Base Unit and the port number (default **502**) and hit Ok to apply.

apply.



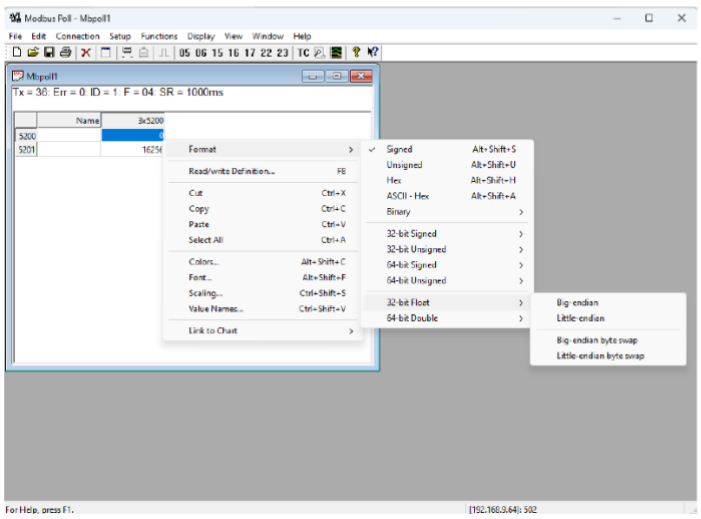
- Once the IP address and port number are configured, click **Set Up** and update the device settings to ensure proper communication. Set the protocol to **Modbus TCP**, the **Slave ID**

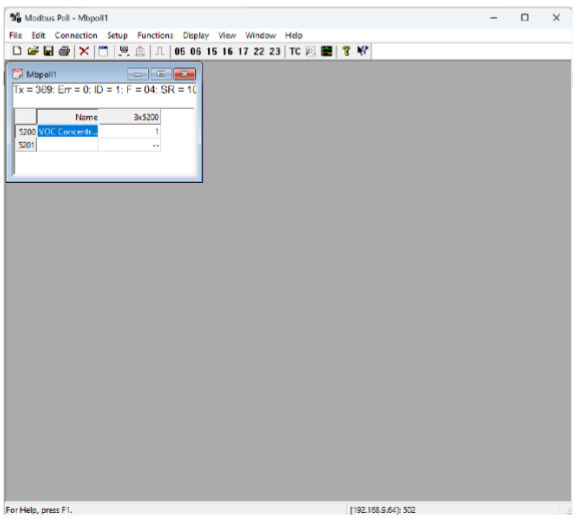
to 1, and the function to **04 – Read Input Registers**. Then specify the **Start Register** as 35200 and the **Register Count** as 2 to enable accurate data retrieval from the device.



- Next, configure the data format using **Little Endian (Byte Swap)**. Once set, the VOC value will be displayed; however, the exact configuration may still depend on the Modbus TCP client you are using.

client you are using.





3. Relevant Registers for DAISY-GAS-VOC

The VOC concentration and status values are accessible through the following Modbus registers:

PARAMETER	REGISTER ADDRESS	DATA TYPE	NOTES
VOC Concentration	35200–35201 (Node 1 example, floating)	32-bit Float	Value in ppm (parts per million)
Sensor State	15200	Unsigned Int	0 = Offline, 1 = Online
Sensor Type	35202	Unsigned Int	Ref. Section 9.2.4 (VOC = ID 6)
Alarm Down	15201	Unsigned Int	1 = Alarm active, 0 = Normal
Alarm Warning	15202	Unsigned Int	1 = Warning active, 0 = Normal
High Down Threshold	45200–45201	32-bit Float	User-defined threshold
High Warning Threshold	45202–45203	32-bit Float	User-defined threshold
Low Down Threshold	45204–45205	32-bit Float	User-defined threshold
Low Warning Threshold	45206–45207	32-bit Float	User-defined threshold

Note: The actual node number depends on sensor order in the chain. Adjust register addresses accordingly. Please refer to section 9.2.4 for a list of Daisy Chain nodes and registers.

9.2.1 Modbus Register List

Things to remember:

- The built-in Temperature Sensor of the Base Unit is always on Node 0.
- For Firmware 7.41 and above, Internal Ping is always on Node 1. Even if the Ping is disabled, it still picks the last value before you disabled it.
- Daisy Chain Gas VOC has 3 node value which appears as follows:
  - 1st Node value - Temperature
  - 2nd Node value – Humidity
  - 3rd Node value - VOC

- Note that if Internal Ping is enabled, Node 0 is Internal Temperature, Node 1 is Internal Ping, Node 2 is Daisy Chain Temperature and Node 3 is Daisy Chain Humidity.
- Daisy Chain sensors are only detected in Modbus TCP, not in Modbus RTU.
- Node numbers follow the order in which sensors are plugged in on the Sensor Ports or what is shown first on the web interface.

If a particular sensor connected has an alarm on the Warning and Down Range, it will trigger the register either for Alarm Warning or Alarm Down respectively regardless of either the value is less than (<) or the value is greater than (>) than the threshold.

9.2.2 Supported Registers

Coils (Discrete Outputs) - 00001 to 09999 (Read/Write)

Input Status - 10001 to 19999 (Read)

Input Registers - 30001 to 39999 (Read)

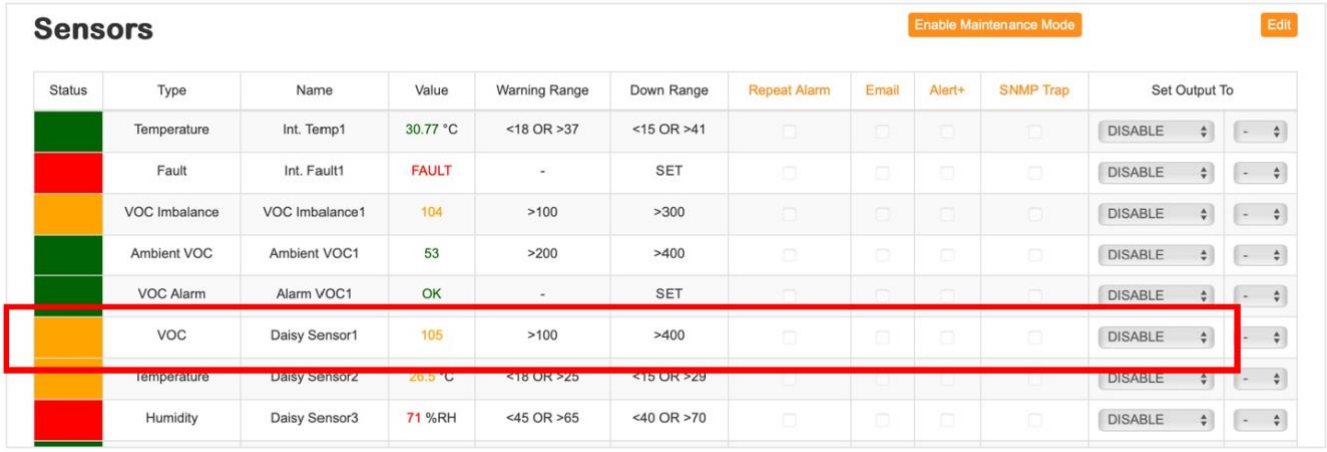
Holding Registers - 40001 to 49999 (Read/Write)

9.2.3 Function Codes Supported

CODE	FUNCTION	DESCRIPTION
01	Read Coils	Read from 1 to 2000 contiguous status of coils managed by the server. Coils in the response message are packed as one per bit of a byte, 1=On and 0=Off. If the requested quantity of coils is not a multiple of 8, zeros are padded in the final byte.
02	Read Input Status	Read from 1 to 2000 contiguous input status managed by the server. Discrete inputs in the response message are packed as one per bit of a byte, 1=On and 0=Off. If the requested number of inputs is not a multiple of 8, zeros are padded in the final byte.
03	Read Holding Registers	Read the contents of the continuous block of 1 to 127 holding registers. Data are packed as two bytes per register; the first byte contains the high order bits.
04	Read Input Registers	Read the contents of contiguous block of 1 to 127 Input registers. Data are packed as two bytes per register; the first byte contains the high order bits.
16	Set Multiple Registers	Write values into a block of contiguous registers (1 to 120).

9.2.4 List of Daisy Chain Nodes and Registers

In this section we will show the structure of Daisy chain.



As shown in the image above, **Node 1** falls under **VOC** and corresponds to **Input Registers 35200–35201**.

LENGTH AND TYPE	DATA LABEL	STATUS	COILS	INPUT REGISTER	HOLDING REGISTER	NOTES:
Length = 4, Floating	Node 1 Value			35200-35201		Sensor Value
Length = 3, Unsigned	Node 1 State	15200				0 - Offline 1 - Online
Length = 4, Unsigned	Node 1 Type			35202		1 – Temperature 2 – Humidity 6 - VOC
Length = 4, Unsigned	Node 1 Connection			35203		0 - Base Unit
Length = 8, Floating	Node 1 Threshold High Down				45200-45201	
Length = 8, Floating	Node 1 Threshold High Warning				45202-45203	
Length = 8, Floating	Node 1 Threshold Low Down				45204-45205	
Length = 8, Floating	Node 1 Threshold Low Warning				45206-45207	

Note: To calculate the next node, simply add **+32** to all register addresses of the previous node (State, Value, Type, Connection, and Thresholds). For example:

1. Note Node 1 base addresses:

- State = 15200
- Value (Input) = 35200–35201
- Type = 35202
- Connection = 35203
- Thresholds = 45200–45207.

2. To get the next node, **add +32** to each of those addresses.

3. Example (Node 2):

- State = 15232
- Value = 35232–35233
- Type = 35234
- Connection = 35235
- Thresholds = 45232–45239

4. Repeat step 2 for any further nodes (always +32 from the previous node).

Length = 4, Floating	Node 2 Value		35232-35233	
Length = 3, Unsigned	Node 2 State	15232		0 - Offline 1 - Online
Length = 4, Unsigned	Node 2 Type		35234	1 – Temperature 2 – Humidity 6 - VOC
Length = 4, Unsigned	Node 2 Connection		35235	0 - Base Unit

Length = 8, Floating	Node 2 Threshold High Down				45232-45233	
Length = 8, Floating	Node 2 Threshold High Warning				45234-45235	
Length = 8, Floating	Node 2 Threshold Low Down				45236-45237	
Length = 8, Floating	Node 2 Threshold Low Warning				45238-45239	

LENGTH AND TYPE	DATA LABEL	STATUS	COILS	INPUT REGISTER	HOLDING REGISTER	NOTES:
Length = 4, Floating	Node 3 Value			35264-35265		
Length = 3, Unsigned	Node 3 State	15264				0 - Offline 1 - Online
Length = 4, Unsigned	Node 3 Type			35266		1 – Temperature 2 – Humidity 6 - VOC
Length = 4, Unsigned	Node 3 Connection			35267		0 - Base Unit
Length = 8, Floating	Node 3 Threshold High Down				45264-45265	
Length = 8, Floating	Node 3 Threshold High Warning				45266-45267	
Length = 8, Floating	Node 3 Threshold Low Down				45268-45269	
Length = 8, Floating	Node 3 Threshold Low Warning				45270-45271	

Note:

For additional nodes, continue to the next one by adding an **offset of +32** to both the **Input Registers** and **Holding Registers** of the previous node.

For example:

- **Node 3** Input Registers begin at **35264**. Adding 32 gives **35296**, which becomes the Input Register starting point for **Node 4**.
- Similarly, **Node 3** Holding Registers begin at **45264**. Adding 32 gives **45296**, which becomes the Holding Register starting point for **Node 4**.

This same pattern applies for all subsequent nodes.

9.2.5 VOC Alarm and Ambient VOC

Ambient VOC refers to the calculated average of the last 10 readings from each individual VOC sensor. This means that if you have multiple sensors, each one maintains its own rolling average based on the last 10 readings. This value provides a more stable indication of VOC levels over time, helping to smooth out sudden spikes.

VOC Alarm is a separate feature that triggers when a sensor detects VOC levels above a predefined threshold. This threshold is typically set to alert users of potentially harmful concentrations in real time. While the **Ambient VOC** provides a trend, the **VOC Alarm** highlights urgent conditions that may require immediate attention.

Both the **Warning Range and Down Range** thresholds for Ambient VOC can be configured based on user requirements by clicking the **"Edit"** button at the upper right side of the sensor homepage.

In the example shown in the screenshot below:

- The **Warning Range** is set to **>200**, meaning if the Ambient VOC value reaches **201 or higher**, the VOC Alarm status will change to **"Alarm",** indicating that the VOC level has entered the warning stage.
- The **Down Range** is set to **>400**, meaning if the Ambient VOC value reaches **401 or higher**, the status will be considered as **"Down",** and the VOC Alarm status will again change to **"Alarm",** this time indicating that the VOC level has crossed into the down range.

9.2.5.1 VOC Alarm Nodes and Registers

LENGTH AND TYPE	DATA LABEL	STATUS	COILS	INPUT REGISTER	HOLDING REGISTER	NOTES:
Length = 4, Floating	Node 40 Value			31480-31481		
Length = 3, Unsigned	Node 40 State	11480				0 - Offline 1 - Online
Length = 4, Unsigned	Node 40 Type			31482		VOC Alarm
Length = 4, Unsigned	Node 40 Connection			31483		0 - Base Unit
Length = 3, Unsigned	Node 40 in Alarm Down	11481				
Length = 3, Unsigned	Node 40 in Alarm Warning	11482				
Length = 8, Floating	Node 40 Threshold High Down				41480-41481	
Length = 8, Floating	Node 40 Threshold High Warning				41482-41483	
Length = 8, Floating	Node 40 Threshold Low Down				41484-41485	
Length = 8, Floating	Node 40 Threshold Low Warning				41486-41487	

9.2.5.2 Ambient VOC Nodes and Registers

LENGTH AND TYPE	DATA LABEL	STATUS	COILS	INPUT REGISTER	HOLDING REGISTER	NOTES:
Length = 4, Floating	Node 41 Value			31512-31513		
Length = 3, Unsigned	Node 41 State	11512				0 - Offline 1 - Online
Length = 4, Unsigned	Node 41 Type			31514		Ambient VOC
Length = 4, Unsigned	Node 41 Connection			31515		0 - Base Unit
Length = 3, Unsigned	Node 41 in Alarm Down	11513				
Length = 3, Unsigned	Node 41 in Alarm Warning	11514				
Length = 8, Floating	Node 41 Threshold High Down				41512-41513	
Length = 8, Floating	Node 41 Threshold High Warning				41514-41515	
Length = 8, Floating	Node 41 Threshold Low Down				41516-41517	
Length = 8, Floating	Node 41 Threshold Low Warning				41518-41519	

10 Recommended setting for ESS Rack Level Protection

The diagram below illustrates the recommended setup for integrating the Base Unit and connected sensors in a rack-based Li-ion UPS (LIB) system.

The Base Unit serves as the central controller. From the Base Unit, two devices are connected: the **DAISY-STARTER** and the **R-GAS-FLAMMABLE** sensor.

The **DAISY-STARTER** provides the connection point for multiple **DAISY-GAS-VOC sensors**, which are installed inside the racks for off-gas monitoring. For optimal coverage, it is recommended to install two sensors per rack: one at the top and one at the middle section. The recommended VOC sensor settings are:

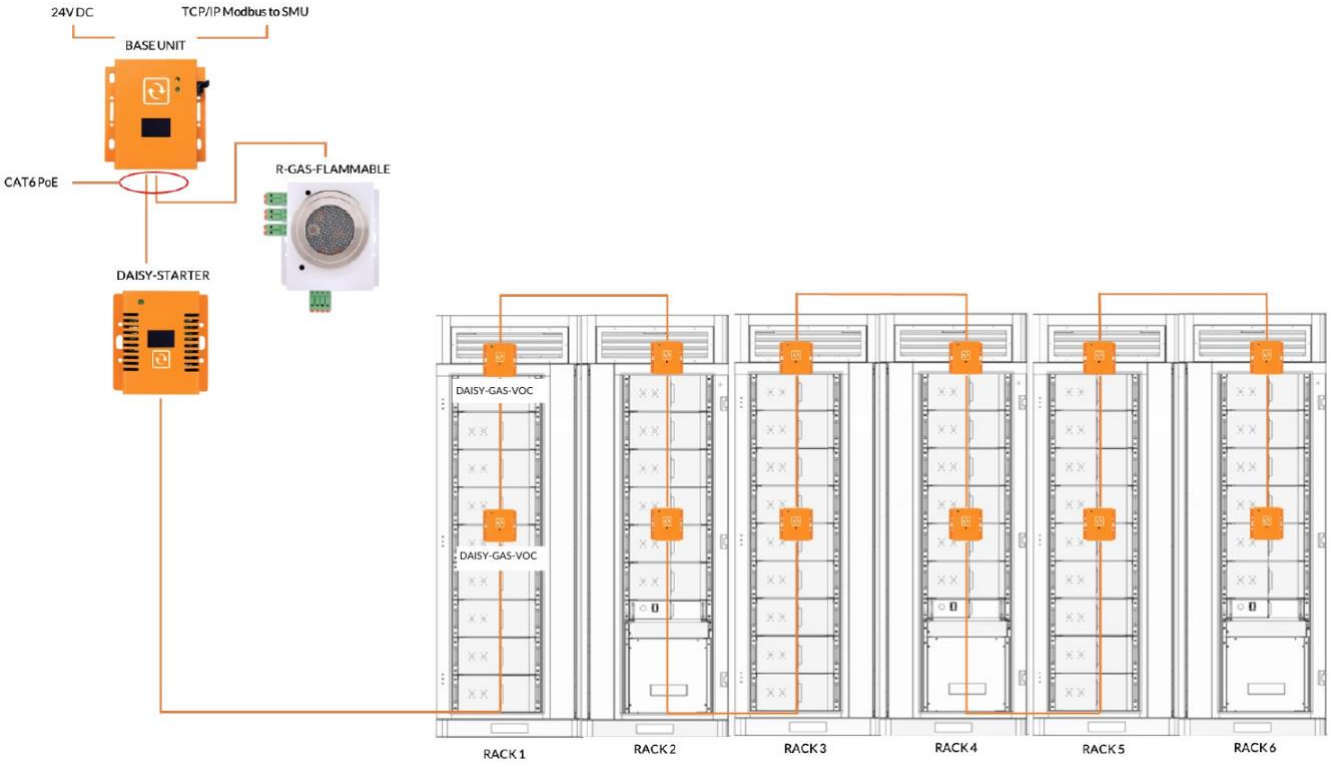
- **Baseline:** 100
- **Warning:** 200
- **Down:** 400

The R-GAS-FLAMMABLE sensor is placed at the room level to monitor for the presence of flammable gases that may be released during a thermal runaway event. This sensor should be integrated with the Fire alarm panel and ventilation system through its programmable relays, in accordance with NFPA 855 requirements.

In this configuration:

- Off-gas detection should trigger a battery stop command.
- Flammable gas detection should activate an alarm connected to the fire panel and ventilation system.

This setup ensures early detection of off-gas at the rack level and compliance with safety standards for flammable gas monitoring at the room level.


24V DC
TCP/IP Modbus to SMU
BASE UNIT
CAT6 PoE
R-GAS-FLAMMABLE
DAISY-STARTER
DAISY-GAS-VOC
DAISY-GAS-VOC
RACK 1
RACK 2
RACK 3
RACK 4
RACK 5
RACK 6

11 Application Notes

In this section, we will guide you on how to apply the recommended settings for the **DAISY-GAS-VOC sensor** to ensure optimal monitoring performance. Configuration of the sensor's baseline, warning, and down ranges allows for accurate detection and timely alerts.

Please note that these settings can also be adjusted depending on the user's requirements or preferences.

The recommended settings for VOC are:

- **Baseline**: 100
- **Warning**: 200
- **Down:** 400

While the recommended settings for Temperature and Humidity are:

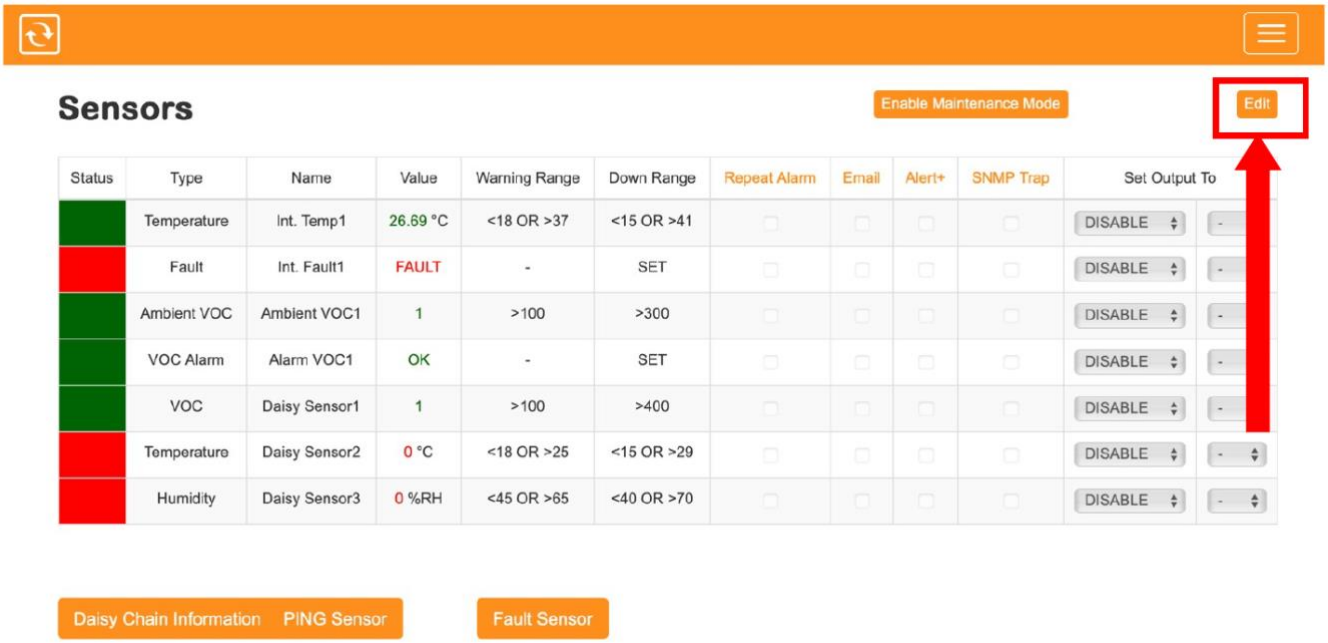
Temperature:

- **Warning**: >40°C or 15-20°C
- **Down:** >55-60°C or 8-10°C

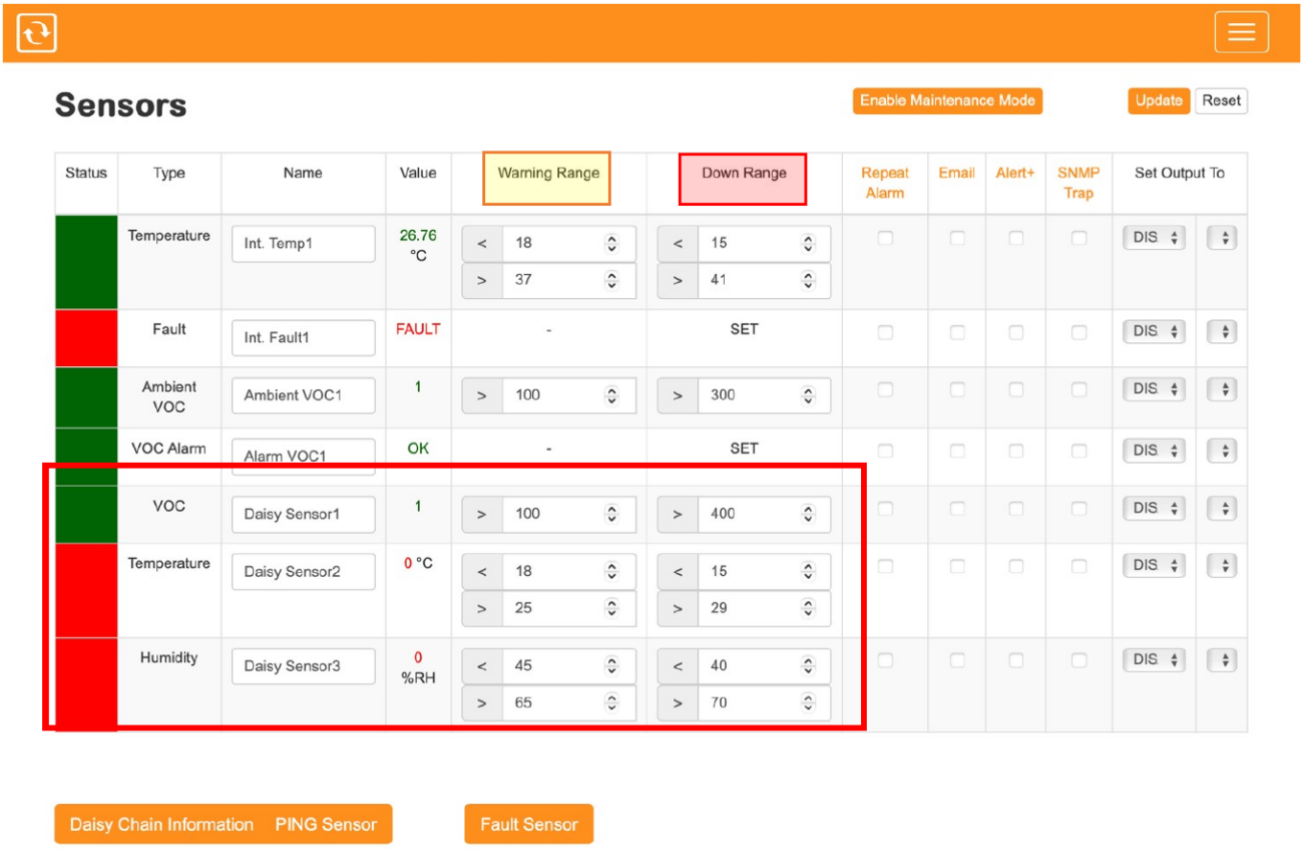
Humidity:

- **Warning**: >60% RH
- **Down:** >70-75% RH

On the **sensor home page**, you will find an **Edit** button at the upper right-hand corner of the page.



Clicking the **Edit** button enables you to modify the sensor settings, including the **Warning** and **Down** ranges.



11.1 Setting up VOC

The VOC Index is a relative air quality indicator that reflects the level of volatile organic compounds (VOCs) in

the surrounding environment. Rather than measuring specific gas concentrations in parts per million (ppm), the

VOC Index provides a scaled value that represents changes in air quality over time. This makes it especially

useful for detecting trends, identifying abnormal conditions, and supporting ventilation or safety responses.

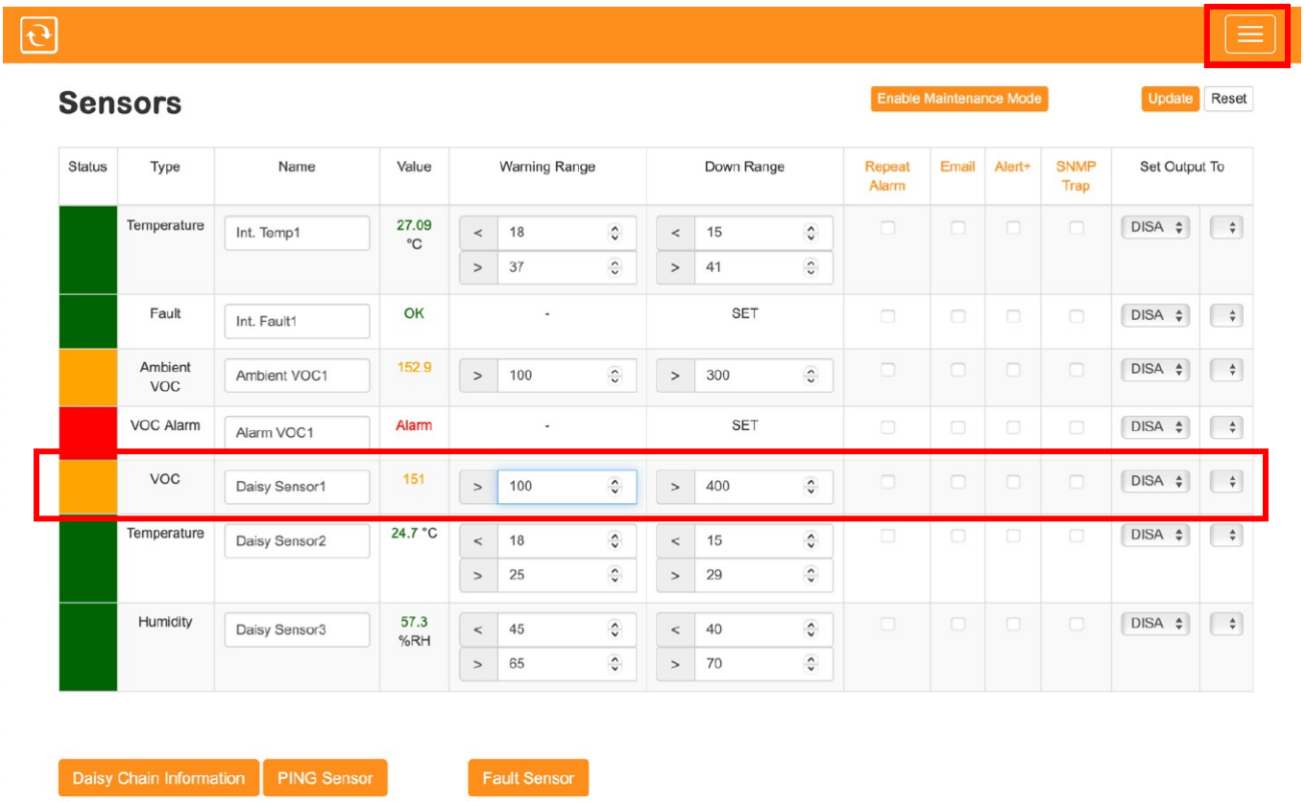
VOCs are commonly emitted from sources such as solvents, cleaning agents, fuels, off-gassing materials, and

industrial processes. Elevated VOC levels may indicate poor air quality or potential safety risks. By monitoring

the VOC Index, users can gain insight into environmental conditions and respond proactively to maintain safe

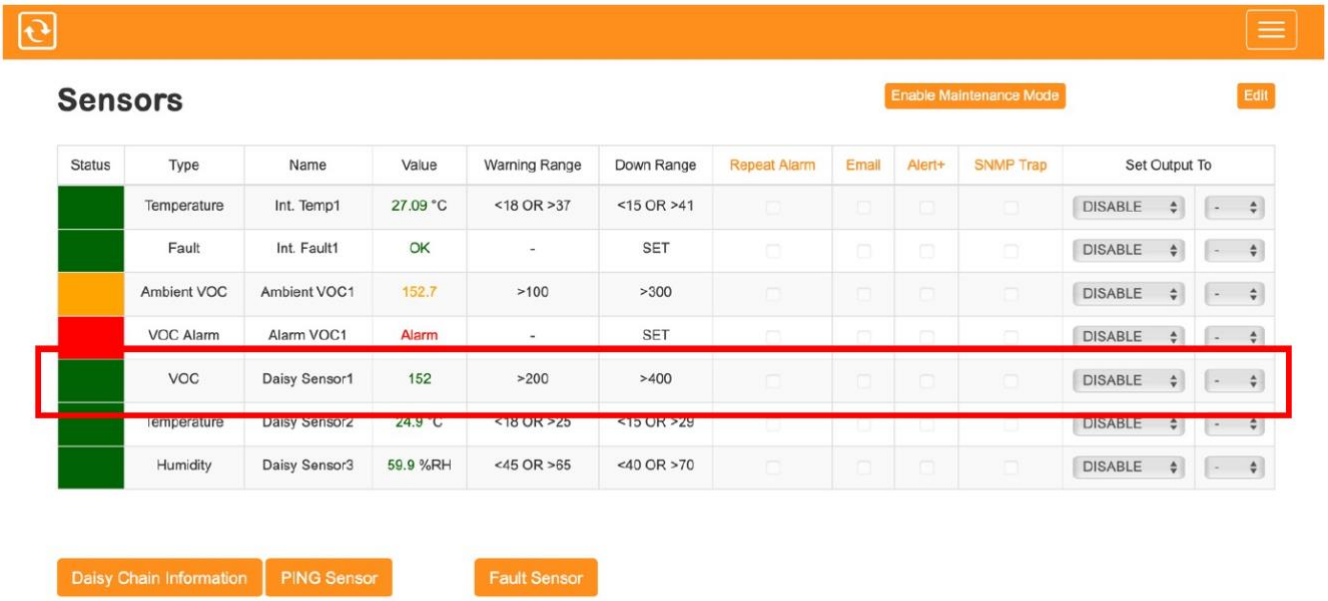
and healthy spaces.

To apply the recommended settings, simply adjust the **Warning** range to 200 and the **Down** range to 400, then click **Update** at the upper right corner of the page.



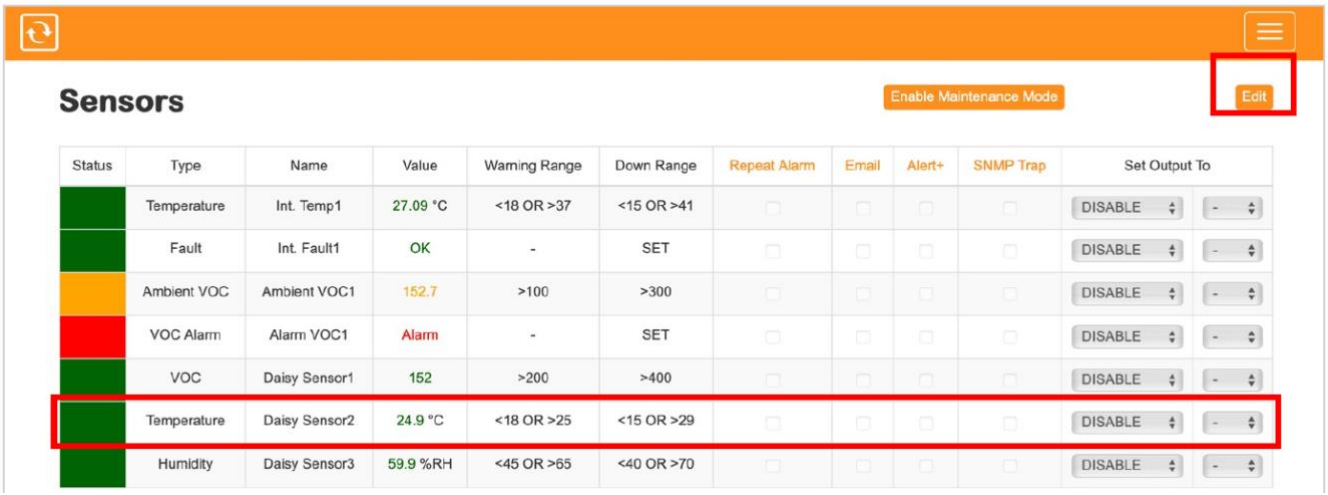
After clicking Update, a confirmation message will appear once the update is successful. Then, click on Return to Sensor Status.

The applied settings are now visible. These settings are user-configurable and may be modified as needed, based on your specific requirements or preferences.



11.2 Setting up Temperature

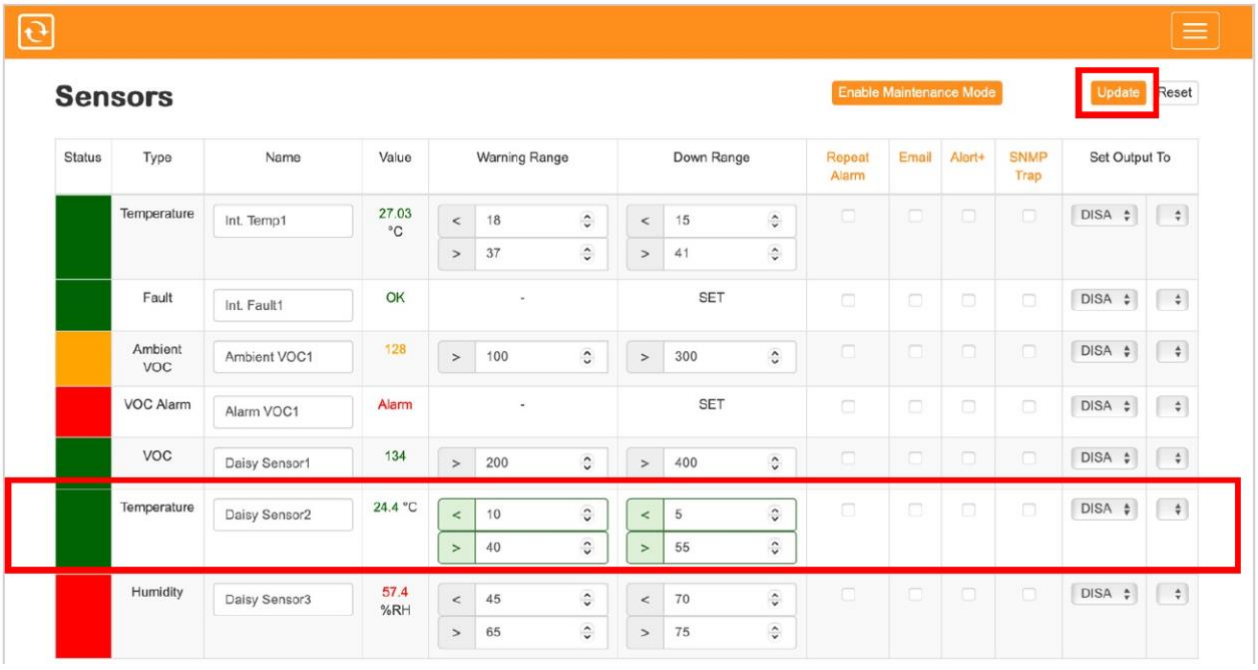
To apply the recommended settings for Temperature, follow the same steps as when configuring the VOC settings. Click the Edit button and adjust the values for Temperature as needed.



As shown, there is an OR condition with two values that must be entered under the Warning and Down Range fields for Temperature. These values should be configured according to your specific requirements. The recommended Warning for Temperature is >40 °C and Down Range is >55°C

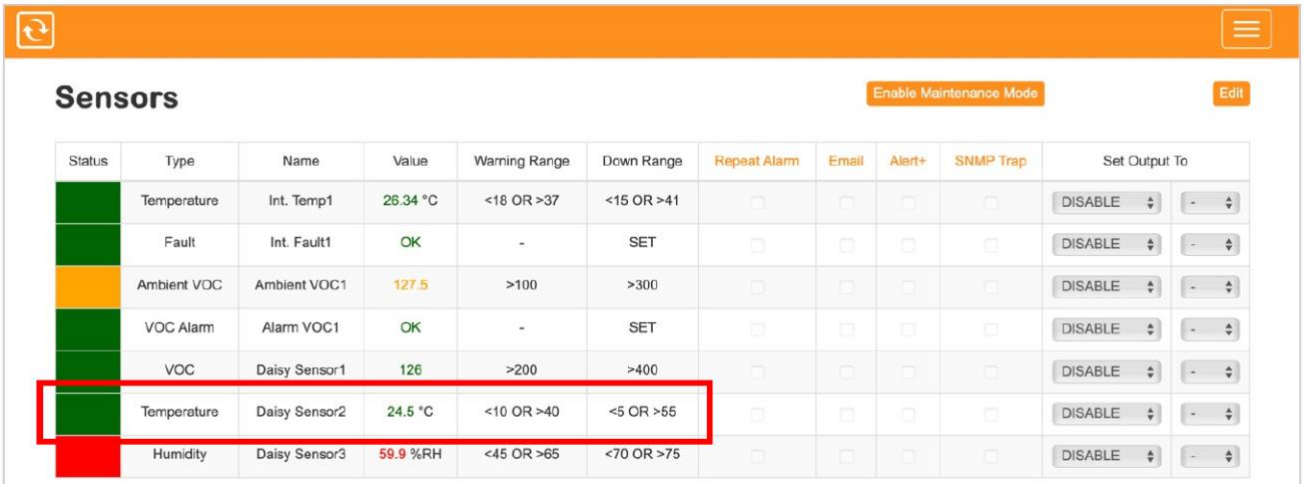
For example, my requirements are to ensure that the temperature does not drop below 10 °C and does not rise above 55 °C. Therefore, I will set the Warning range to <10 °C OR >40 °C.

For the Down Range, since I need to ensure the temperature does not go below 10 °C, I will set the threshold to <5 °C. Additionally, if the temperature exceeds 55 °C, a warning will also be triggered. Once it is set, just click the Edit button at the upper right corner of the page.



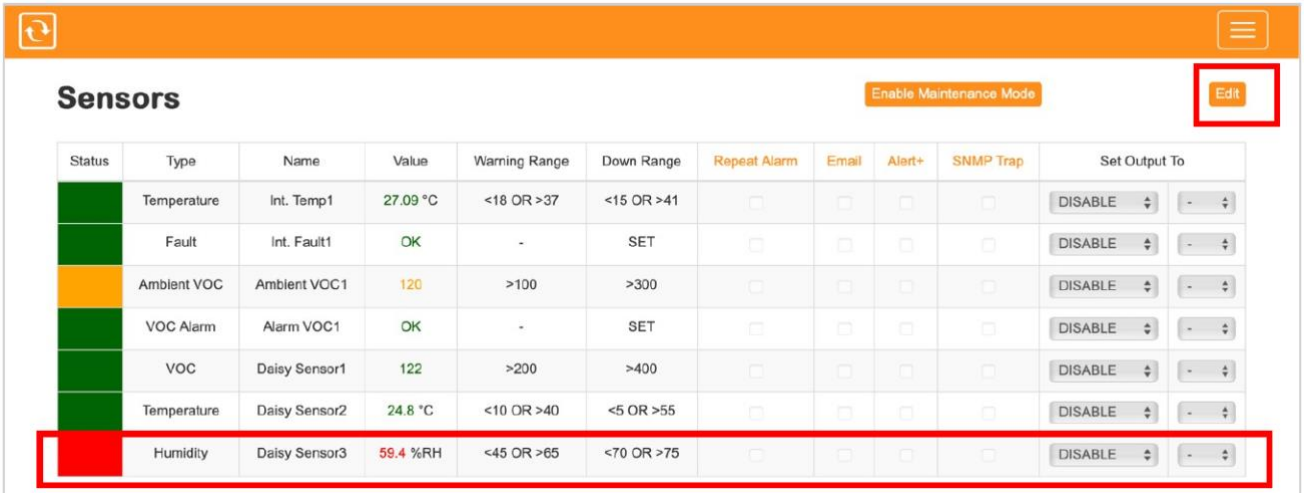
Once the settings are updated, you will see the applied values. If the temperature falls below 10 °C (e.g., down to 8 °C), a Warning alert will be sent. If it drops further to 5 °C, a Down alert will be sent.

Note: The values for both *Warning* and *Down Range* are user-configurable and may be adjusted according to your specific requirements or preferences.



11.3 Setting up Humidity

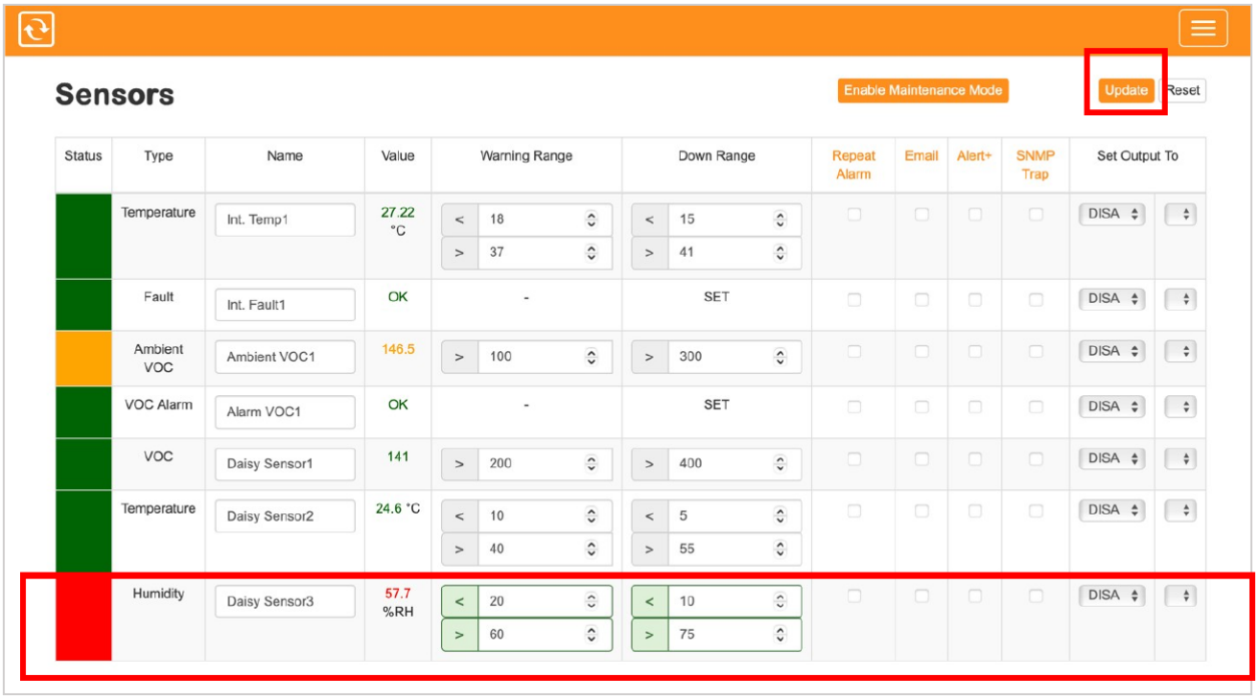
To apply the recommended settings for Humidity, follow the same steps as when configuring the VOC settings. Click the Edit button and adjust the values for Humidity as needed.



These values should be configured according to your specific requirements. The recommended thresholds for Humidity are Warning at >60%RH and Down at >70-75%RH.

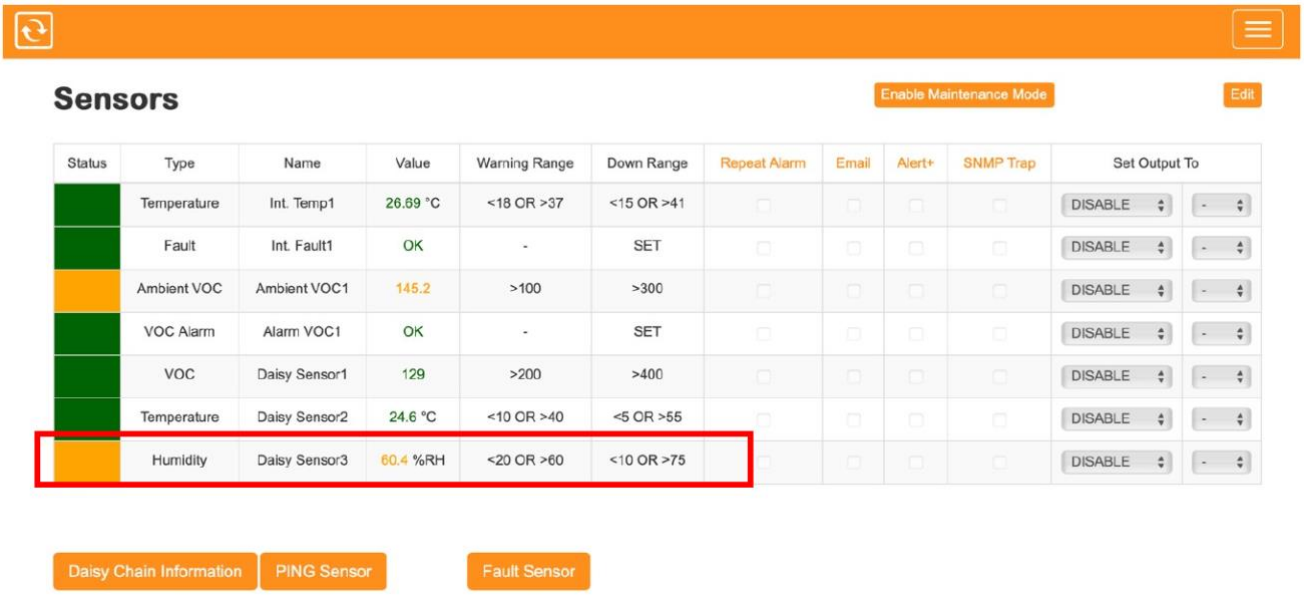
For example, my requirements are to ensure that the humidity does not drop below 20% and does not rise above 75%. Therefore, I will set the Warning range to <20% OR >60%.

For the Down Range, since I need to make sure the humidity does not go below 20%, I will set the threshold to <10%. Additionally, if the humidity exceeds 75%, a down alert will also be triggered



Once the settings are updated, you will see the applied values. If the humidity falls below 20% (e.g., down to 18%), a Warning alert will be sent. If it drops further to 10%, a Down alert will be sent. Similarly, if the humidity rises above 60%, a Warning alert will be sent, and if it exceeds 75%, a Down alert will be sent.

Note: The values for both *Warning* and *Down Range* are user-configurable and may be adjusted according to your specific requirements or preferences."



12 Troubleshooting

12.1 Checklist

Before diving into troubleshooting, it is important to first confirm that the basic setup and requirements are correct. Many common issues can be resolved by addressing simple configuration or connection errors. Use the checklist below as your first line of verification:

- Ensure the sensors and Base Unit are physically set up correctly. Please refer to section 5.1 on how to properly connect the daisy chain sensors and Base Unit.
- Inspect all cable connections and confirm that the IN/OUT ports are properly used.
- Check the OLED display on the DAISY-STARTER to verify the sensor scan count.
- Confirm the firmware version being used is correct and supported.

12.2 Steps

If the checklist has been verified and issues still persist, proceed with a step-by-step troubleshooting process. These steps are designed to isolate whether the problem lies with a specific sensor, cable, or overall setup:

1. Run a sensor scan via the web interface after setup.
2. If the sensors do not appear after 1-2 minutes or longer, refresh the web interface or reboot the Base Unit.
3. If the sensors still do not appear, disconnect all sensors from the DAISY-STARTER.
4. Once all sensors are disconnected from the DAISY-STARTER, start testing them individually.
5. Connect one sensor directly to the DAISY-STARTER and run a scan from the web interface.
6. Check if the sensor appears on the interface and confirm that its readings are displayed correctly.
7. Disconnect the sensor, then repeat the process with the next one. Continue until all sensors have been tested.
8. This process will help identify whether the issue is caused by a faulty sensor, a cable, or the overall set up.

9. If the sensor does not appear or display readings correctly when connected directly, or if the issue persists after testing all sensors, proceed to request an RMA for further support.

13 RMA

Defective InfraSensing hardware can be returned to one of our repair centers through our Return Merchandise Authorization (RMA) program.

RMA requests have to be submitted through your order page or from your my.infrasensing.com account.

If purchased from a reseller, add your products to your my.infrasensing.com account.

Warranty covered repairs:

All InfraSensing products are covered by a limited 1 year world-wide warranty as detailed here.

If the defect to your product(s) is covered by the warranty, then the product(s) will be diagnosed, repaired or replaced and finally tested before returning the product(s) to you.

If the defect is found to be not warranty covered, then an inspection fee of $75 per product will be invoiced. After payment reception of the inspection fee you have 3 options: receive the defective product(s) back, have it repaired (if repairable) or purchase of a new product(s). In the event of a repair or purchase of new product(s), the cost will be discounted with the paid inspection fee.

Out of warranty repairs:

Do you have a defective device outside of its warranty period or is the defect not covered by warranty? It might still be possible to repair it. In such an event, you can also apply for an out of warranty repair. This incurs an inspection fee of $75. After receiving payment for the inspection fee, the RMA will be issued to you. If the device can be repaired, then you will receive a quote for repair with a discount for the paid inspection fee. You may also opt for the purchase of a new unit with a discount for the paid inspection fee.

Depending on the complexity of the defects and availability of parts, you should expect a turn-around time of 2 to 5 weeks. We appreciate your patience while we try to repair the defective units.

14 Document control

VERSION	DATE	CHANGE
2	26 August 2026	Restyled to the corporate house style (IS-HS-001-v4) as PI-UM-DAISY-GAS-VOC-v2. Content unchanged from the v2 Word source.
1	—	Previous issue (OFF-Gas User Manual_v2 source document).