



AIR IOT - User Manual (Webserver Edition)



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1. OVERVIEW

AIR IOT is an ESP32 based environmental monitor with a built in webserver. It displays live gauges on an RGB panel (LVGL) and serves a responsive UI (User Interface) over Wi Fi in AP and STA modes.

2. QUICK START

- Connect to AP SSID “IoT_Air” with password “repro123”.
- Browse to <http://192.168.4.1/> (AP default), or use the IP shown on the Index page if STA is connected.
- Open Unit Setup to configure Wi Fi, MQTT, NTP, and (optionally) Static IP.

3. WEBSERVER ENDPOINTS

ENDPOINT	METHOD	PURPOSE
/	GET	Index page with device info & live values
/SensorReadings	GET	Auto refresh values (5 s)
/UnitSetup	GET/POST	Configure credentials, MQTT, intervals (restarts)
/UnitSetupDone	GET	Confirmation after save
/DateTimeUpdate	GET/POST	Set epoch/system time
/DateTimeUpdateDone	GET	Confirmation after time update
/IMU	GET	Plain text acceleration magnitude
/OTAUpdate	GET/POST	Password protected OTA upload
/Style.css	GET	Stylesheet

4. PASSWORDS & SECURITY

- AP Wi Fi Password: “repro123”
- OTA Update Password (/OTAUpdate): “9326”



5. VALUES & UNITS DISPLAYED ON THE WEBSERVER

SENSOR	UNITS
Temperature (HDC1080)	°C
Humidity (HDC1080)	%
CO ₂ (SCD4x)	ppm
CO ₂ Temperature (SCD4x)	°C
CO ₂ Humidity (SCD4x)	%
PM1.0 (SPS30)	µg/m ³
PM2.5 (SPS30)	µg/m ³
PM4.0 (SPS30)	µg/m ³
PM10.0 (SPS30)	µg/m ³
Acceleration (IMU)	g
SPL (DB Meter)	dBA

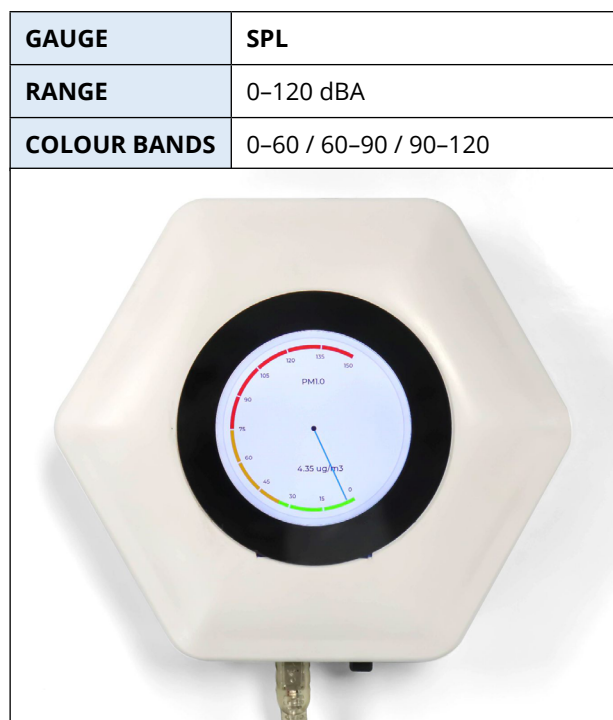
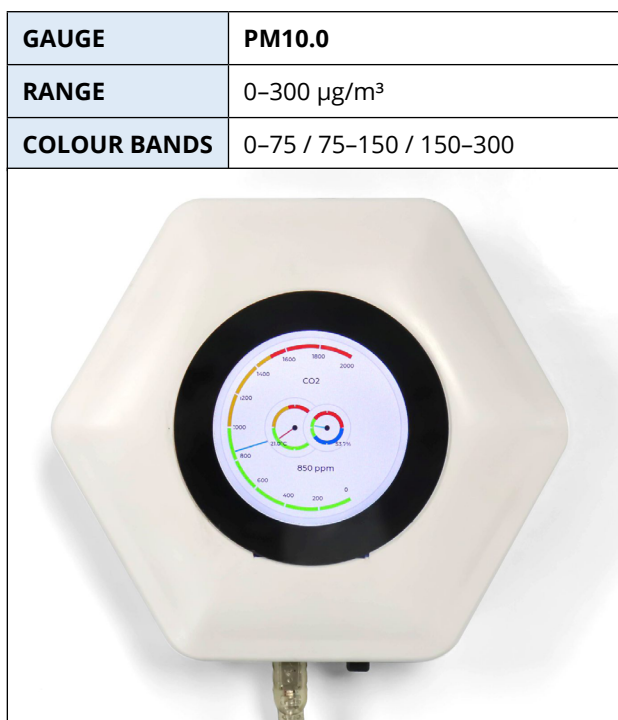
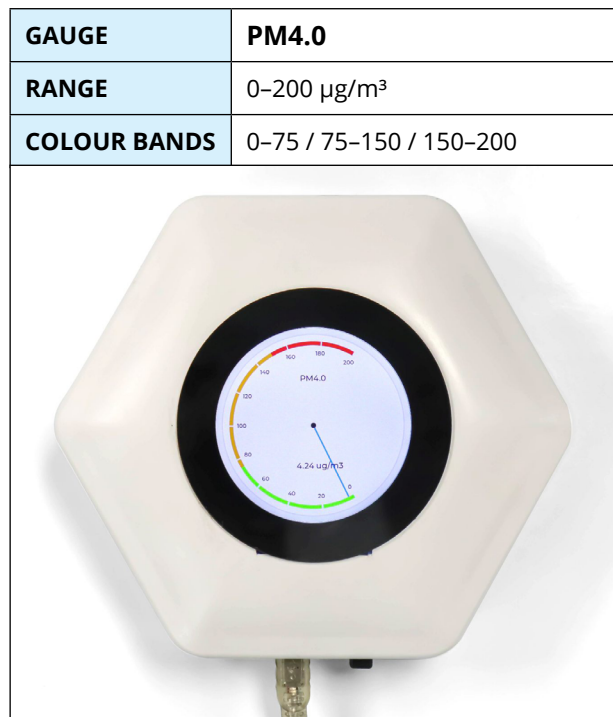
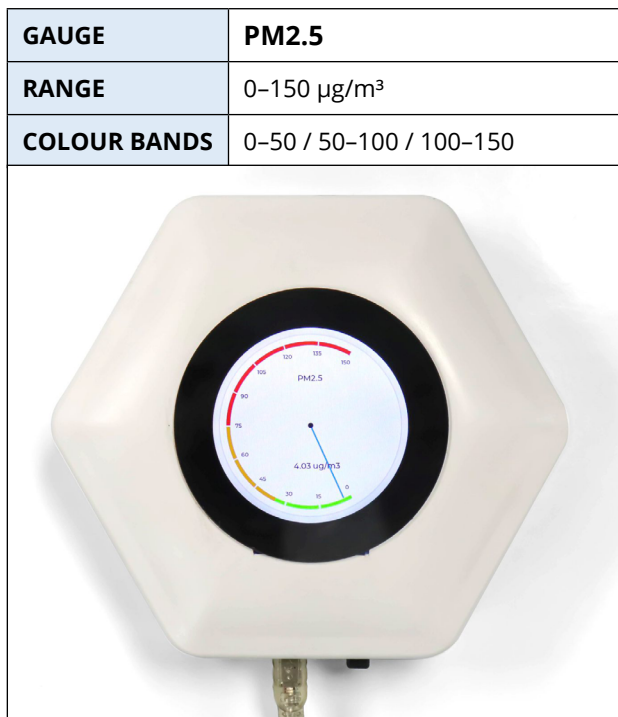
6. TFT GAUGES & RANGES

GAUGE	CO ₂
RANGE	0–2000 ppm
COLOUR BANDS	0–1000 / 1000–1500 / 1500–2000

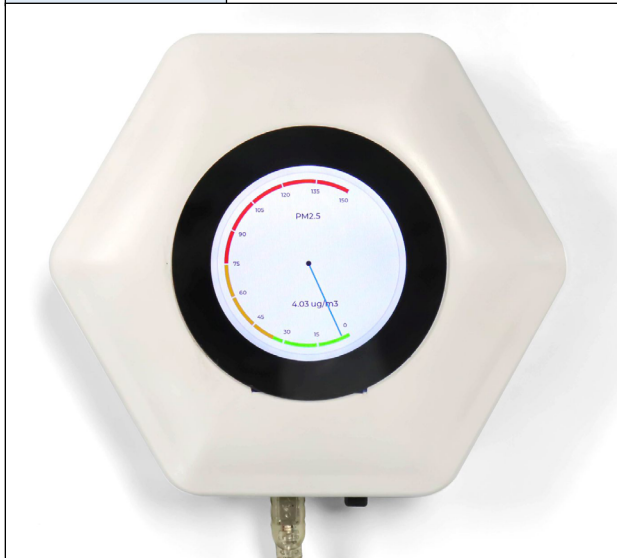


GAUGE	PM1.0
RANGE	0–150 µg/m ³
COLOUR BANDS	0–50 / 50–100 / 100–150

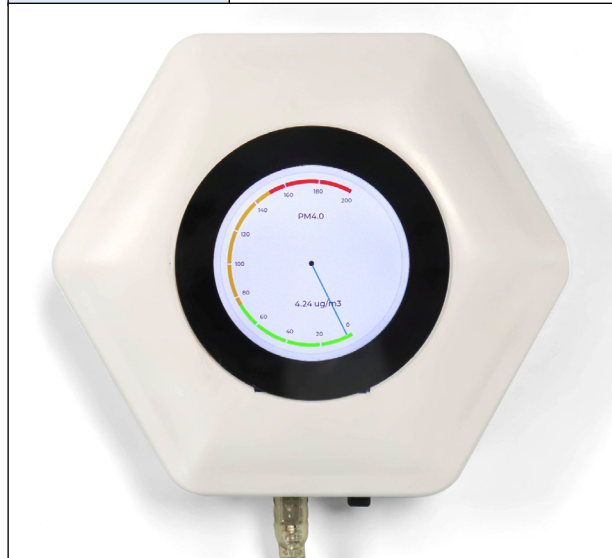




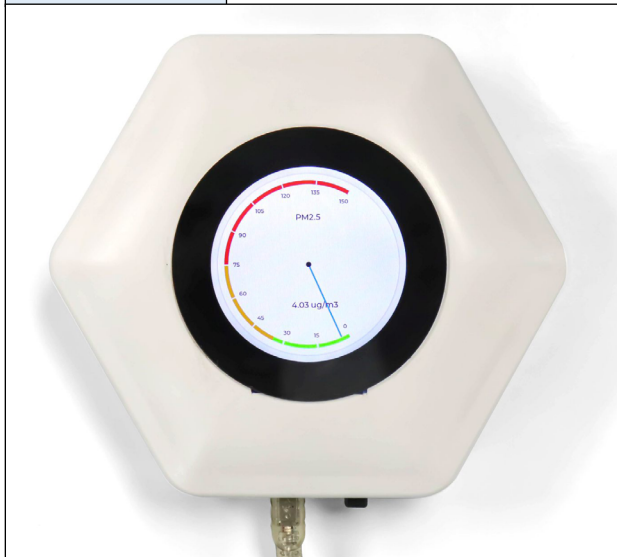
GAUGE	IMU (Accel)
RANGE	0-20 g
COLOUR BANDS	0-5 / 5-10 / 10-20



GAUGE	Temp (HDC1080)
RANGE	0-50 °C
COLOUR BANDS	0-15 / 15-25 / 25-35 / 35-50



GAUGE	Humidity (HDC1080)
RANGE	0-100 %
COLOUR BANDS	0-30 / 30-60 / 60-100



7. MQTT PUBLISHING

Broker: (set in Unit Setup):1883 Topic base: (set in Unit Setup) which default to the smartmonitoring.co.za site.

JSON keys: MACAddress, Temp_HDC, Hum_HDC, Temp_SCD, Hum_SCD, PM1.0, PM2.5, PM4.0, PM10.0, CO2, Accel, SPL

Example: {"MACAddress":"AA:BB:CC:DD:EE:FF","Temp_HDC":23.4,"Hum_HDC":46.1,"Temp_SCD":23.2,"Hum_SCD":45.8,"PM1.0":4.2,"PM2.5":7.8,"PM4.0":9.1,"PM10.0":10.5,"CO2":612,"Accel":0.98,"SPL":52.3}

8. UNIT SETUP (CONFIG SAVE & RESTART)

Defaults: SSID=(blank), NTP=pool.ntp.org, MQTT=(blank):1883, Topic=(blank) – to be completed by the user. Saving settings writes to NVS (non-volatile storage) and schedules an automatic restart on the device.

9. OTA UPDATE

Use /OTAUpdate with password "9326"; upload a .bin. Device suspends sensor tasks, flashes, reboots.

10. TIMEKEEPING

SNTP is used for clock sync; /DateTimeUpdate allows setting epoch manually. DS3231 is kept in sync.

11. SENSOR SPECIFICATIONS (SHORT)

HDC1080 (TI) — Temperature & Humidity (I ² C)	
Temperature accuracy	±0.2°C typical (25 °C)
Humidity accuracy	±2% RH typical
Ranges	0–100% RH, –40 °C to +125 °C (sensor rating; practical accuracy spec around room temperature)
SCD4x (Sensirion) — CO ₂ , plus T/RH (I ² C)	
Measurement range	SCD40: 400–2,000 ppm; SCD41: up to 5,000 ppm (CO ₂ output range up to 40,000 ppm for diagnostics)
Accuracy	SCD40 ±(50 ppm + 5% of reading) from 400–2,000 ppm; SCD41 tighter specs in 400–1,000 ppm and extended to 5,000 ppm
Response time	~60 s (τ63%)
SPS30 (Sensirion) — Particulate Matter PM1/2.5/4/10 (I ² C/UART)	
Mass concentration range	0–1,000 µg/m ³ for PM1.0, PM2.5, PM4.0, PM10.0
Precision	±10% (mass concentration), typical
SPL (DB Meter) — (I ² C 0x48)	
Output	Instantaneous sound level in dBA (approximate), plus MIN/MAX registers
Range (typical)	0–120 dBA (application dependent; not a certified Class 1 instrument)

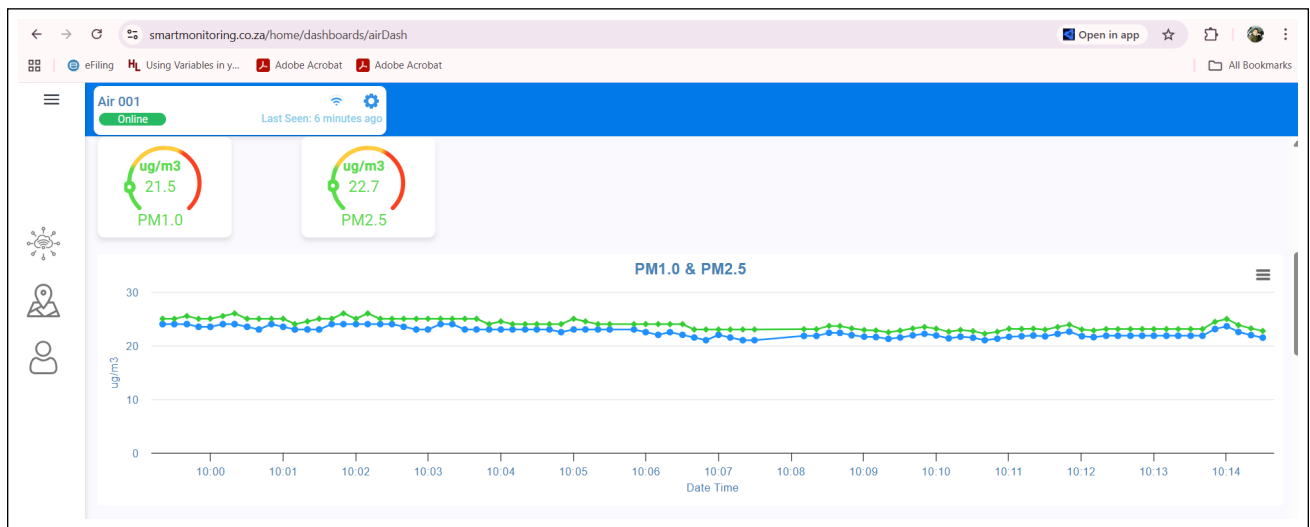
12. SMART MONITORING BACK END DASHBOARD

(Found at www.smartmonitoring.co.za) **Not all features shown below

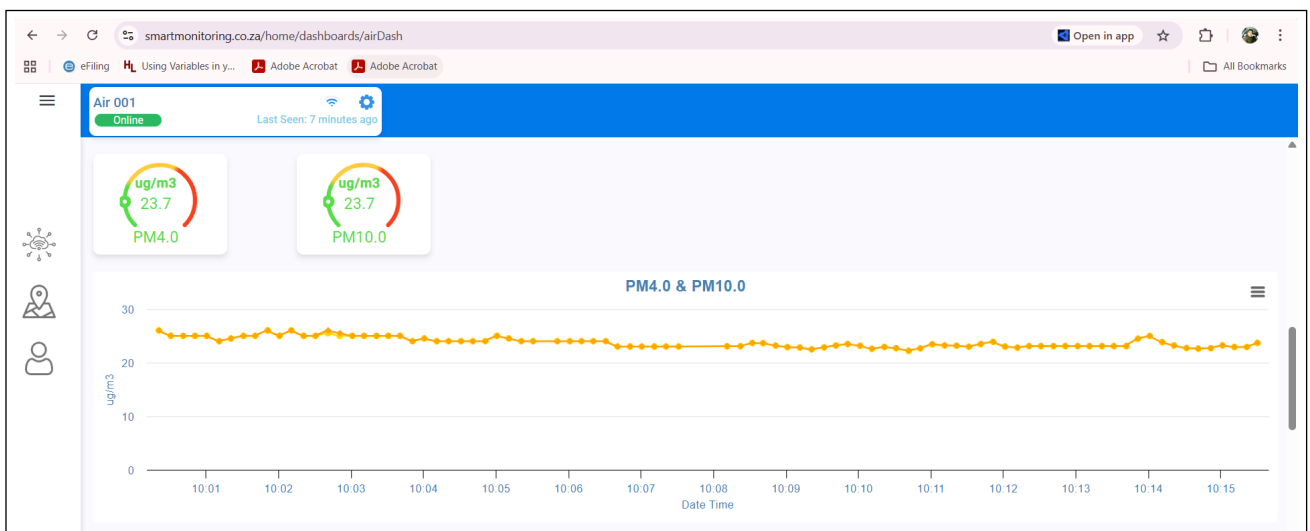
The Smart Monitoring main dashboard can be found below once the user and unit details have been registered on the website.

Below are the Screen shots from the Dashboard showing the different sensor Widgets and the graphs displaying their value over the set period set in the Webserver

Particulate Sensor measurement from 1.0 to 2.5



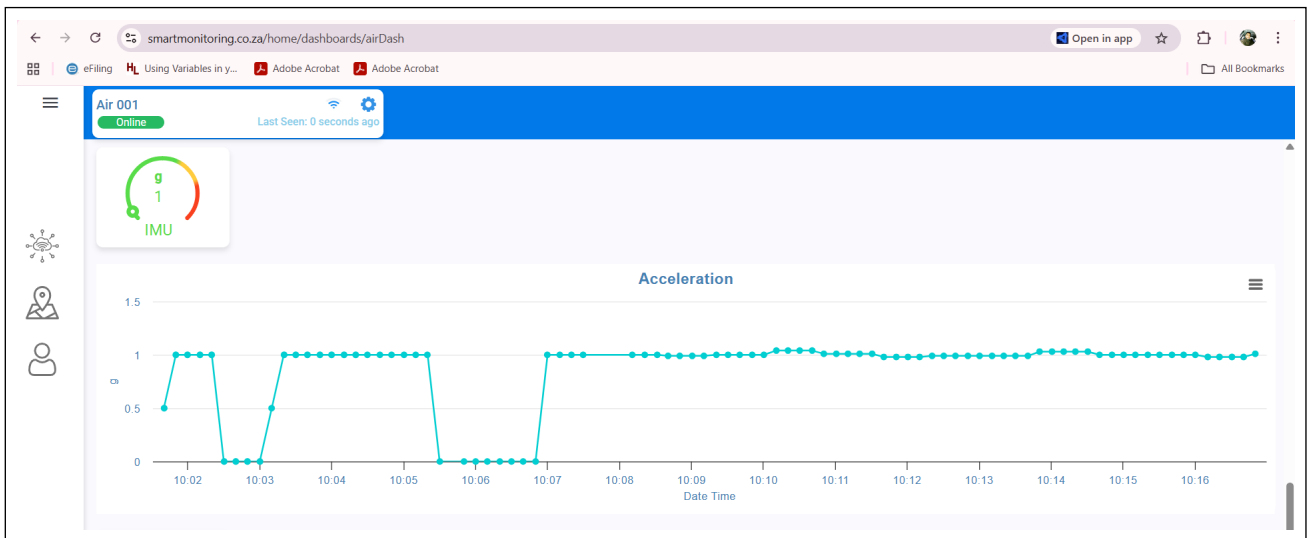
Particulate Sensor measurement from 4.0 to 10.0



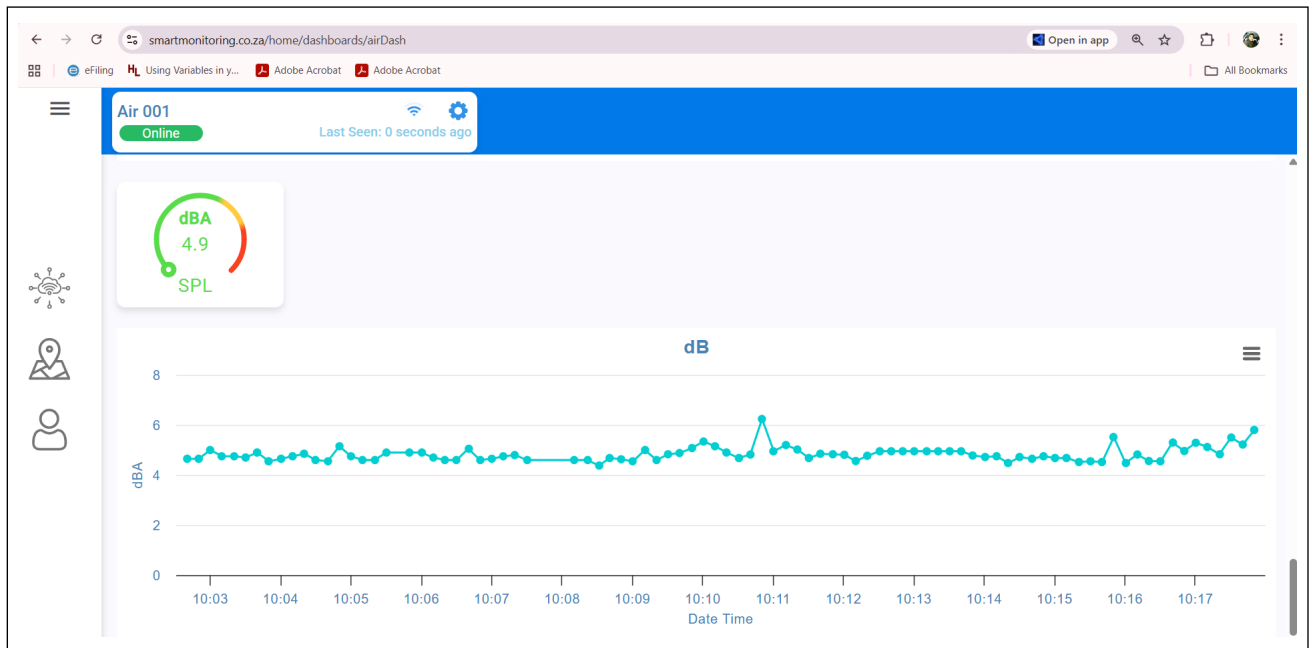
CO2 measurement



IMU Measurement



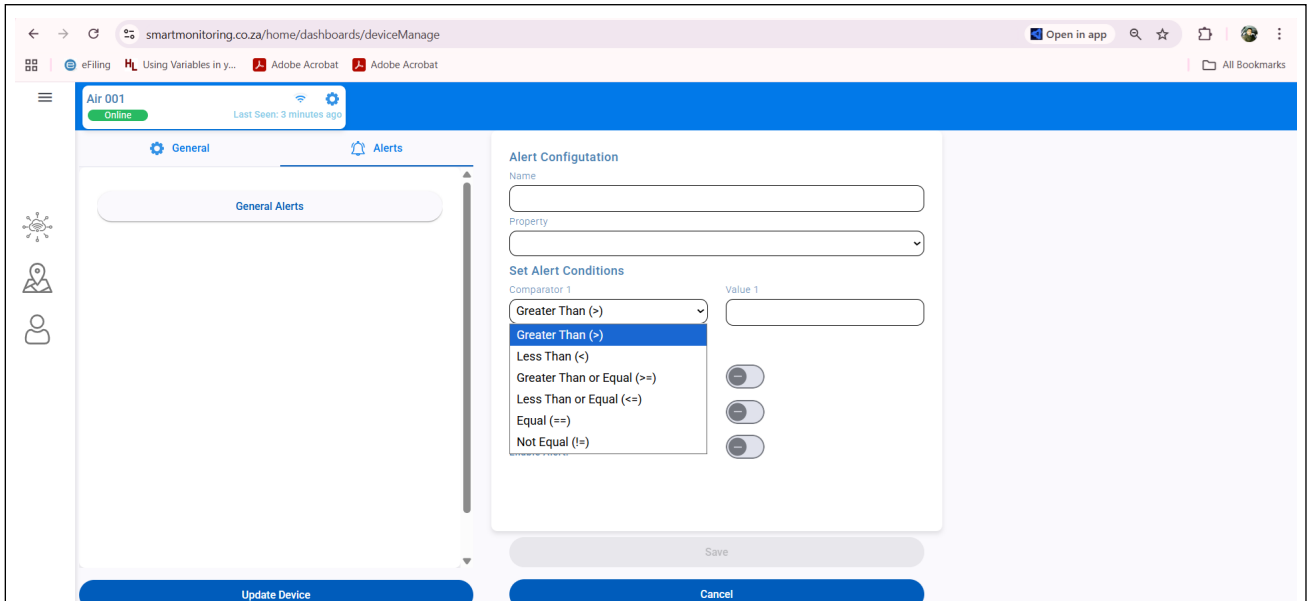
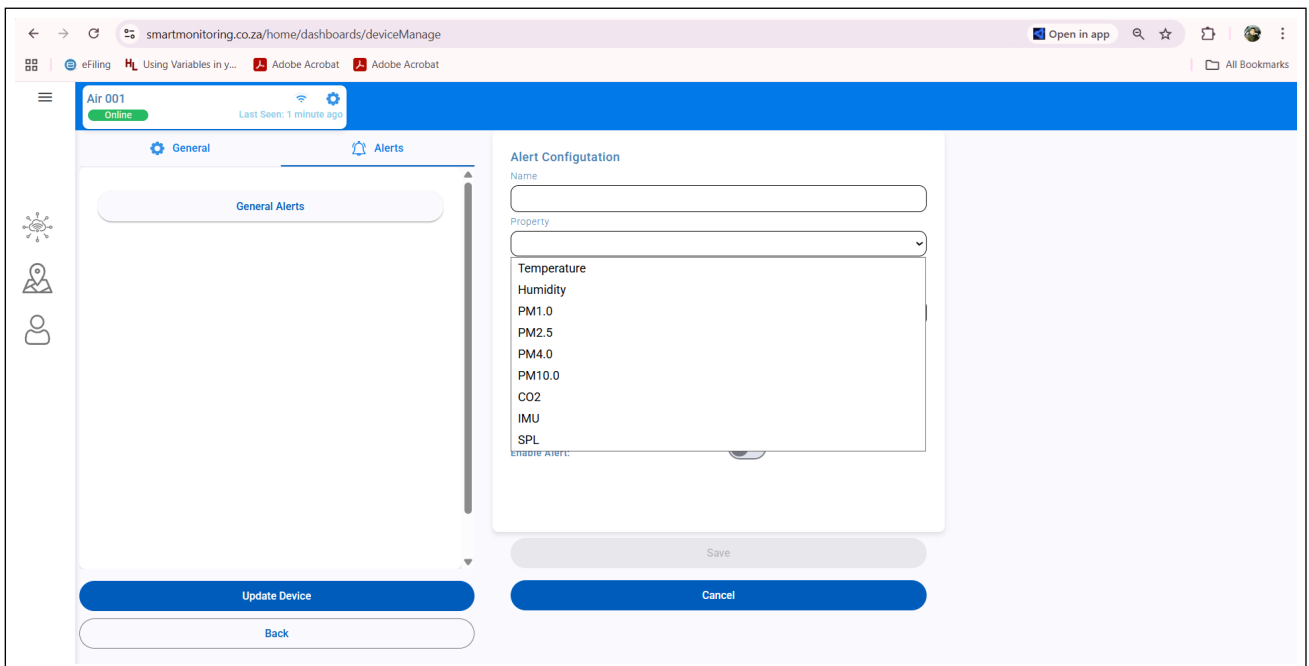
Sound Pressure Level (SPL) measurement shown in dBA

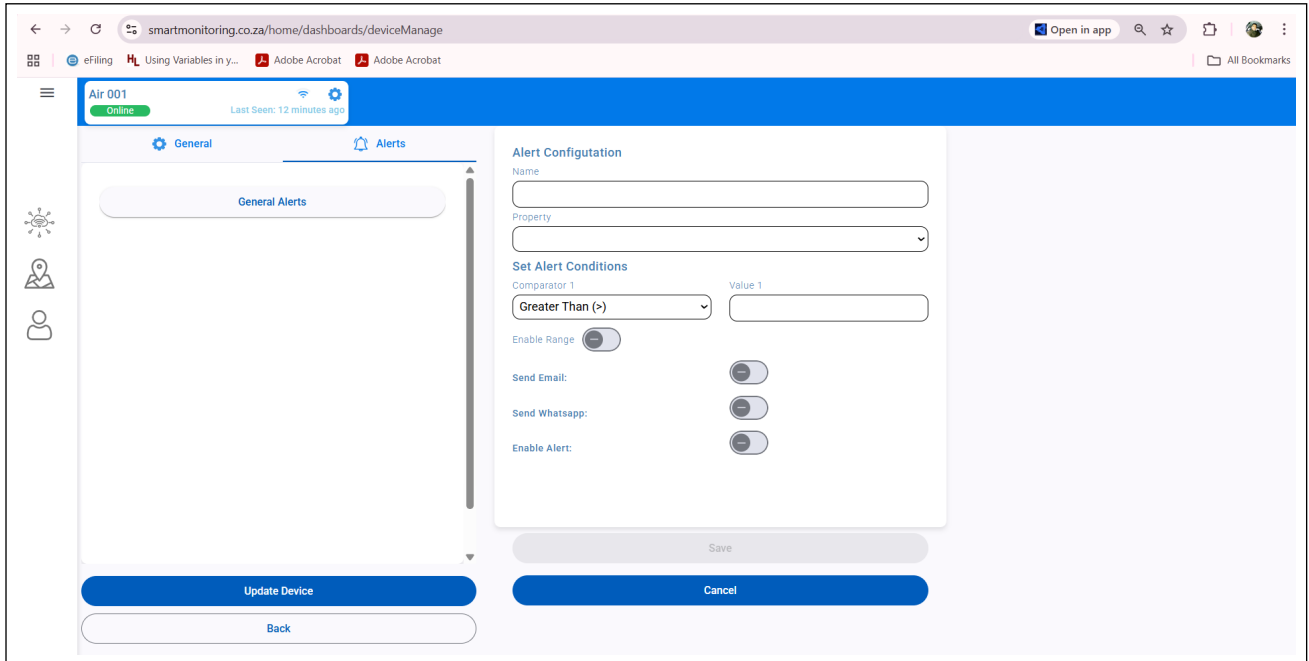


Temperature and Humidity Measurement



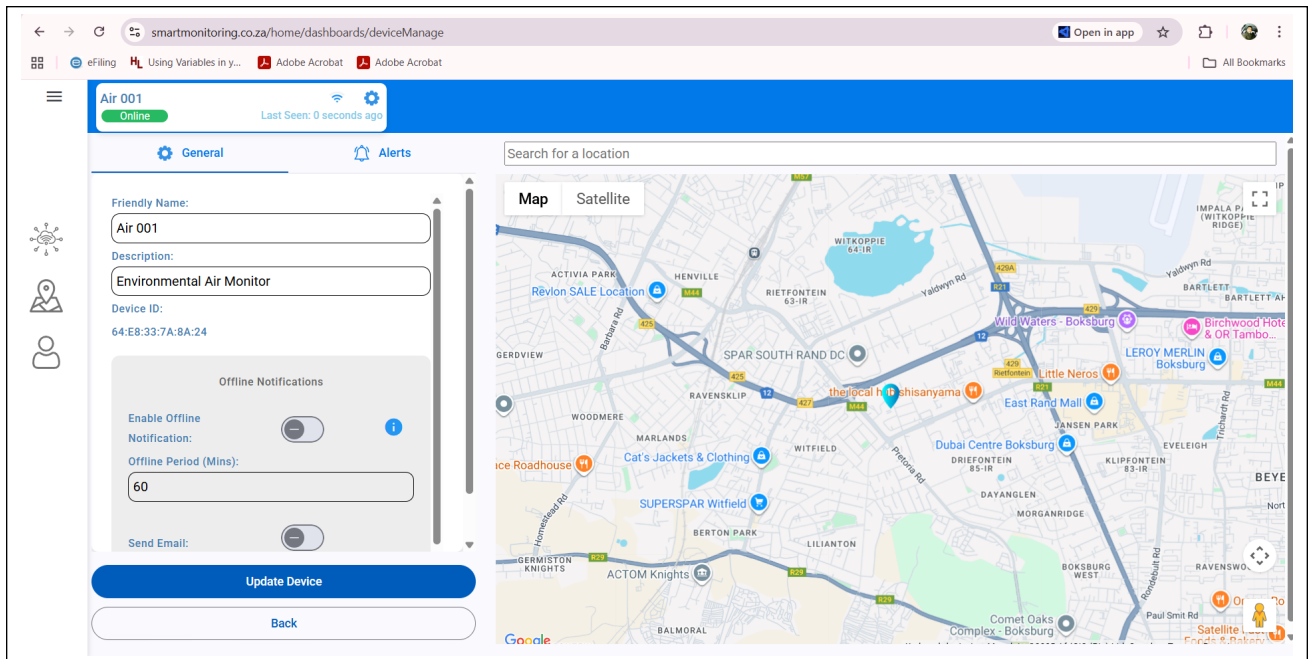
The user is also able to set alerts of the various fields, Alert Screen shots as shown below.



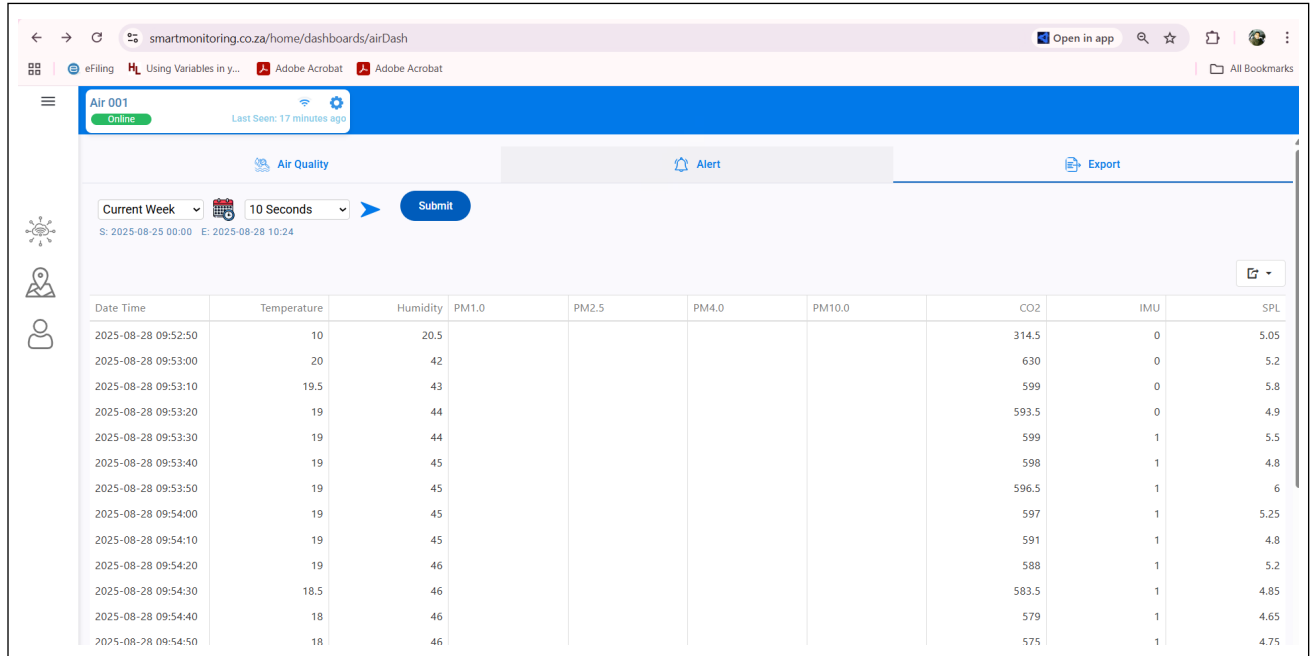
The screenshot shows the 'Alert Configuration' page for 'Air 001'. The page is divided into two main sections: 'General Alerts' on the left and 'Alert Configuration' on the right. The 'Alert Configuration' section includes fields for 'Name', 'Property', and 'Set Alert Conditions'. The 'Set Alert Conditions' section has a 'Comparator 1' dropdown set to 'Greater Than (>)', a 'Value 1' input field, and three toggle switches for 'Enable Range', 'Send Email', 'Send Whatsapp', and 'Enable Alert'. At the bottom of the 'Alert Configuration' section are 'Save' and 'Cancel' buttons. The 'General Alerts' section has an 'Update Device' button and a 'Back' button.

The user is also able to set their location which is shown on the Map Below:



The screenshot shows the 'Location Selection' page for 'Air 001'. The page is divided into two main sections: 'General' on the left and 'Map' on the right. The 'General' section includes fields for 'Friendly Name' (set to 'Air 001'), 'Description' (set to 'Environmental Air Monitor'), and 'Device ID' (set to '64:E8:33:7A:8A:24'). Below these fields are 'Offline Notifications' settings, including 'Enable Offline Notification' (toggle), 'Offline Period (Mins)' (set to 60), and 'Send Email' (toggle). At the bottom of the 'General' section are 'Update Device' and 'Back' buttons. The 'Map' section shows a Google Map of Johannesburg with a search bar at the top. The map displays various locations and landmarks, including 'WITKOPPIE', 'SPAR SOUTH RAND DC', 'Dubai Centre Boksburg', and 'Comet Oaks Complex - Boksburg'.

Save values can be exported from the Smart Monitoring Database to Excel (CSV format) at selectable intervals set in the Webserver, this is shown below.

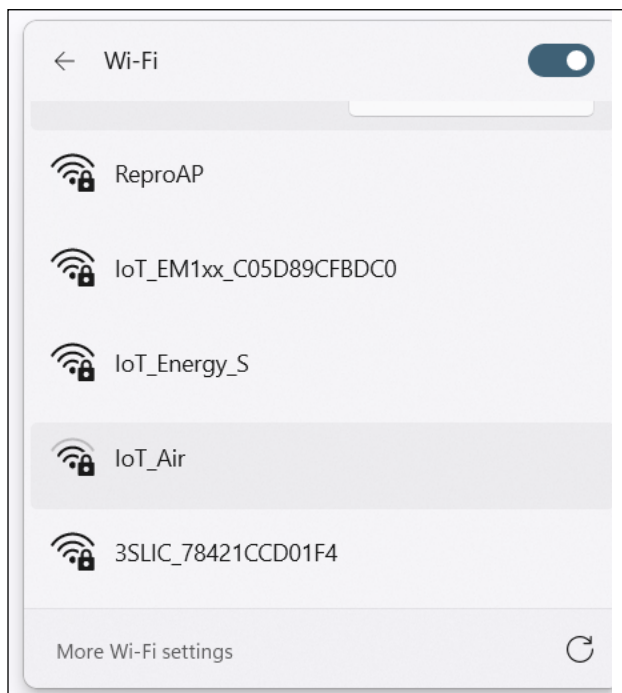


Date Time	Temperature	Humidity	PM1.0	PM2.5	PM4.0	PM10.0	CO2	IMU	SPL
2025-08-28 09:52:50	10	20.5					314.5	0	5.05
2025-08-28 09:53:00	20	42					630	0	5.2
2025-08-28 09:53:10	19.5	43					599	0	5.8
2025-08-28 09:53:20	19	44					593.5	0	4.9
2025-08-28 09:53:30	19	44					599	1	5.5
2025-08-28 09:53:40	19	45					598	1	4.8
2025-08-28 09:53:50	19	45					596.5	1	6
2025-08-28 09:54:00	19	45					597	1	5.25
2025-08-28 09:54:10	19	45					591	1	4.8
2025-08-28 09:54:20	19	46					588	1	5.2
2025-08-28 09:54:30	18.5	46					583.5	1	4.85
2025-08-28 09:54:40	18	46					579	1	4.65
2025-08-28 09:54:50	18	46					575	1	4.75

The user is also able to register for Alerts via WhatsApp and email.

13. SETTING UP THE WEBSERVER

The user needs to search for the AIR IOT's SSID are shown below.



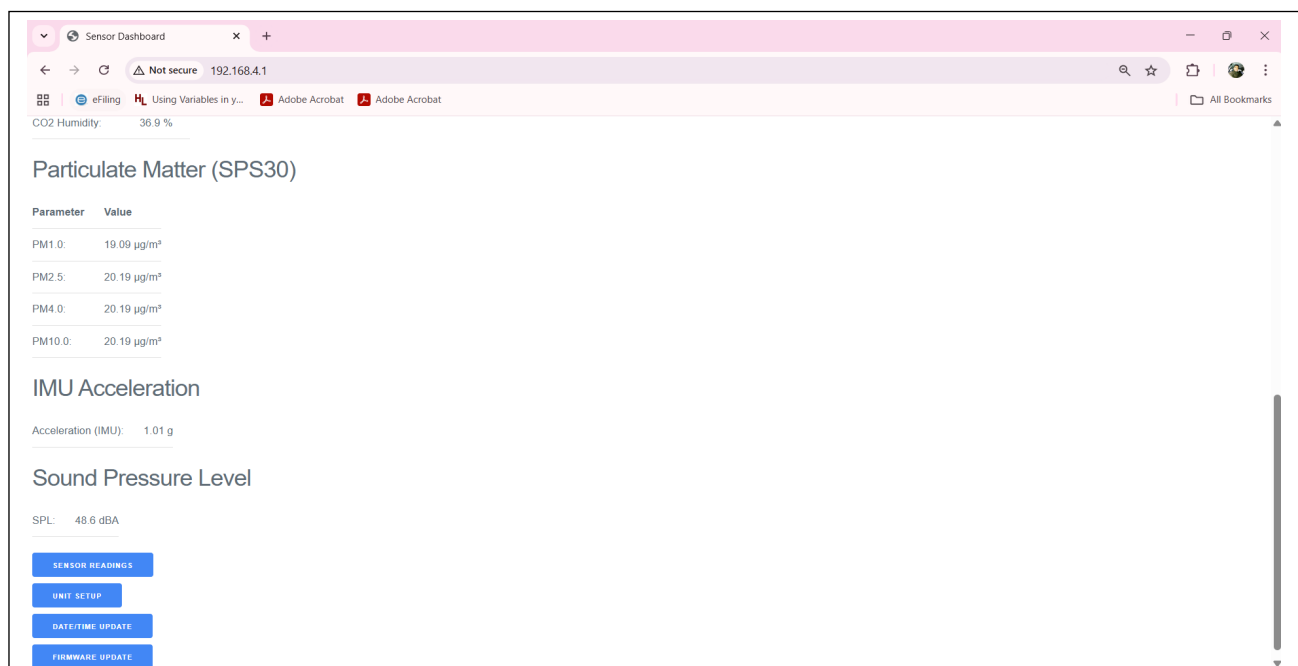
Once the user has “clicked” on the device to “pair” with it, the user needs to fill in the password of “repro123” to connect to the device.



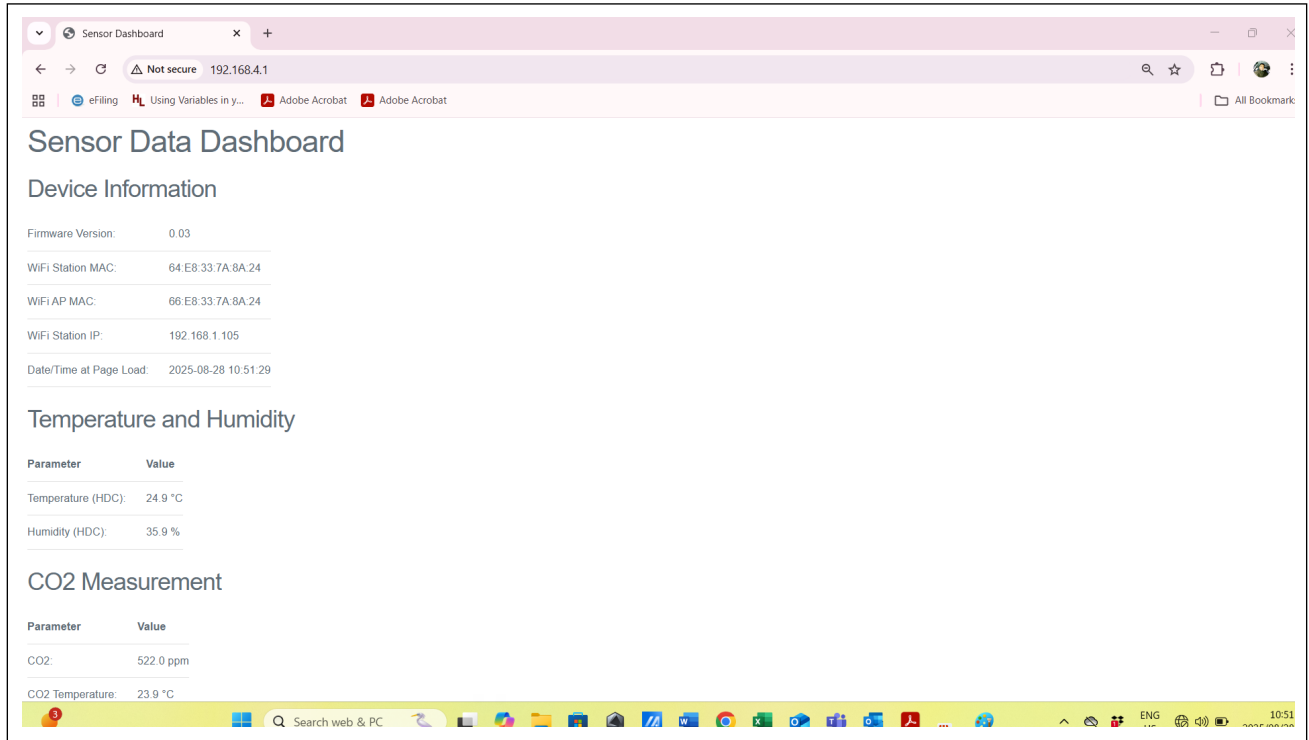
The user then needs to open a web browser and enter 192.168.4.1 in the URL's address. This will bring up the index page as shown below.

The index page consists of the following tabs.

- Sensor Readings
- Unit Setup
- Date/Time Update
- Firmware Update



Once the User has clicked the ‘Sensor Reading’ tab, all the Sensor information will be shown below from all sensors connected.



The screenshot shows a web browser window displaying the 'Sensor Data Dashboard' at the URL 192.168.4.1. The dashboard is titled 'Sensor Data Dashboard' and contains three main sections: 'Device Information', 'Temperature and Humidity', and 'CO2 Measurement'.

Device Information

Firmware Version:	0.03
WiFi Station MAC:	64 E8 33 7A 8A 24
WiFi AP MAC:	66 E8 33 7A 8A 24
WiFi Station IP:	192.168.1.105
Date/Time at Page Load:	2025-08-28 10:51:29

Temperature and Humidity

Parameter	Value
Temperature (HDC):	24.9 °C
Humidity (HDC):	35.9 %

CO2 Measurement

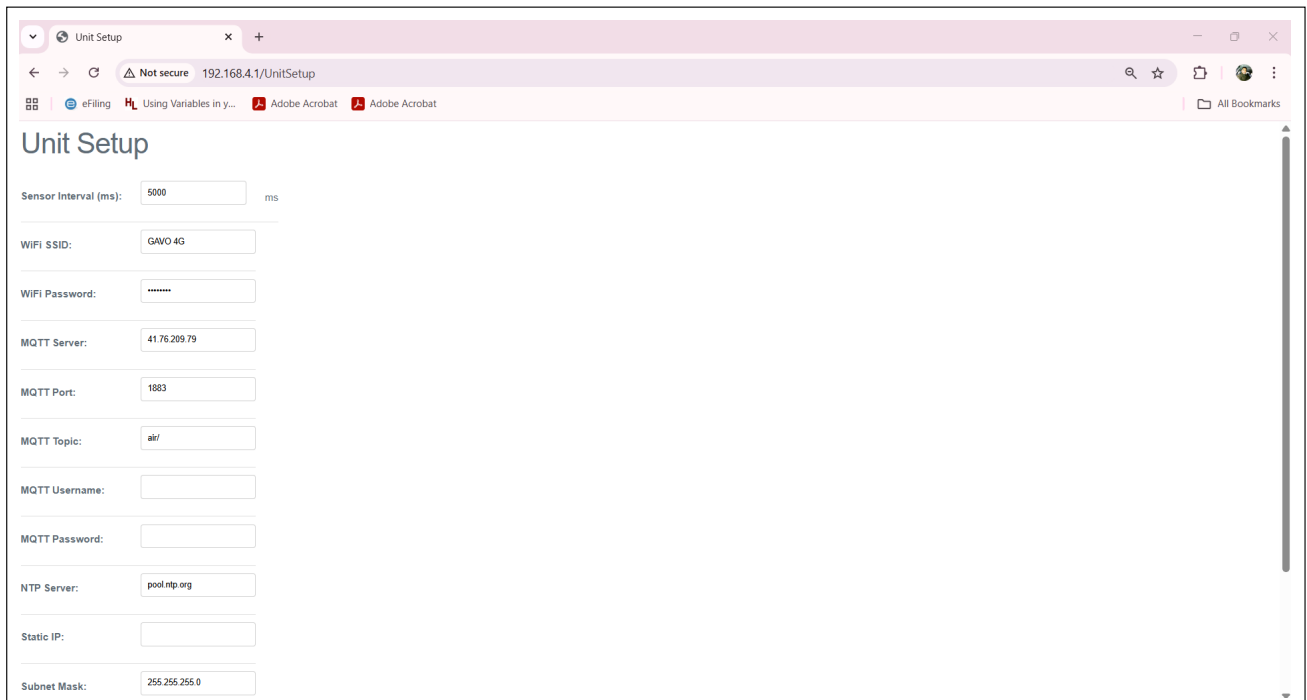
Parameter	Value
CO2:	522.0 ppm
CO2 Temperature:	23.9 °C

The browser window shows a 'Not secure' warning for the local IP address. The taskbar at the bottom indicates the system time is 10:51 and the language is set to ENG.

The Setup Tab is the where the user will enter their SSID and Password to connect to their Wi-Fi to enable the unit to push the data via MQTT to the Smart Monitoring servers.

The user can also use a different MQTT Server (from the default Smart Monitoring) and can enter a different IP Address for the MQTT Server, Username and password to connect to a different MQTT Broker and Server.

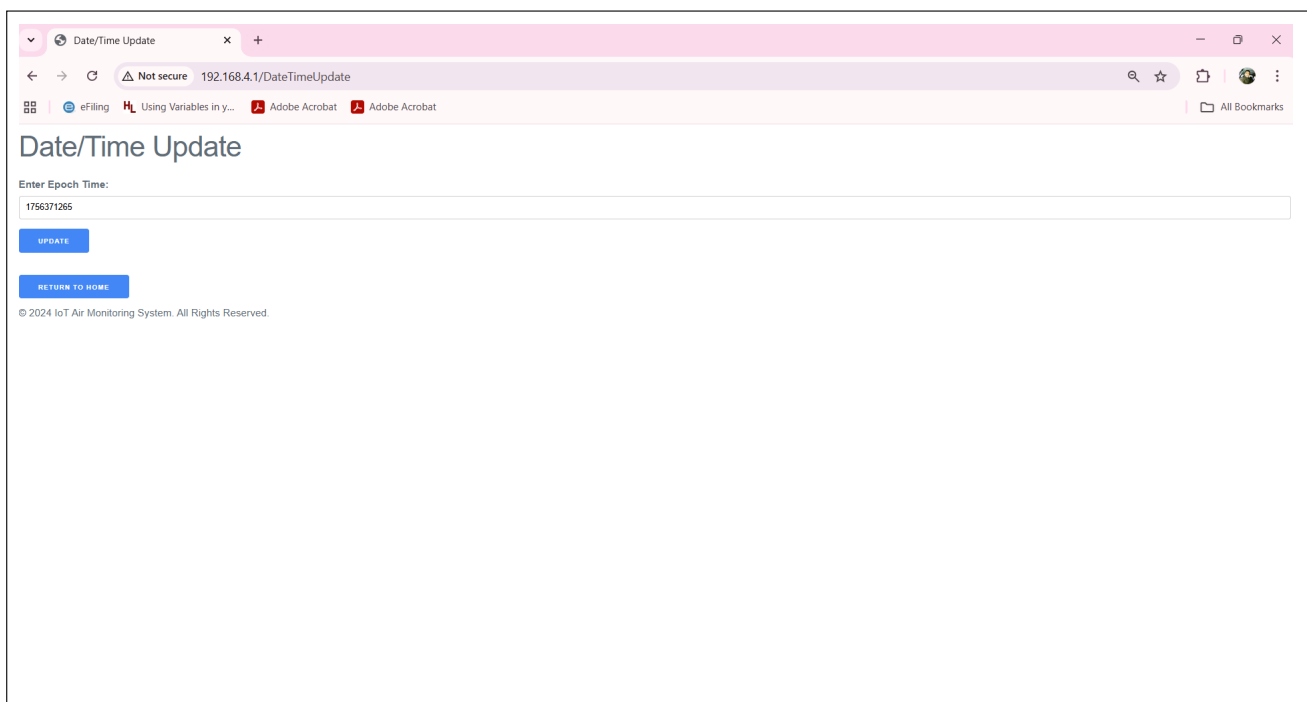
The user is also able to change the sampling rate from one second to 60-minute intervals. 60 seconds is the default value.



The screenshot shows the 'Unit Setup' web interface in a browser. The URL is 192.168.4.1/UnitSetup. The interface includes the following fields:

- Sensor Interval (ms): 5000 ms
- WiFi SSID: GAWO 4G
- WiFi Password: [Redacted]
- MQTT Server: 41.76.209.79
- MQTT Port: 1883
- MQTT Topic: air/
- MQTT Username: [Empty]
- MQTT Password: [Empty]
- NTP Server: pool.ntp.org
- Static IP: [Empty]
- Subnet Mask: 255.255.255.0

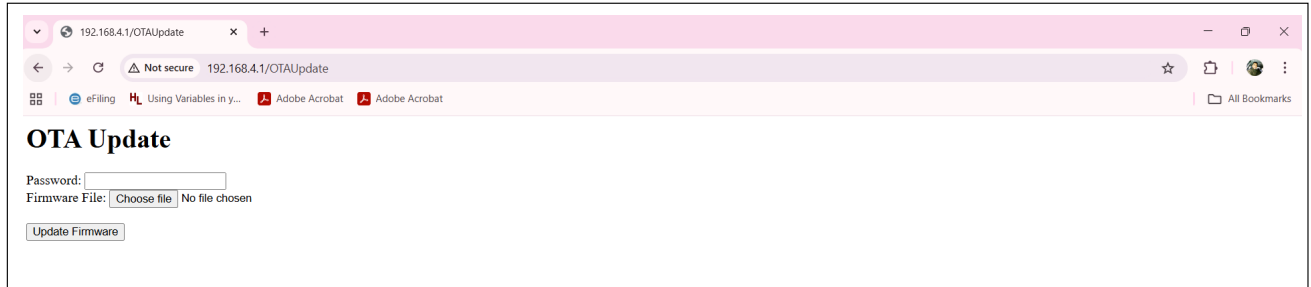
The Date/Time update tab is used to update the Date/Time, this is also automatically updated once the user has connected to Wi-Fi (internet) as this is automatically updated via the NTP Server.



The screenshot shows the 'Date/Time Update' web interface in a browser. The URL is 192.168.4.1/DateTimeUpdate. The interface includes the following elements:

- Enter Epoch Time: 1756371265
- UPDATE button
- RETURN TO HOME button
- Footer: © 2024 IoT Air Monitoring System. All Rights Reserved.

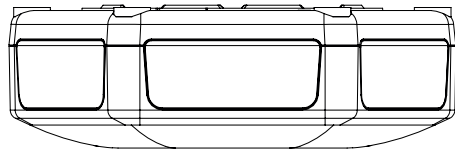
Firmware updates are done via the Firmware Update Tab whereby a “bin” file is automatically uploaded. This is password protected, the password of “9326” is entered to update the bin file.



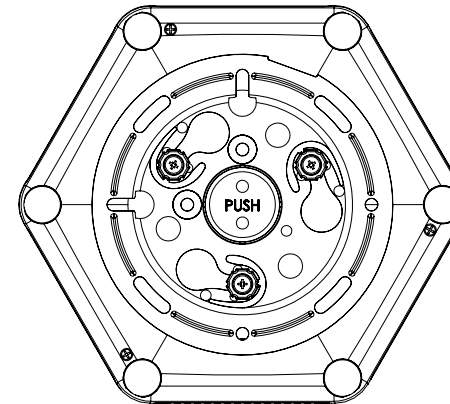
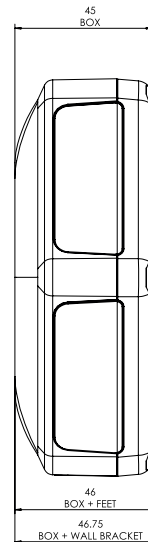
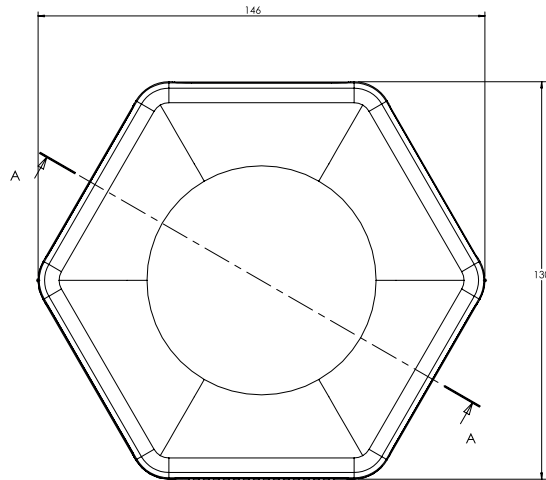
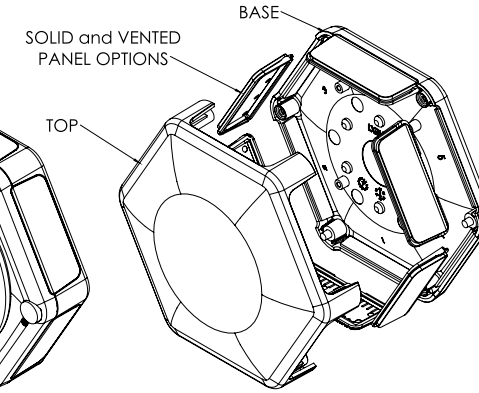
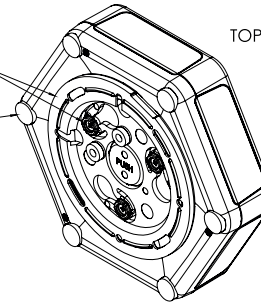
The screenshot shows a web browser window with the address bar displaying "192.168.4.1/OTAUpdate". The page title is "OTA Update". Below the title, there is a "Password:" label followed by a text input field. Below that, there is a "Firmware File:" label followed by a "Choose file" button and the text "No file chosen". At the bottom, there is an "Update Firmware" button.

14. MECHANICAL DRAWINGS

ASSEMBLY SHOWS BOTH:
RUBBER FEET AND BRACKET OPTION
NOT INCLUDED IN STANDARD PRODUCT



WALL MOUNT BRACKET
& MOUNTING NUTS
RUBBER FEET



 UNIT 14, SALIGNA PARK, 3 SALIGNA STREET, WITFIELD, BOXSBURG, 1459	NAME	DATE	TITLE:	REV	DESCRIPTION
	DRAWN	1/2025	2025/09/01	0	INITIAL RELEASE
	CHECKED				
	ENG APPR:				
	MEG APPR:				
	G.A.				
PLEASE NOTE: • DEBURR AND BREAK SHARP EDGES • ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED • DO NOT SCALE THE DRAWING			DRAWING NO. RS-MD-0215		
SHEET 1 OF 5 SCALE: 2:5			D		

