User Manual for 3-Channel AC Network Based Sensor Model FAC2000-23

Description – Initialization – Technical Information

Sensor Technical Information

General	
Model	FAC2000-23
Dimension	Length × Height × Depth 14 cm × 2.4 cm × 9.4 cm
Weight	500 g
Working Temperature	-10 to 80 °C
Storage Temperature	-20 to 80 °C
Working Humidity	0 – 60%
Working Voltage	24 - 100 Volts
Mounting Brackets	2 holes at the top to be fixed on the wall
Guaranty	2 Years
Input/ Output	
Type of Input	0-5 ampere AC current with the option of adding a current transformer
Number of inputs	3
Output	Network

Security Considerations

(Before using this product, please read the precautions)

Please carefully read this manual before using the product and pay full attention to the mentioned points to use the product correctly.

In this manual, safety measures are classified into two levels: “Warning ⚠ ” and “Caution ⚠ ”.

Warning ⚠	Improper handling may lead to dangerous conditions and cause death or serious injury.

Caution ⚠	Improper handling may lead to dangerous conditions and cause minor or moderate injury to persons or damage to property.

Follow the safety measures of both levels as they are very important for personal and system safety. Ensure that users read this manual and then keep it in a safe place for future reference.

Design Precautions

Warning ⚠

- Paying attention to the details of cabling and proper connection is one of the most important parts of installing sensors, which directly affects the performance and efficiency of the network.
- Always use a consistent standard (T568A or T568B) at both ends of the cable to prevent connection issues.
- Mistakes in wiring during socket installation can lead to hardware damage to the Sensor or improper network performance.
- After installing the sockets, connect the cable to the Sensor. If the Sensor is not recognized or does not function properly, check the following:
  - Complete connection of the socket to the cable
  - Correct wiring arrangement
  - Use a network tester to identify potential cabling errors
  - If the above points are confirmed, test the relevant sensor with a tested network cable at the sensor installation site to ensure the sensor’s proper functioning.
- Avoid excessive bending or sudden pulling of cables while working with them, as this can damage the internal wires and reduce signal quality.

Caution ⚠

- Do not bundle the RJ45 cable with the main circuit and power cables, and do not install them close to each other. Maintain a minimum distance of 100 mm (3.94 inches) between them. Failure to maintain this distance may cause interference due to noise.

Installation Precautions

Warning ⚠

- Before installing the sensor, ensure the quality of the cable being used. The manufacturer recommends using RJ45 with CAT6 specification. Failure to follow this guideline may result in damage to the device.
- To maintain signal integrity, it is essential to connect the shield of the RJ45 cable to properly shielded sockets.
- Avoid installing the sensor in environments with extremely high or low temperatures or humidity levels that exceed the sensor's operating range. Such conditions may lead to malfunction or incorrect performance.
- Use the 4–20 mA current sensor strictly for its intended purposes. Do not connect it to incompatible devices, as this may cause errors or permanent damage.

Caution ⚠

- Use the Sensor in an environment that complies with the general specifications in this manual. Using this Sensor in any other operational environment may cause electric shock, fire, malfunction, or damage and reduce the quality of the module.
- Never directly touch the conductive part or electronic component of the Sensor. Doing so may cause malfunction or damage to the data logger.
- When installing Sensor on the wall, carefully tighten the wall screws. Loose screws may cause the Sensor to fall and create a short circuit.
- Prevent external materials such as dust or wire fragments from entering the Sensor. These external materials may cause fire, malfunction, or damage.

Wiring Precautions

Warning ⚠

- Before wiring, ensure the health and quality of all input and output cables. Failure to do so may cause product damage.

Caution ⚠

- Before connecting the RJ45 cable, ensure that the type of connector to be connected is correct. Connecting an incorrect connector or incorrect wiring will cause Sensor damage.
- When wall-mounting the Sensor, tighten the mounting bracket screws securely. Loose screws can cause the Sensor to fall and short circuit.
- Securely connect the RJ45 cable to the Sensor. Failure to do so may cause cable damage and improper device operation.
- Ensure that all incoming data cables connected to the Sensor are routed through a cable channel or secured with a cable tie. Failure to do so may result in accidental cable pulling, which can damage the Sensor and cables or cause module malfunction due to loosen connections.
- Handle RJ45 cables with care when disconnecting them from the Sensor. Pulling on the cables can lead to device malfunctions or damage to the Sensor or cable.

Startup and maintenance precautions

Warning ⚠

- Do not touch the conductive or electronic part of the sensor while it is activated. Doing so may cause an electric shock or damage the sensor.

Caution ⚠

- Sensor Installation and setup **must** only be done by qualified and expert repair personnel familiar with the knowledge related to protection against electric shock.
- Avoid resetting the sensor unnecessarily. Doing so will cause all changes made on the sensor's web page will be returned to factory settings.

Operational safety measures

Warning ⚠

- Do not touch any conductive parts or electronic components of the data logger while the Sensor is transmitting data. Doing so may cause the Sensor to malfunction or fail.

Caution ⚠

- To avoid noise interference, keep all radio communication devices, including mobile phones, at least 25 centimeters away from the Sensor in all directions.

Waste disposal precautions

Caution ⚠

- Dispose the Sensor as an industrial waste.
- Ensure Sensors are segregated from other waste in accordance with local regulations. Dispose of Sensors correctly at your local waste collection/recycling facility.

Contents of the box

Please verify that the box contents match the packing list. The following items should be included:

- An Alternative Current Sensor, model FAC2000-23 [1]
- 48-volt adaptor [2]
- SD Card
- OTG cable
- A user manual.

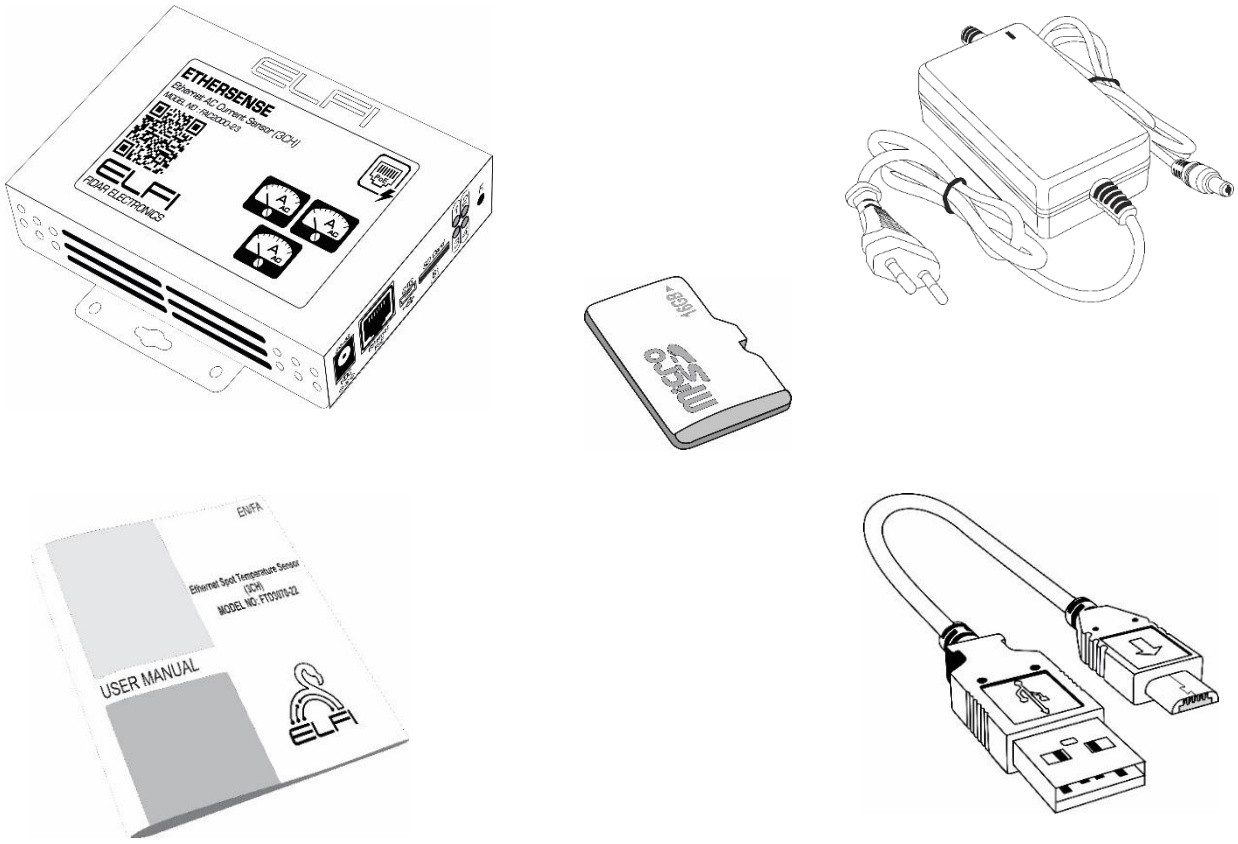


Figure 1: Contents of the box

1. Detailed dimensions of the device can be found on page 25 of the user manual.
2. If requested by the customer

Table of Contents

1. Initialization of the Sensor

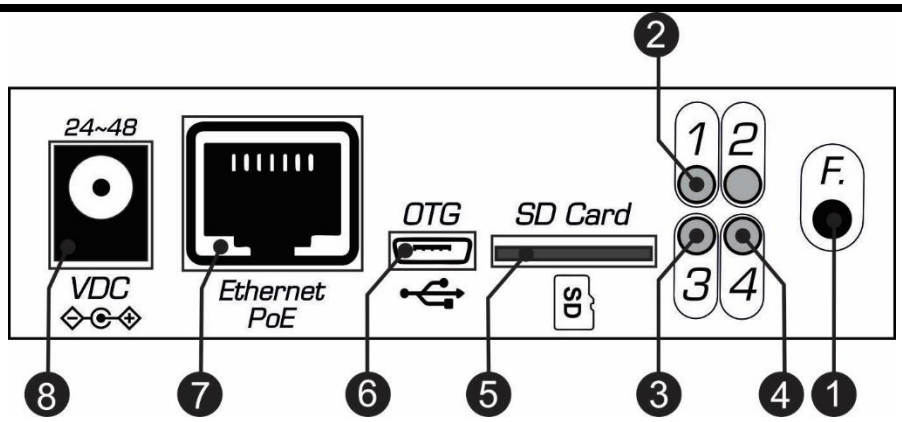


Figure 2: Side view of the sensor

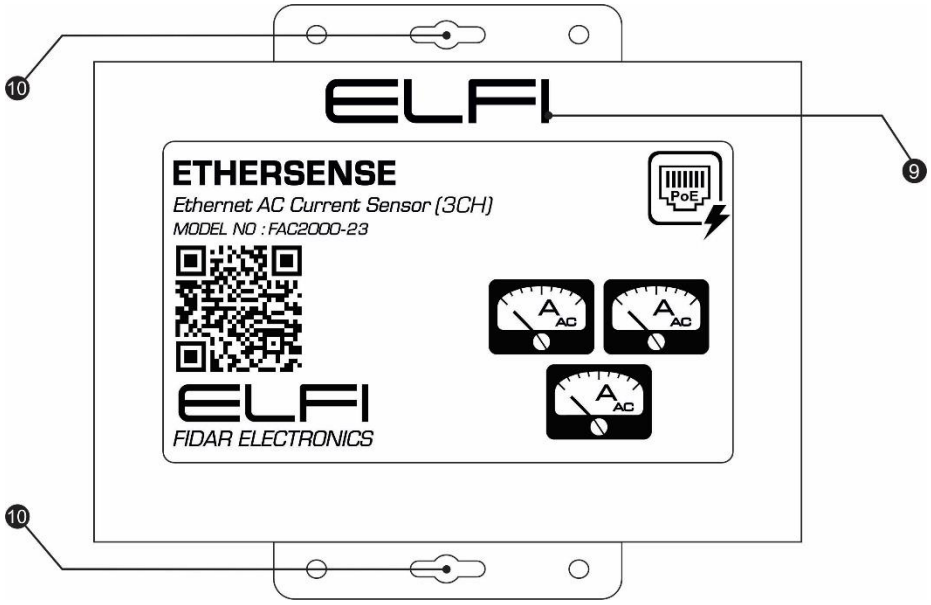


Figure 3: Front view of the sensor

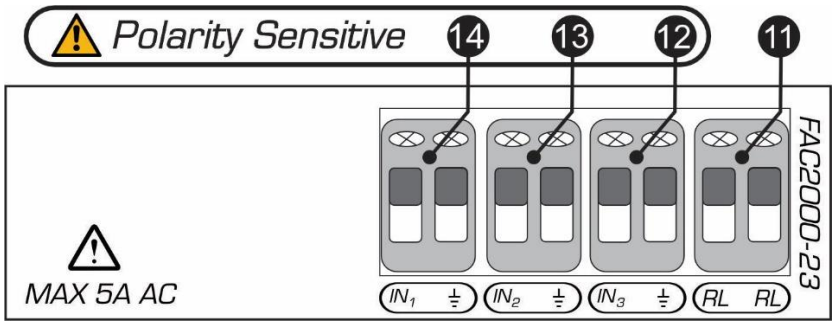


Figure 4: Side view of the sensor

Table 1: Information related to Sensor cover

Number	Name	Description
1	F Key	To perform a calibration and factory reset procedure on the Sensor
2	POWER LED	Indicates Sensor's Power Connection
3	Light which indicates the status related to each channel's calibration.	1. Blinking 1 time per second: channel 1 calibration is ongoing. 2. Blinking 2 times per second: channel 2 calibration is ongoing. 3. Blinking 3 times per second: channel 3 calibration is ongoing
4	Light which indicates the status related to calibration Settings.	———
5	SD Card	SD Card input
6	OTG	OTG cable input
7	Ethernet PoE	Ethernet cable input
8	VDC	Adaptor input
9	Sensor Power Connection Display	If the Sensor's power is connected, the ELFI symbol will be displayed in green.
10	Wall Mounting Location	———
11	RL	To connect sensor to warning equipment (siren, light) or cooling system
12	IN_3	Sensor 3rd Channel
13	IN_2	Sensor 2nd Channel
14	IN_1	Sensor 1st Channel

2. Connecting Sensor to network

To set up the sensor, if you are using a PoE switch, simply connect the sensor to the switch using a cable. Otherwise, use a 48V adapter to set up the sensor and then connect the sensor to your network using a network cable.

Note: Please note that under no circumstances should you use the adapter and network cable at the same time to set up the sensor.

Note: If the sensor is offline, first check the RJ45 or Ethernet cable connection. If the cable is properly connected and the sensor is still not responding, perform a reset as follows:

Disconnect the Ethernet (RJ45) cable from the sensor. Press and hold the F button. While holding the button, reconnect the Ethernet cable. Continue holding the F button until the ELFI indicator light turns on, then release the button.

3. Calibration

To calibrate the current sensor, follow the steps below in order:

Step 1: Entering Calibration Mode

1. Press and hold the F button for 4 seconds.
   - LED 3 will begin to blink (once per second).
   - If the LED does not turn on, try again.

Step 2: Press the F key once again.

- LED 3 will start blinking twice per second.

Step 3: Exit Calibration Mode for Channel 1

Note: After completing calibration for Channel 1, the sensor will automatically proceed to the next channel for calibration.

Step 4: Calibrating Additional Channels

1. To calibrate the second channel, press the F button once more.
   - LED 3 will blink twice per second.

2. Repeat steps 2 and 3 for the second and third channels.

Note: When calibrating the third channel, LED 3 will blink three times per second.

In Case of Errors:

- If the LEDs do not function correctly or calibration is incomplete, restart the process from the beginning.

Note: Calibration always starts from Channel 1 in sequence.

4. Sensor Software Configuration

To access the sensor's user interface, after powering it on, enter the IP address 192.168.1.7 into a browser on a computer connected to the same network. Enter the username and password [1] to access the sensor's web interface (see Figure 5).

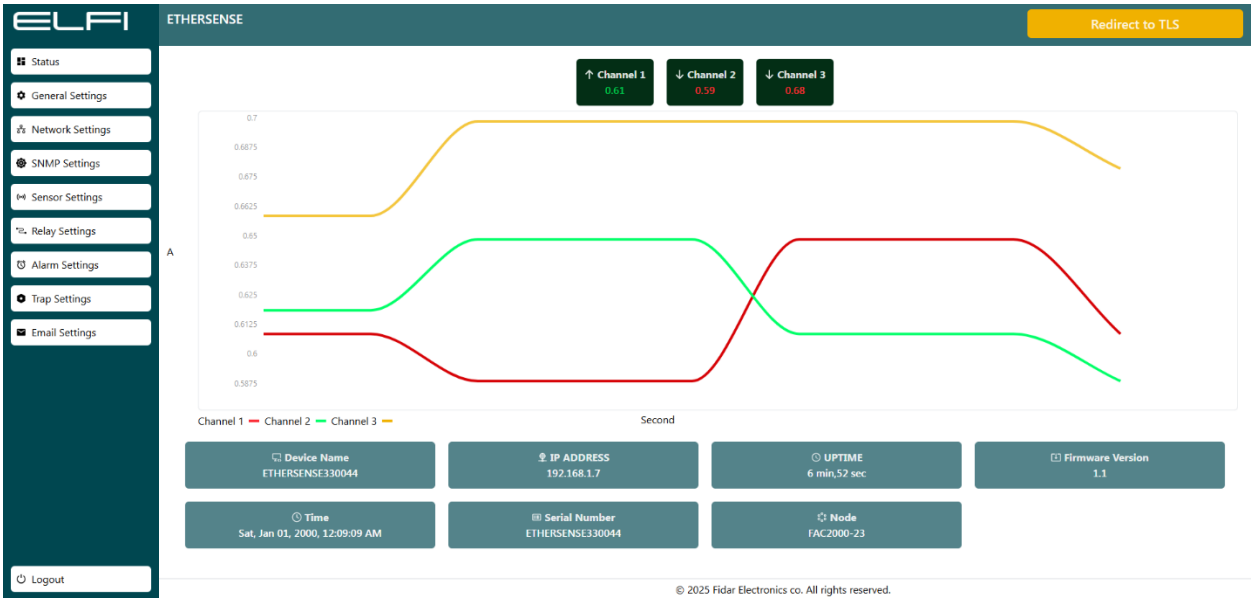


Figure 5: Sensor Web Page

1. The default username and password for this sensor are both "admin".

4.1. Status Menu

The Status page displays real-time and essential sensor information to the user. This page includes a current graph for all three sensor channels as well as technical data related to the sensor, designed for quick and easy monitoring of system performance (Figure 6).

Current Graph

In this section, the measured current values from the sensor's three channels are displayed graphically:

- Each channel is represented on the graph with a distinct color and label for easy identification.
- Live current data, along with historical fluctuations, are visually presented.
- The graph automatically updates to reflect accurate and up-to-date information.

Sensor Information

This section provides technical details about the sensor:

- **Device Name:** Custom name assigned to the sensor for easy identification on the network or in the field.
- **IP Address:** The network address through which the sensor is connected.
- **Uptime:** The total time the sensor has been running continuously since the last startup or reset.
- **Firmware Version:** Indicates the current software version of the sensor, reflecting its features and updates.
- **Time:** The current date and time set on the sensor, essential for event logging and time synchronization.
- **Serial Number:** The unique ID of the sensor used for tracking and documentation.
- **Sensor (Node) part number:** Corresponding to the sensor hardware, identifying its technical specifications.

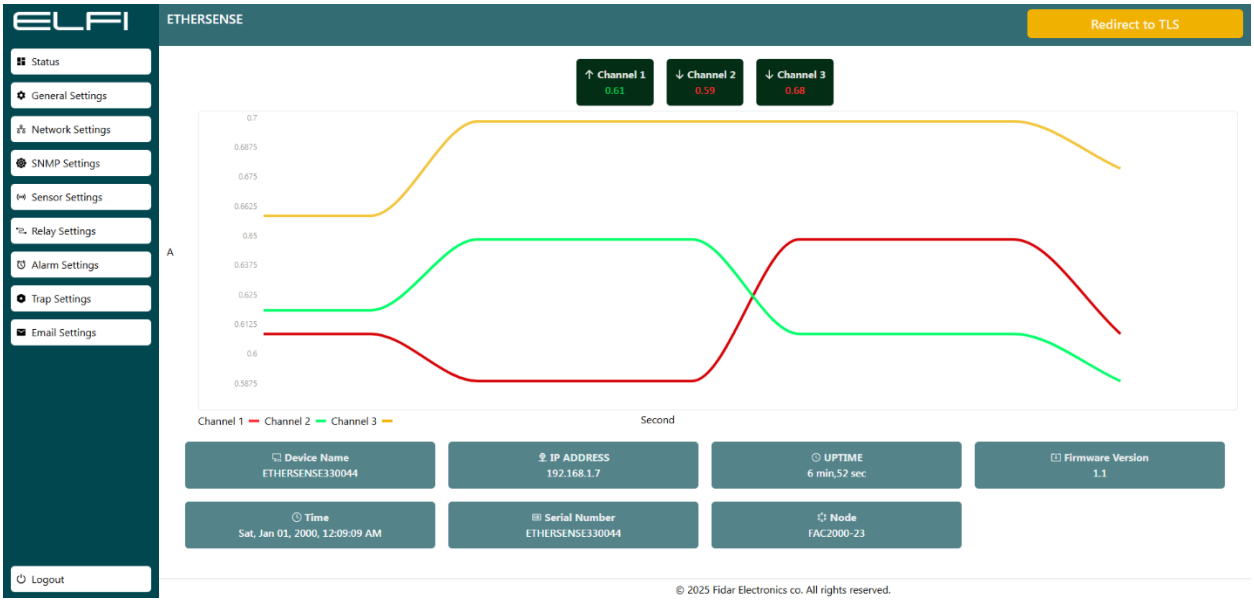


Figure 6: Sensor “Status” Menu

4.2. General Settings Menu

This menu allows for time configuration and password changes (see Figure 7).

- To configure time settings, use the NTP option to automatically synchronize the sensor’s clock with internet time servers. If disabled, you can manually adjust the date and time, or sync with your computer’s clock.
- For enhanced security, change the default sensor password.

Note: The default Device Name is the sensor's Serial Number. It is recommended to rename the device after setup for easier identification.

Note: After making any changes, first click Save and then select Reboot to apply the settings completely.

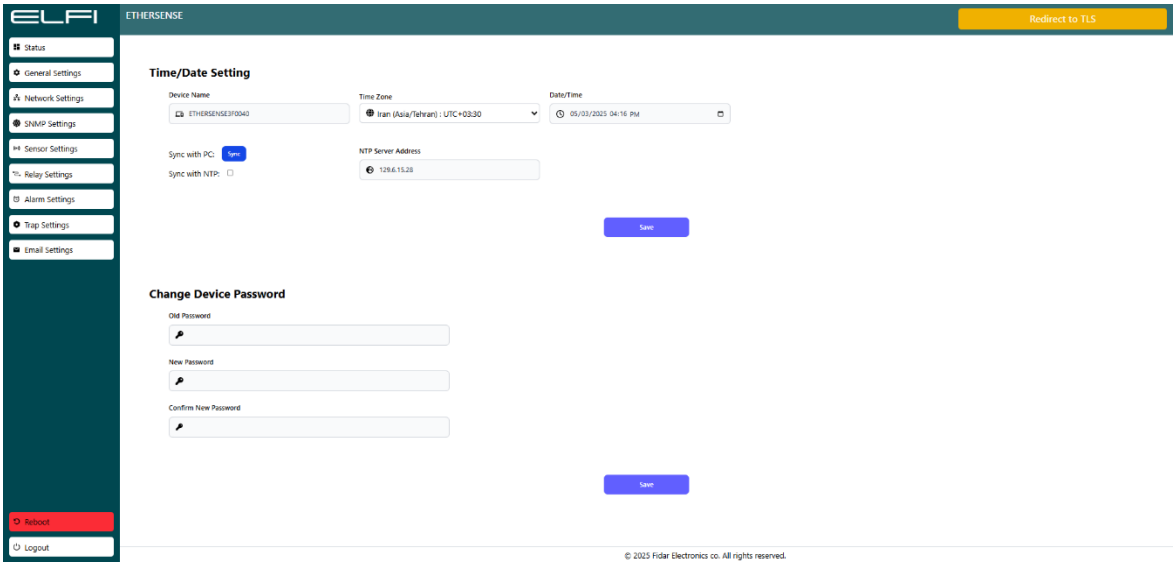


Figure 7: Sensor "General Settings" Menu

4.3. Network Settings Menu

This section helps configure the sensor's network connectivity. Depending on your network requirements, you can use either automatic configuration via DHCP or manual configuration (see Figure 8).

1. When DHCP is enabled, the sensor automatically obtains required network information from the DHCP server. This includes the IP Address, Subnet, Gateway, DNS Server, and other relevant settings.

2. When DHCP is disabled, if you prefer to enter the settings manually, disable the DHCP option. Once disabled, the following fields will become available for manual configuration:

- **IP Address:** The unique address of the sensor on the network (e.g., 192.168.1.100)
- **Subnet:** Defines the local network range (e.g., 255.255.255.0)
- **Gateway:** The default gateway address for connecting to external networks (e.g., 192.168.1.1)
- **DNS1 & DNS2:** Addresses of DNS servers used to resolve domain names to IP addresses
- **HTTP Port:** Port used to access the sensor's web interface via HTTP (Default: 80)
- **HTTPS Port:** Port used to access the sensor's web interface via HTTPS (Default: 443)

- **Certificate:** A digital file that verifies the sensor's identity for secure HTTPS communication
- **Private Key:** A component of the certificate used to decrypt data in secure connections

After completing the settings, click Save, then click Reboot to apply the changes.

Important Notes:

Note: The Private Key must remain confidential and must not be shared.

Note: To enhance security, use HTTPS instead of HTTP.

Note: It is recommended to change default ports (e.g., 80 and 443) if possible.

Note: Store the Private Key in a secure location and prevent unauthorized access.

Note: Use encryption for the Private Key file.

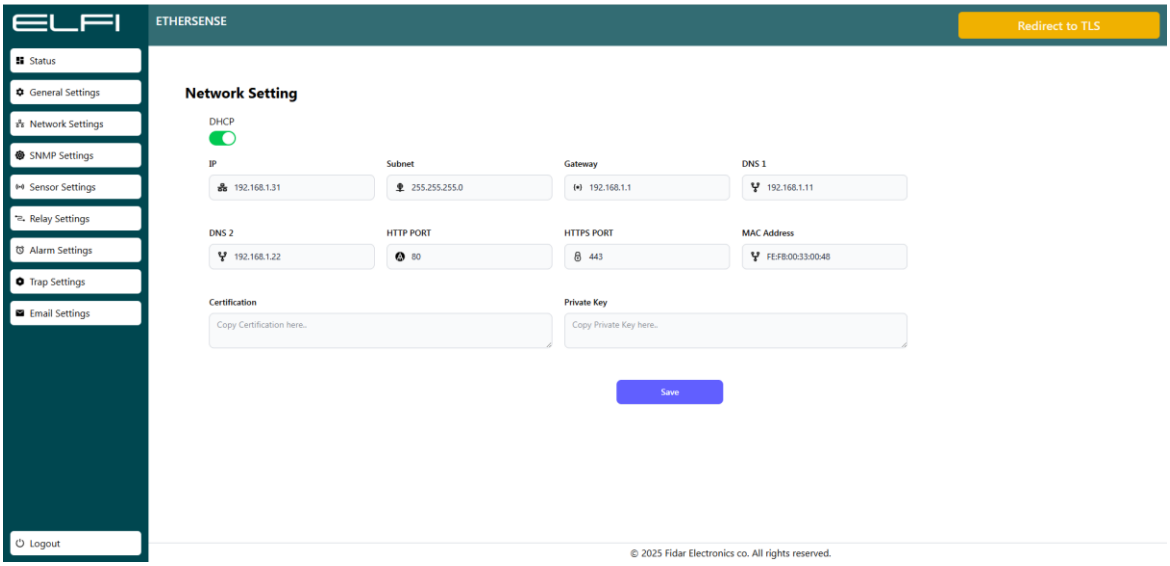


Figure 8: Sensor "Network Settings" Menu

4.4. SNMP Settings Menu

SNMP (Simple Network Management Protocol) enables communication between the network administrator and devices such as sensors, switches, and routers. This section includes options for protocol version, Community settings, OIDs, and Traps (see Figure 9).

- Current Version: Indicates the SNMP version supported by the sensor. Typically, versions 1 and 2 are supported.

- Community: Acts as a simple password controlling access to sensor information.

Default: public, which allows general access to public sensor data.

Note: Change the default public value to a secure and unique name.

Note: Avoid using easy-to-guess names like "public" or "private".

Note: In the SNMP OID and Trap OID sections, review available identifiers.

Note: Configure Trap OIDs based on your monitoring needs to avoid unnecessary notifications.

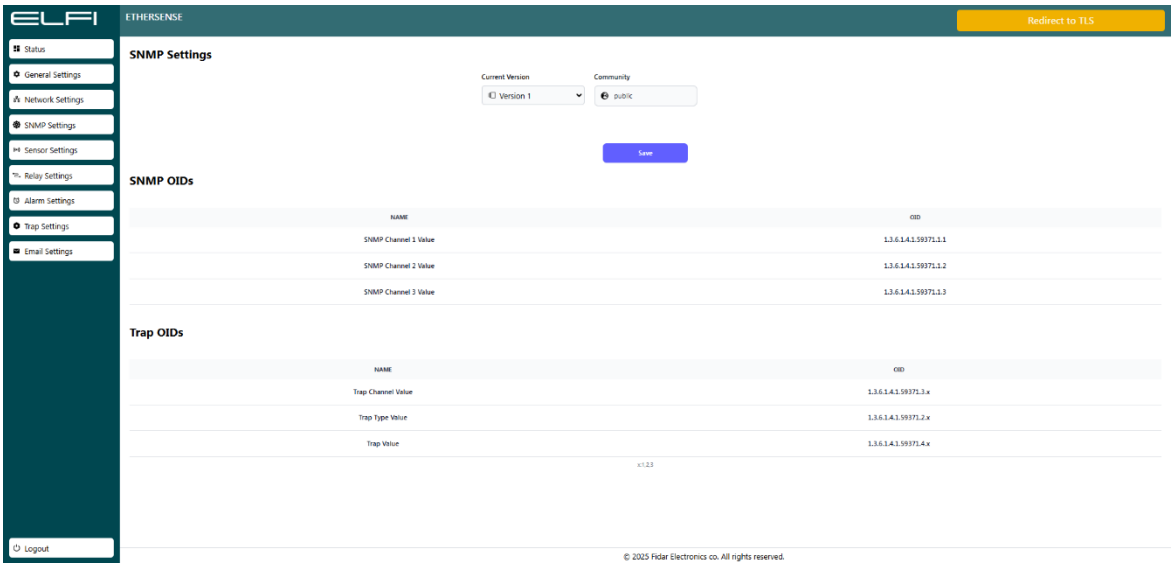


Figure 9: Sensor “SNMP Settings” Menu

4.5. Sensor Settings Menu

If a CT (Current Transformer) is used, you can configure the corresponding transformer ratio settings for each sensor channel individually in the Sensor Settings Menu (Figure 10).

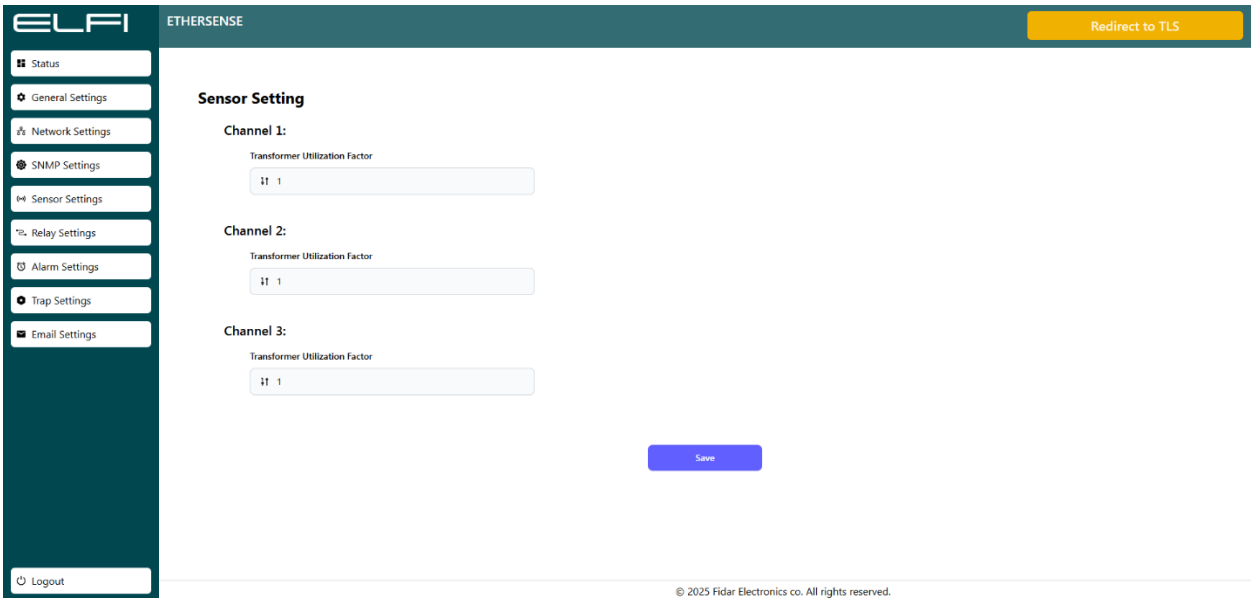


Figure 10: Sensor "Sensor Settings" Menu

4.6. Relay Settings Menu

Relay settings can be configured in two modes:

- Time-Based Mode: When this mode is enabled and a time value is set (e.g., 10 seconds), the relay will activate connected devices—such as sirens, cooling systems, etc.—for the specified time duration (10 seconds in this example) as soon as the relay is triggered, and will then automatically turn off.
- If Continuous mode is selected, once the relay is triggered, connected devices—such as alarms, cooling systems, etc.—will remain active until the sensor exits the alarm state. Additionally, in Continuous mode, if the option "Reset relay status when alarm ends" is enabled, the relay will automatically return to its previous state when the alarm condition ends (e.g., the alarm will be turned off). (See Figure 11)

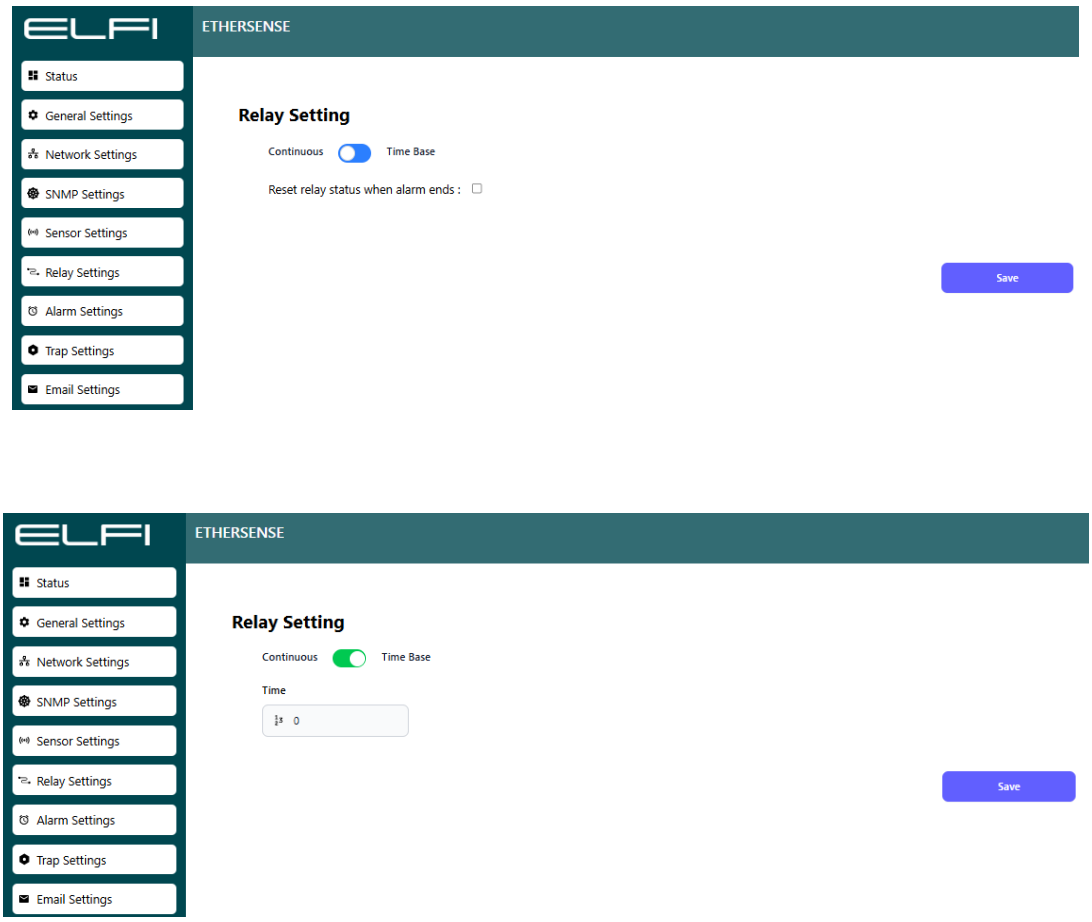


Figure 11: Sensor "Relay Settings" Menu

4.7. Alarm Settings Menu

The Sensor Alarm Settings page allows you to configure alarms individually for each of the three current monitoring channels. This feature helps you monitor voltage/current variations per channel and respond promptly when thresholds are crossed. The sensor supports three independent channels, each of which can be configured separately. For every channel, you can define specific thresholds for **High Alarm, High Pre-Alarm, Low Alarm, Low Pre-Alarm** (See Figure 12)**.**

Types of Alarms

High Alarm

- Triggered when the current exceeds the defined high threshold.]
- Useful for detecting dangerously high current levels.

High Pre-Alarm

- Activated when the current approaches the high threshold.
- Acts as an early warning for potential overload conditions.

Low Alarm

- Triggered when the current drops below the defined low threshold.
- Useful for detecting undercurrent or disconnection risks.

Low Pre-Alarm

- Activated when the current approaches the low threshold.
- Acts as an early warning for potential drops below safe limits.

How to Configure Alarms

1. For each channel, define the following parameters:
   - **High Alarm:** Critical high current value.
   - **High Pre-Alarm:** Near-critical high current value.
   - **Low Alarm:** Critical low current value.
   - **Low Pre-Alarm:** Near-critical low current value.

Alarm Notification Options

1. Email Notification

- Once triggered, the sensor can send an alarm email to predefined recipients.
- The email includes sensor details and the type of alarm.
- Ensure that the SMTP settings are correctly configured in the Email Settings section.

2. SNMP Trap

- The sensor can send a trap to the network management server upon alarm activation.
- Suitable for centralized monitoring in managed network environments.
- Relevant SNMP and Trap OID settings must be properly configured.

3. Relay Activation

- The sensor can activate a relay in response to an alarm event.
- This may trigger a warning light, siren, or control an external device.
- Recommended for environments requiring immediate physical response.

Selecting Alarm Notification Methods

1. In the Alarm Notification Method section, choose one or more of the following options:
   - Email: Send an alarm notification via email.
   - SNMP Trap: Send a trap to the network management server.
   - Relay Activation: Trigger a relay to activate external hardware.

Saving Settings

1. After configuring your thresholds, click Save, then select Reboot to apply the changes.
2. The sensor will apply the new settings and will be ready to notify you when defined conditions are met.

Important Notes

Email Alerts: Double-check recipient addresses and SMTP configurations.

Fast Response Environments: Use relay activation (e.g., for sirens or warning lights).

Avoid False Alarms: Set Pre-Alarms slightly above or below main alarm thresholds.

Environmental Accuracy: Adjust current thresholds based on your application and connected equipment.

Testing: Always test alarm functions after making changes.

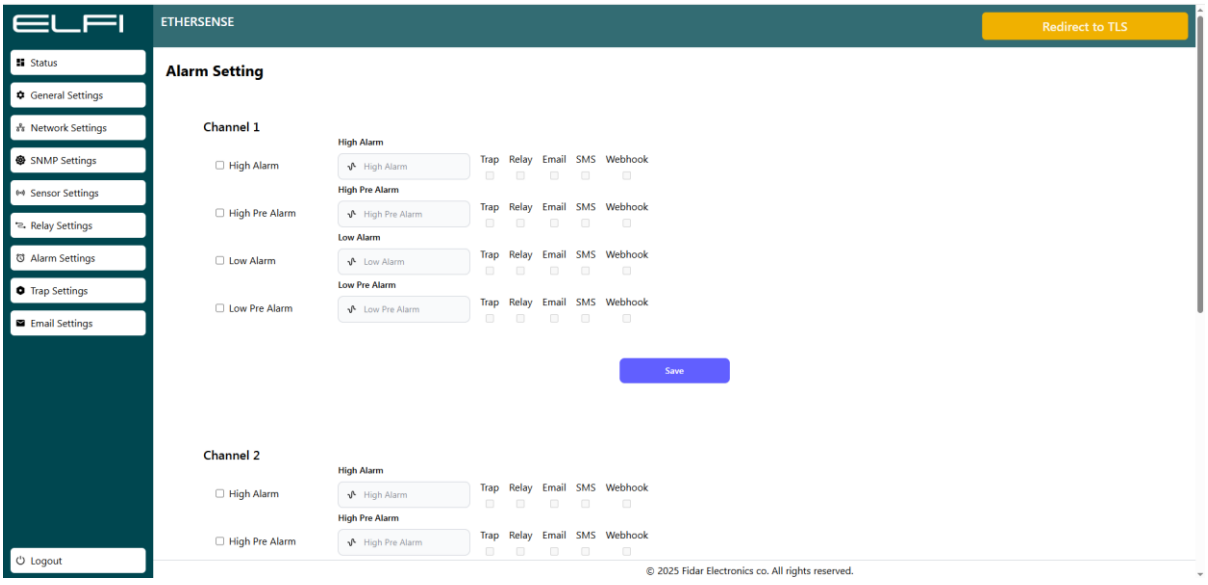


Figure 12: Sensor “Alarm Settings” Menu

4.8. Trap Settings Menu

A Trap is an asynchronous alert message sent by the sensor to the SNMP server, providing information about specific events (such as alarms or status changes). These messages are automatically transmitted by the sensor without any polling request from the server. (See Figure 13). To configure Trap Settings:

1. Go to the Trap Settings section.
2. Fill in the following fields:
   2.1. **Trap Destination IP:** The IP address of the network management server.
   2.2. **Trap Port:** The appropriate port number (default: 162).
   2.3. **Trap Community:** A community string used for SNMP access. (It is recommended to change the default value for improved security.)

Within the Trap Settings page, you will find the Send Delay Config option. This defines a delay before Trap messages are sent to the network management server. It is useful for optimizing network performance and reducing server load, especially in environments with frequent events.

Importance of Send Delay:

- **Network Traffic Management:** Prevents flooding the network with multiple Trap messages in a short time.
- **Reducing Server Load:** Allows the SNMP server enough time to process previous messages before receiving new ones.
- **Avoiding Redundant Alerts:** Temporary sensor fluctuations won't immediately trigger a Trap, preventing unnecessary alerts.

How Send Delay Config Works:

- Set Delay Time (in seconds):
- Default: 0 (no delay)
- Example: 10 means the Trap will be delayed for 10 seconds after the event occurs.
- Trap messages are only sent after the delay, even if multiple events happen.

Using Delay in Repeated Traps:

- If several events occur within the delay period, only the latest status is sent.
- This helps reduce traffic and prevents repetitive messages.

Note: Choose a delay that does not risk missing critical events.

Note: For time-sensitive networks, set a very low or zero delay.

Note: After configuration, verify the Trap functionality to ensure messages are delivered properly.

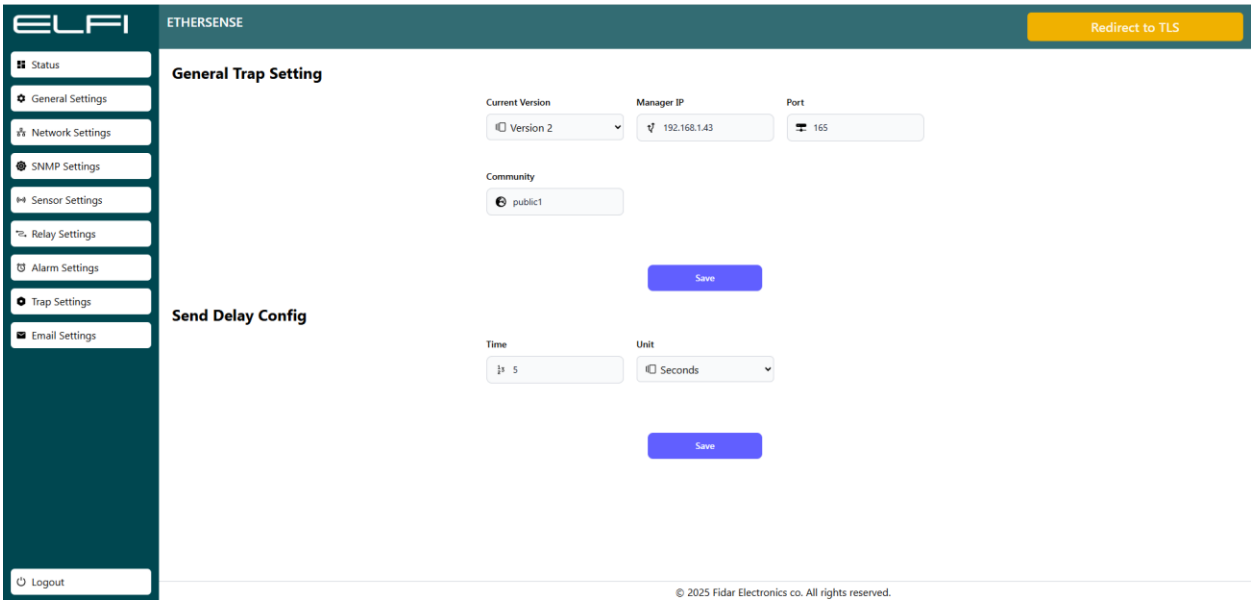


Figure 13: Sensor "Trap Settings" Menu

4.9. Email Settings Menu

This section allows you to configure settings for sending emails via the SMTP (Simple Mail Transfer Protocol). It is used for sending alerts, notifications, or reports to designated email addresses. (See Figure 14)

Available Fields:

- **SMTP Sender Email Address:** The email address shown as the sender in the message. This must be valid and usually matches the credentials of the SMTP server. (Example: example@yourdomain.com)
- **SMTP Receiver Email Address:** The destination email address where alerts will be sent. (Example: example@yourdomain.com)
- **SMTP Server Address:** The address of the SMTP server used to send emails. (Depends on your email provider.)
- **Server IP:** If using a local SMTP server, enter its IP address here.
- **SMTP Port:** Port number used for communication with the SMTP server. Common values:

- 25: No encryption (legacy, rarely used today)
- 465: Secure connection using SSL/TLS
- 587: Secure connection using STARTTLS

- **SMTP Username:** Username for authentication, typically the same as the sender's email address.
- **SMTP Password:** Password for the specified SMTP username (used for authentication).
- **Time:** Time interval (in seconds) for sending emails or scheduling automated messages.
- **Test Email Address:** An email address used for testing the configuration. Use the “Send Test Email” option to verify that the settings are correct.

After completing the configuration, click Save, then Reboot to ensure all settings are applied correctly.

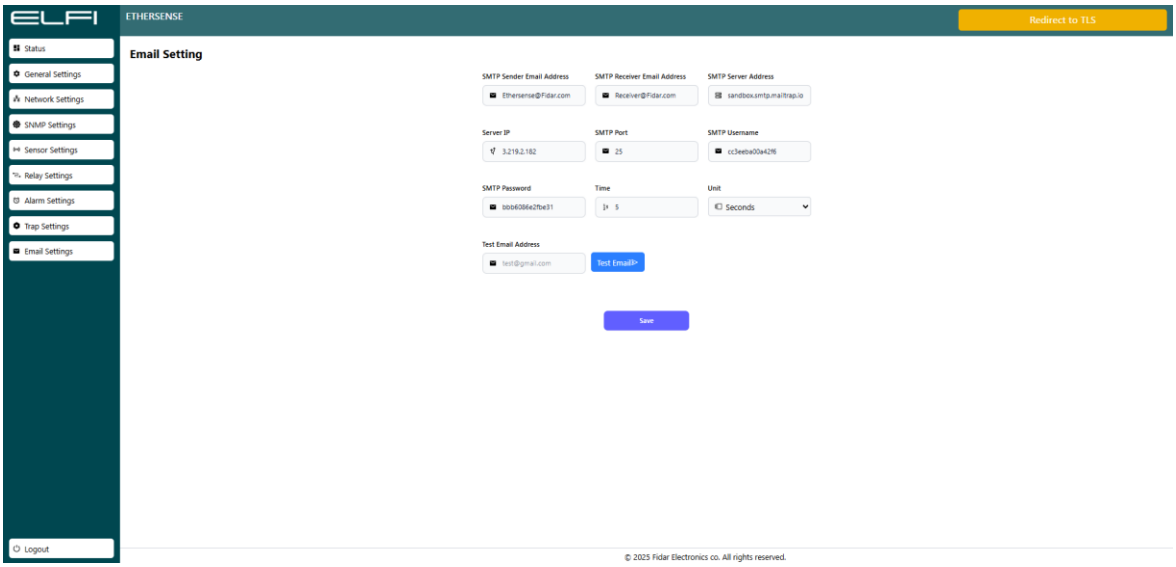
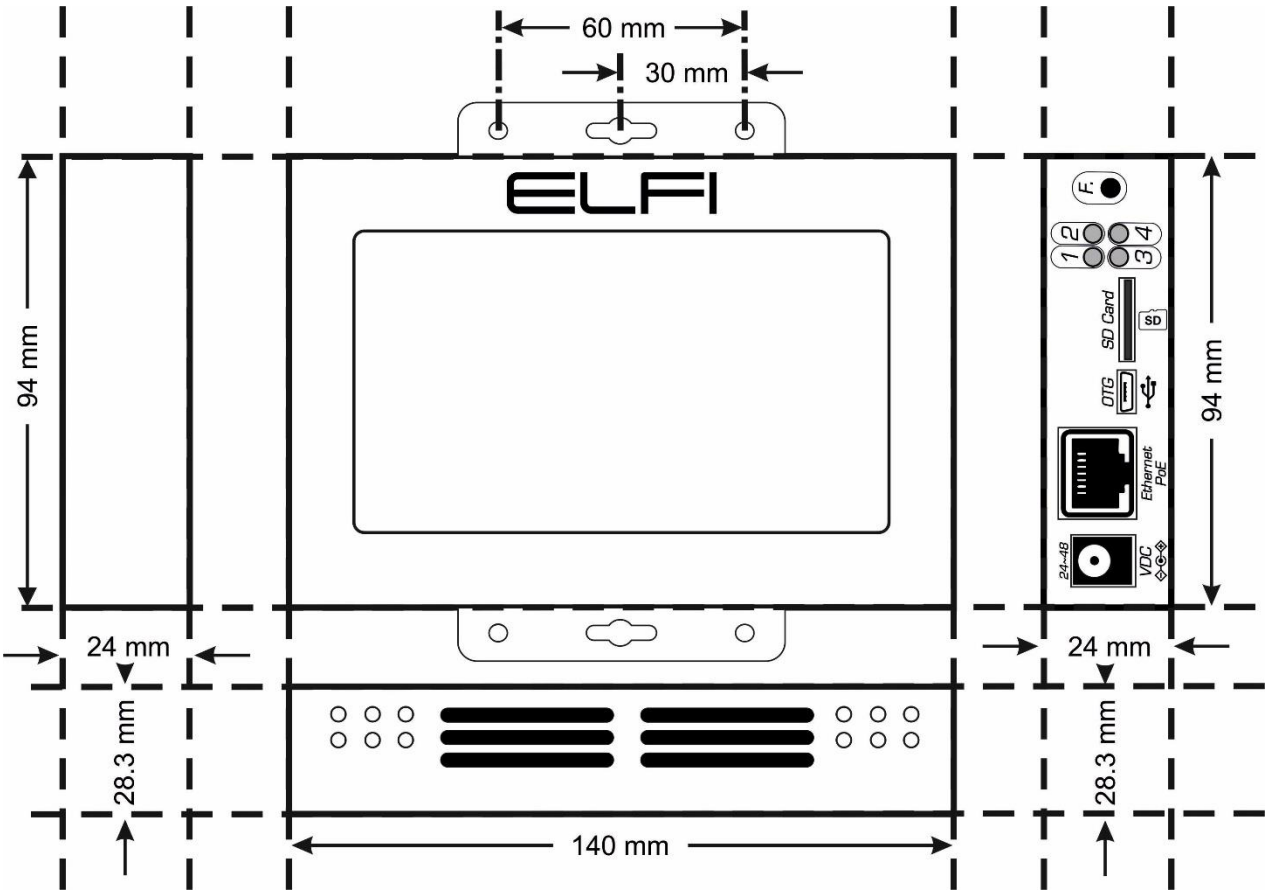


Figure 14: Sensor “Email Settings” Menu

5. Sensor Dimensions



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