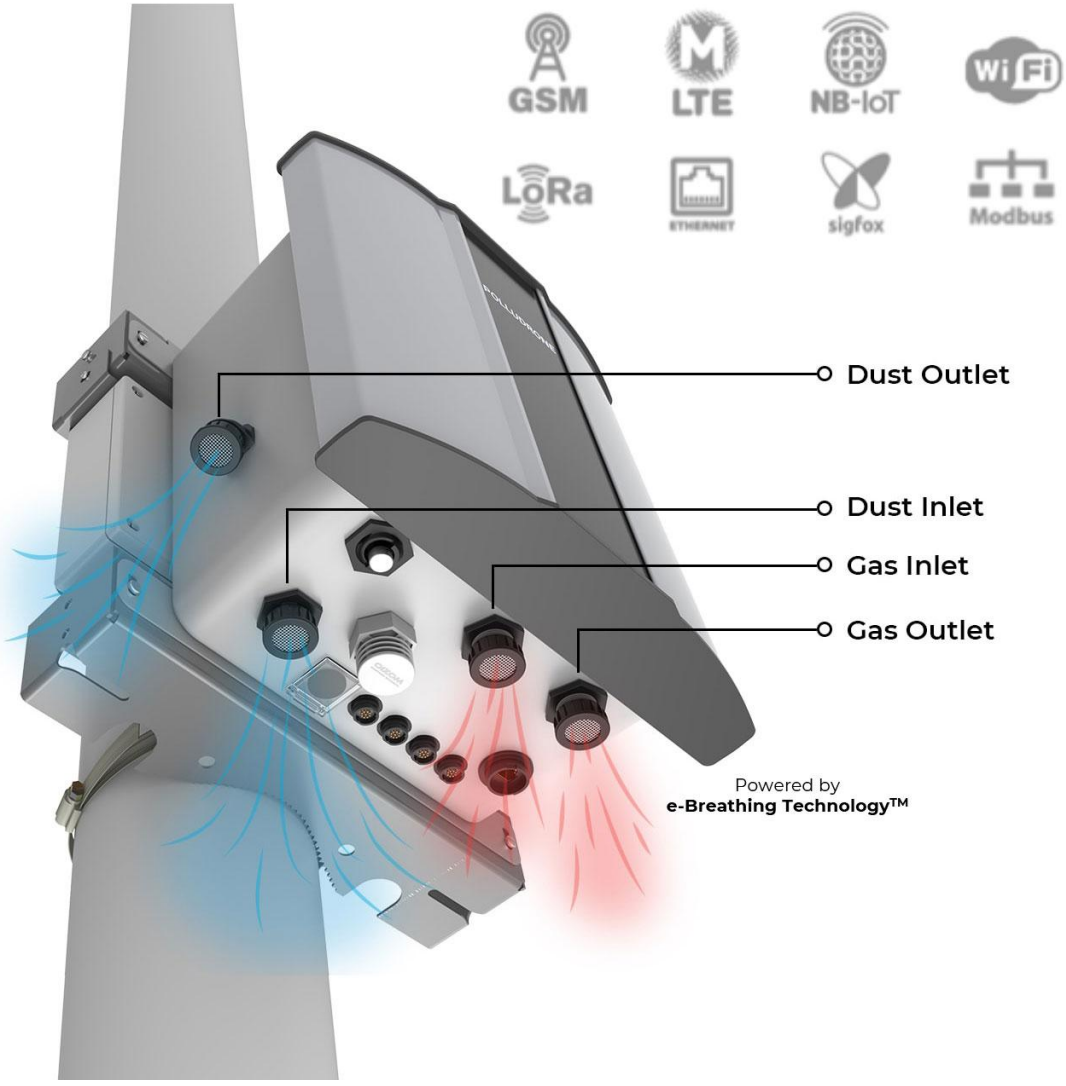
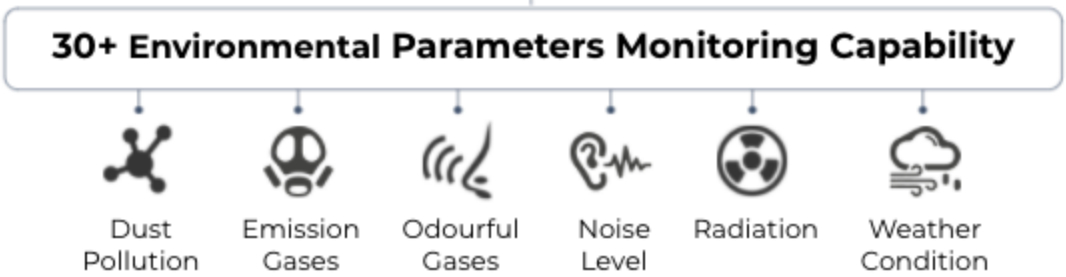
OIZOM™
REDEFINING RESOURCES

User Manual





Document ID : RAD21UM001

ABOUT THIS DOCUMENT

This document is a comprehensive USER manual for all types of Ambient Environment Monitoring Solutions by Oizom. Please refer to Section-2 carefully to identify your product variant for further details.

REVISION HISTORY

Revision	Date	Created	Approved	Comments
1.0	26/07/2021	AK	SP	All details updated as per new design version V6
2.0	09/09/2021	AK	SP	Added MODBUS and Relay cable specifications
3.0	27/09/2021	AK	SP	Modified sensor life in table 9.1
4.0	22/10/2021	AK	SP	Updated resolution and min. Detection in table 3.1
5.0	07/02/2022	AK	SP	Changed Power rating for Solar Panel
6.0	31/08/2022	BN	SP	Diagrams & User Flow updated.

Note: **Please do not install the unit without performing a bench test.**

Refer Section 5 for Bench Test (Initial Setup).

Table of Contents

1. Introduction

All 4 flagship products will monitor real-time environmental data with high precision and accuracy. This manual will guide you in installation and help you understand the functioning of these products.

The solution offers a wide range of wired and wireless communication protocols to choose from. Its low powered electronics, use of Solar Panel for external power, and internal battery backup make it eco-friendly.

Engineered for accuracy, the aluminium alloy compact enclosure is weatherproof and tamper-proof. Such features make Oizom® an ideal choice for Ambient Environment Monitoring.

The data sent from the hardware is supported by Envizom™, a cloud analytics software. Envizom™ offers Real-time Data Modelling, Data Analytics, Automated Reports, Smart Notifications, Real-time Pollution Mapping, Air-quality Predictions, Pollution Source Finding, etc.

1.1 Product features

Real time data transfer
Data visualization and analytics on a real-time basis.

Theft resistance
Instant alert in case of any attempt of theft or vandalism

Multiple ways of data communication
More than 8 modes of communication (wired and wireless)

Battery backup
In case of power loss, 12 hours of battery backup

Patented Technology
Works on innovative e-breathing technology for higher data accuracy.

Solar Power compatible
Capable of running solar power

Retrofit Design
Plug and play design for ease of implementation

Compact
Light-weight and compact system installed at 12-15 feet (4-5 m) height.

Ultimate Durability
Made of high grade engineering material ,and composite polymers for long life.

Identity & Configuration
Each equipment carries its unique identity with geo-tagging through wireless configuration.

Weatherproof
IP66 grade enclosure for endurance against harsh weather conditions

Tamper Proof
Comes with a security system to avoid tampering / malfunction / sabotage

3-level Calibration
Factory calibration, Laboratory calibration in an ISO/IEC 17025 laboratory for zero & span gas and Colocation calibration with reference grade systems.

2. Know Your Product

Oizom® offers 'State of the Art' solutions for Environmental Monitoring. Using an accurate sensor system, Oizom® designs solutions keeping Flexibility, Scalability, and Durability as a prime focus. Oizom's Ambient Monitoring Solutions work on patented 'Active Monitoring Technology'. Based on the application, Oizom® offers Ambient Environmental Monitoring solutions.

Table 2.1 Product offerings

Product/ Variants	LITE	SMART	PRO	External Modules
POLLUDRONE® *Ambient Pollution Monitoring Solution*	$PM_{2.5}$, PM_{10}, CO_2, CO, Noise, Light, UV-Radiation, Temperature/Humidity	All offerings as per Polludrone® Lite + SO_2, NO, NO_2, O_3,	All offerings as per Polludrone® Smart + H_2S, PM_1, PM_{100}	Wind-speed & direction, Rainfall, Flood Monitor
DUSTROID® *Dust Monitoring Solution*	N.A.	PM_1, $PM_{2.5}$, PM_{10}, PM_{100}, Temperature, Humidity	All offerings as per Dustroid® Smart + Heated inlet to nullify effects of temperature & humidity	Wind-speed & direction, Rainfall, Ambient Noise
ODOSENSE® *Odour Monitoring Solution*	SO_2, H_2S, NH_3, Temperature, Humidity	All offerings as per Odosense® Lite + CH_3SH, TVOC Temperature, Humidity	All offerings as per Odosense® Smart + CH_2O, NO_2, Cl_2, Temperature, Humidity	Wind-speed & direction, Rainfall
WEATHERCOM® *Automatic Weather Station*	Wind Speed, Wind Direction, Rainfall, Light, UV Radiation, Temperature, Humidity, Pressure			Flood Monitor

All the hardware solution offerings are compatible with optional solar-powered operation with battery backup. All the solutions are compatible with different modes of data communication like GSM, Wifi, LoRa, Ethernet etc.

NOTE: For ease of usage, read Monitor/Device in this manual for your purchased product

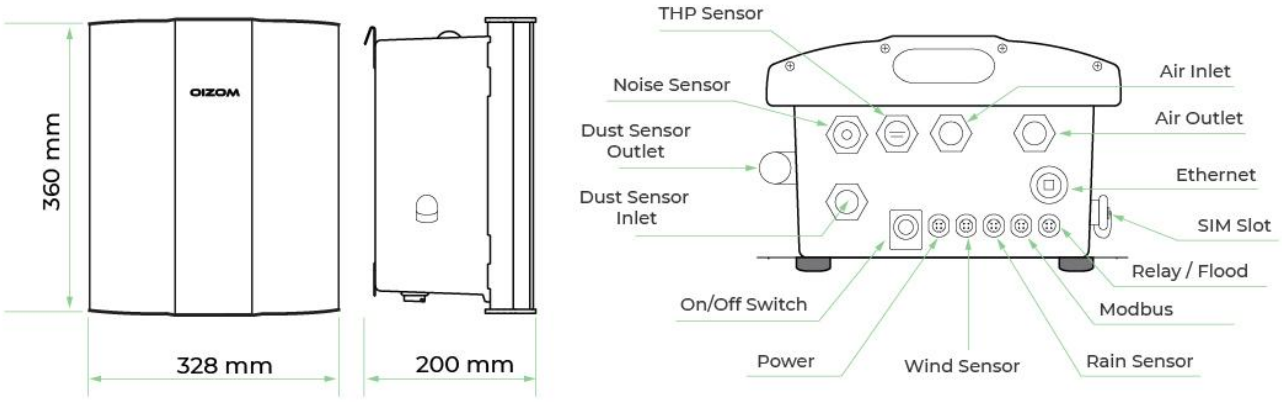


Figure 2.1 Schematic

Size (HxWxD)	360mm x 328mm x 200mm
Weight	7.2 kg (Device weight)
Material	Aluminum Magnesium Alloy, Mild-steel (With Powder Coating), FRP
Certifications	CE, FCC Certified, PTCRB Certified Communication Module

* Battery backup varies with connectivity, parameters, data interval, etc.

3. Product Specifications

3.1 Sensor specifications

Multiple sensors can be integrated into the monitor for different environmental parameters. Below are the sensor specifications which Oizom® can offer as a solution. The solution provided to you may not have all the sensors mentioned below.

Table 3.1 Details of parameters offered

ID	Parameter	Range	Resolution	Min. Detection	Error / Drift	Working Principle
PM_1	Ultra Fine Particulate Matters with size less than 1µ	0-5000 µg/m3	0.1 µg/m3	1 µg/m3	Up to ±10%	Optical Particle Counter
$PM_{2.5}$	Suspended Particulate Matters with size less than 2.5µ					
PM_{10}	Suspended Particulate Matters with size less than 10µ					
PM_{100}	Total Suspended Particulates (TSP)	0-30000 µg/m^3				
CO_2	Carbon Dioxide	Up to 5000 ppm	1 ppm	20 ppm	< ±5 ppm / Year	NDIR
CO	Carbon Monoxide	0-100 ppm	10 ppb	100 ppb	< ±100 ppb / Year	Electrochemical
SO_2	Sulfur Dioxide	0-20 ppm	1 ppb	10 ppb	< ±20 ppb / Year	Electrochemical
NO	Nitric Oxide	0-20 ppm	1 ppb	10 ppb	< ±50 ppb / Year	Electrochemical
NO_2	Nitrogen Dioxide	0-20 ppm	1 ppb	10 ppb	< ±20 ppb / Year	Electrochemical

O_3	Ozone	0-20 ppm	1 ppb	10 ppb	< ±20 ppb / Year	Electrochemical
H_2S	Hydrogen Sulfide	0-100 ppm	1 ppb	10 ppb	< ±100 ppb / Year	Electrochemical
NH_3	Ammonia	0-100 ppm	10 ppb	100 ppb	2% / Month	Electrochemical
CH_2O	Formaldehyde	0-10 ppm	1 ppb	50 ppb	2% / Month	Electrochemical
CH_3SH	Methyl Mercaptan	0-10 ppm	10 ppb	100 ppb	2% / Month	Electrochemical
Cl_2	Chlorine	0-20 ppm	10 ppb	100 ppb	2% /Month	Electrochemical
TVOC	Total Volatile Organic Compounds	0-20 ppm	1 ppb	5 ppb	N.A.	PID
Ns	Ambient Noise	Upto 140 dB	1 dB	30 dB	2% / Year	Capacitance
Li	Light Intensity	Up to 1,00,000 Lux	1 Lux	1 Lux	N.A.	Photoconductivity
UV	UV Radiation (0-12 UVI)	0.1-100,000 uW/cm2	0.1 uW/cm2	0.1 uW/cm2	N.A.	Photoconductivity
Lv	Visible Light Intensity	Up to 5000 Lux	0.1 Lux	0.1 Lux	N.A.	Photoconductivity
Temp	Temperature	-20 °C to +85 °C	0.01 °C	-20 °C	N.A.	Solid State Semiconductor Sensing
Hum	Humidity	Up to 100% Rh	0.10%	0.10%	N.A.	Solid state semiconductor sensing
Bmp	Barometric Pressure	300-1100 hPa	0.18 Pa	300 hPa	±1.0 hPa / Year	Solid state semiconductor sensing
Ws	Wind Speed	0-40 m/s	0.1 m/s	0.1 m/s	N. A.	Ultrasonic
Wd	Wind Direction	0-359°	1°	1°	N. A.	Ultrasonic
Fl	Flood Monitoring	1-765 cm	1 cm	1 cm	N. A.	Ultrasonic
Rm	Rainfall Monitoring	N.A.	0.5 mm	0.5 mm	N. A.	Tipping Bucket

3.2 Technical Specifications

Table 3.2 Operating Specifications

Processor	Quad-Core ARM Cortex A-72
Memory	2GB RAM, 8GB eMMC ROM
Internal Storage	Upto 3 months
Device Interface	On-device Software / API
Operating Humidity	0-90% (IEC 61010-1:2010, AMD1:2016)
Operating Temperature	-20 °C to +60 °C (IEC 61010-1:2010, AMD1:2016)

Table 3.3 Power specifications

Avg. Power Consumption	Maximum 5 Watt (Actual consumption depends upon the number of parameters)
Power Input Options	AC Power: 110-230VAC 50-60Hz Solar Power: 60Watt Monocrystalline Solar Panel (Check Table 3.3.1 for recommended specifications)
PSU Specs	24V, 2Amps output from either of the power inputs
Battery Backup Time	Up to 12 Hours
Battery Specs	LiFePO4 battery cell with rated voltage 12.8V Capacity 6Ah

Notes:
- For Solar + AC Power, do consider the above-mentioned ratings respectively.
- Minimum Voltage Required Over Solar Panel system: 24V DC
- During standby mode monitor consumes up to 5 watts of power.
- Power consumption may differ as per your sensor parameter configuration.
- A Lithium Iron Phosphate (LiFePO4) battery cell with a rated voltage of 12.8 V and a capacity of 6Ah provides a backup of 12 hours.

Table 3.3.1 Recommended solar panel specifications

Open Circuit Voltage	28 V
Short Circuit Current	1.85 Amp
Voltage at Max Peak Power	24.96 V
Current at Max Peak Power	1.6 Amp

Table 3.4 Communication specifications

Data Interval	5-30 minutes (configurable)
Data-push Protocol	HTTP post request to host-server
Data-pull	HTTP request on device IP
Firmware Updates	Over-The-Air Firmware Update
Standby Connectivity	GSM (2G/3G/4G) for remote diagnosis, FOTA updates and cloud calibration

Table 3.5 Communication protocols

Communication	Connectivity	Specification
Wireless	GSM	Global 2G/3G/4G
	LORA	868 MHz, 915 MHz
	LTE	CAT-M1
	NB-IoT	CAT-NB1
	Sigfox	868 to 869 MHz, 902 to 928 MHz
	Wifi	802.11 b/g/n
Wired	Ethernet	10BaseT/100BaseTX
	Relay	2 Channel
	Modbus	RS485 RTU/TCP

4. Hardware Assembling

4.1 Unboxing

Unbox the package and take out the device and its accessory tray. During unboxing make sure the mentioned arrow on the packaging should point upwards .

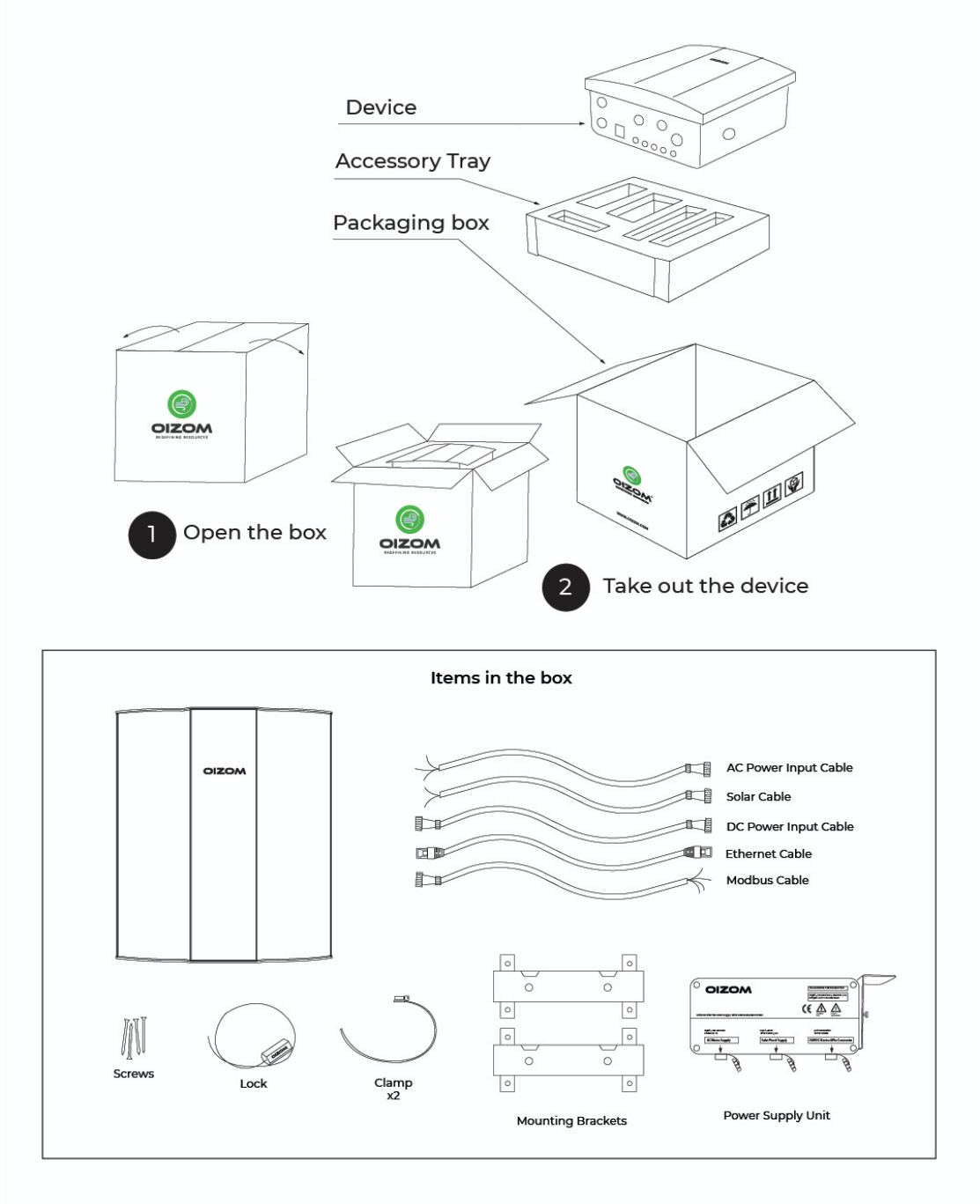


Figure 4.1 Unboxing the package

4.2 Product identification

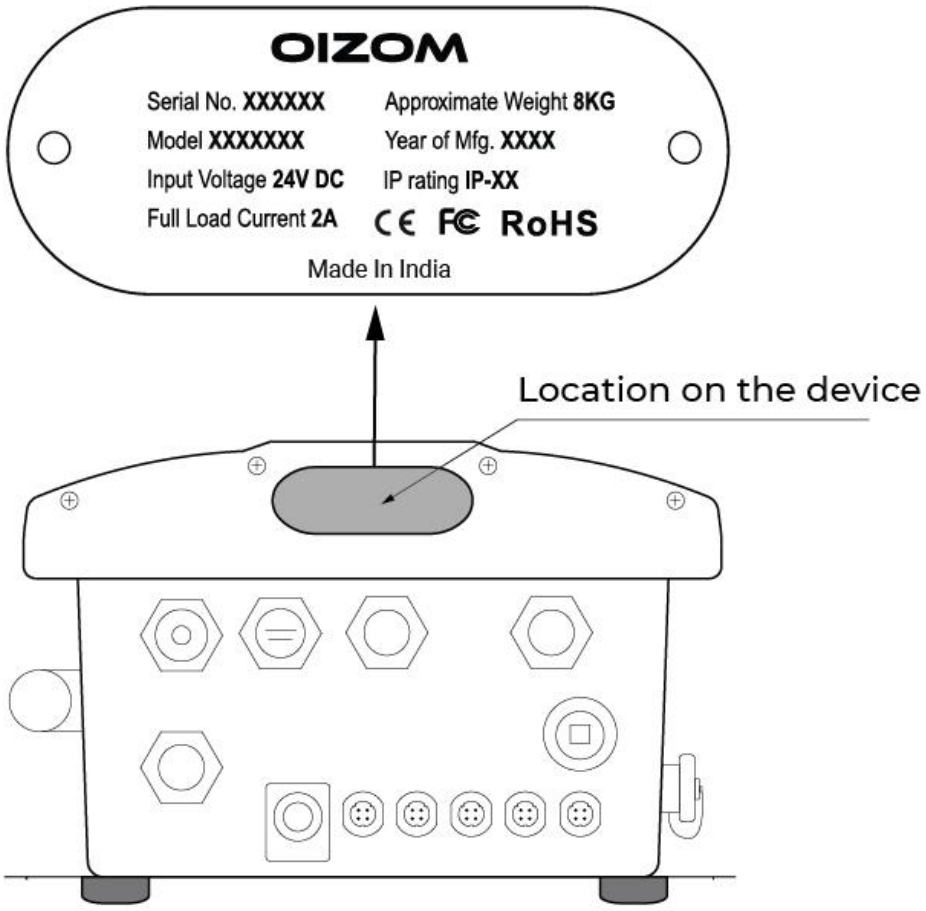


Figure 4.2 Product identification

Every product is assigned a unique serial number before it is dispatched from the facility. This unique serial number can be found on the nameplate along with information about the product name, part number, power rating and certifications. The unique serial number is very important and becomes crucial while communicating for any kind of support.

4.3 Components

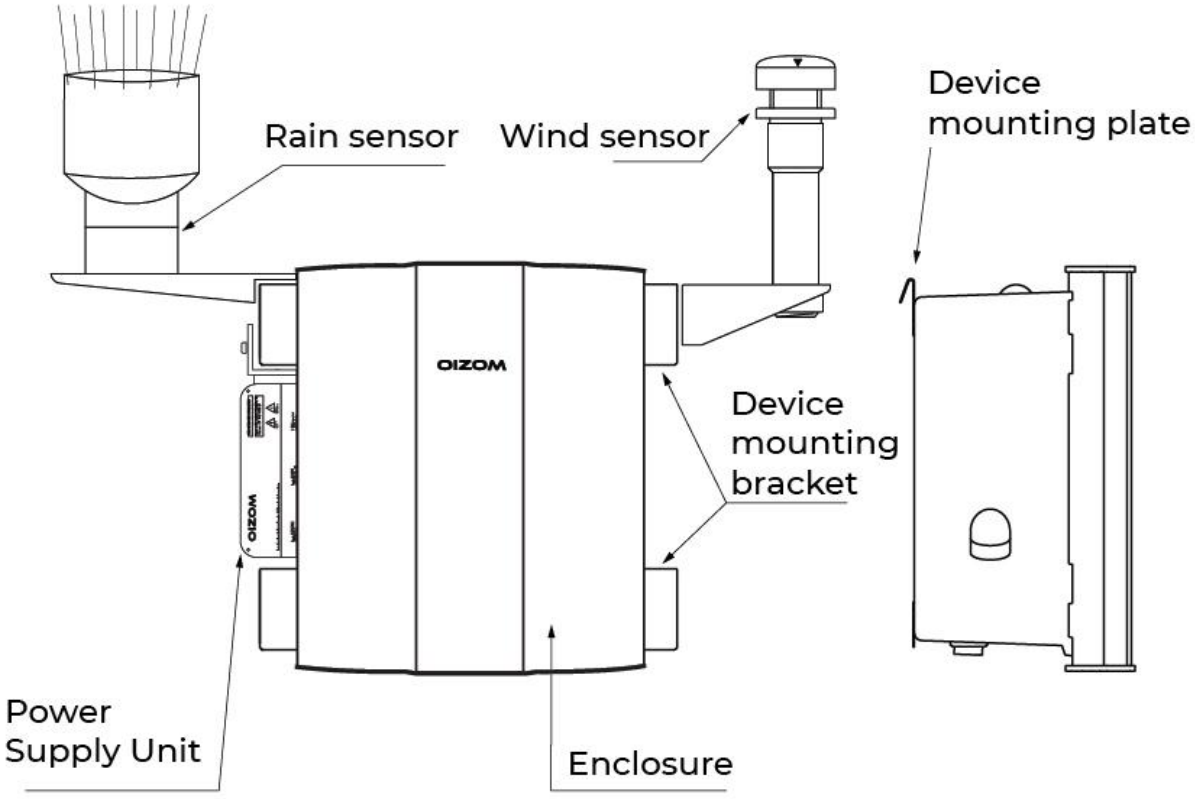


Figure 4.1 Components

4.3.1 Enclosure

The enclosure is robust and compact in size which makes it compatible with pole and wall installations. It is a combination of aluminium-magnesium alloy and industrial-grade FRP non-corrosive type enclosure. All products are offered in this single-sized enclosure:

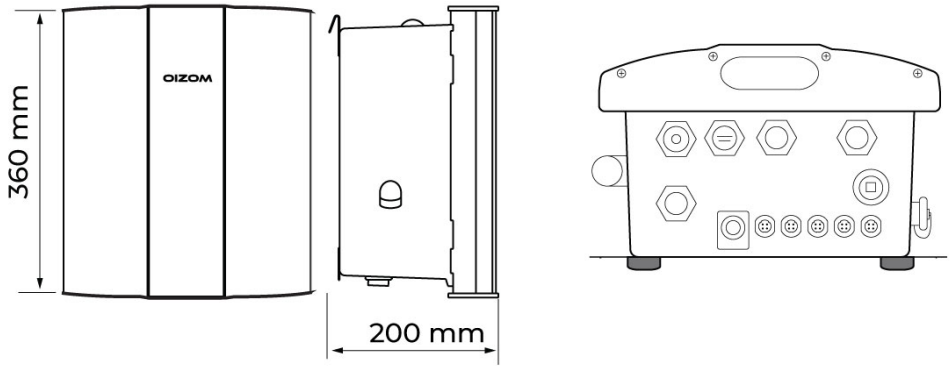


Figure 4.2 Enclosure

4.3.2 Connectors

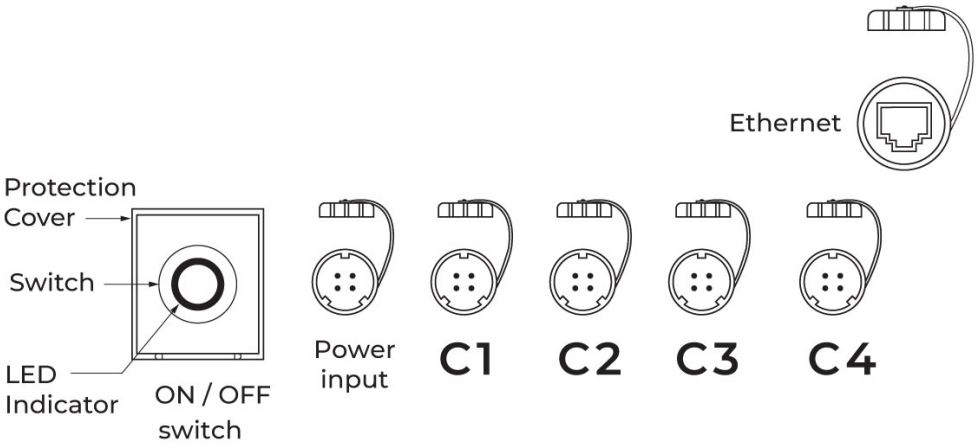


Figure 4.3 Schematic of connectors

All connectors attached to the monitor are covered with waterproof caps.
The dedicated connectors are as per following table:

Connectors	Purpose
Power Input	DC power cable from PSU
C1	Input cable from Wind Sensor
C2	Input cable from Rain Sensor
C3	Output cables for MODBUS
C4	Output cable for 2 Channel Relay / Input cable from Flood Sensor (as per Cable Tag)

4.3.3 Power Supply Unit (PSU)

To provide power supply to the monitor consisting of SMPS with a specification of 24 V, 2 Amps output from either of the power inputs.

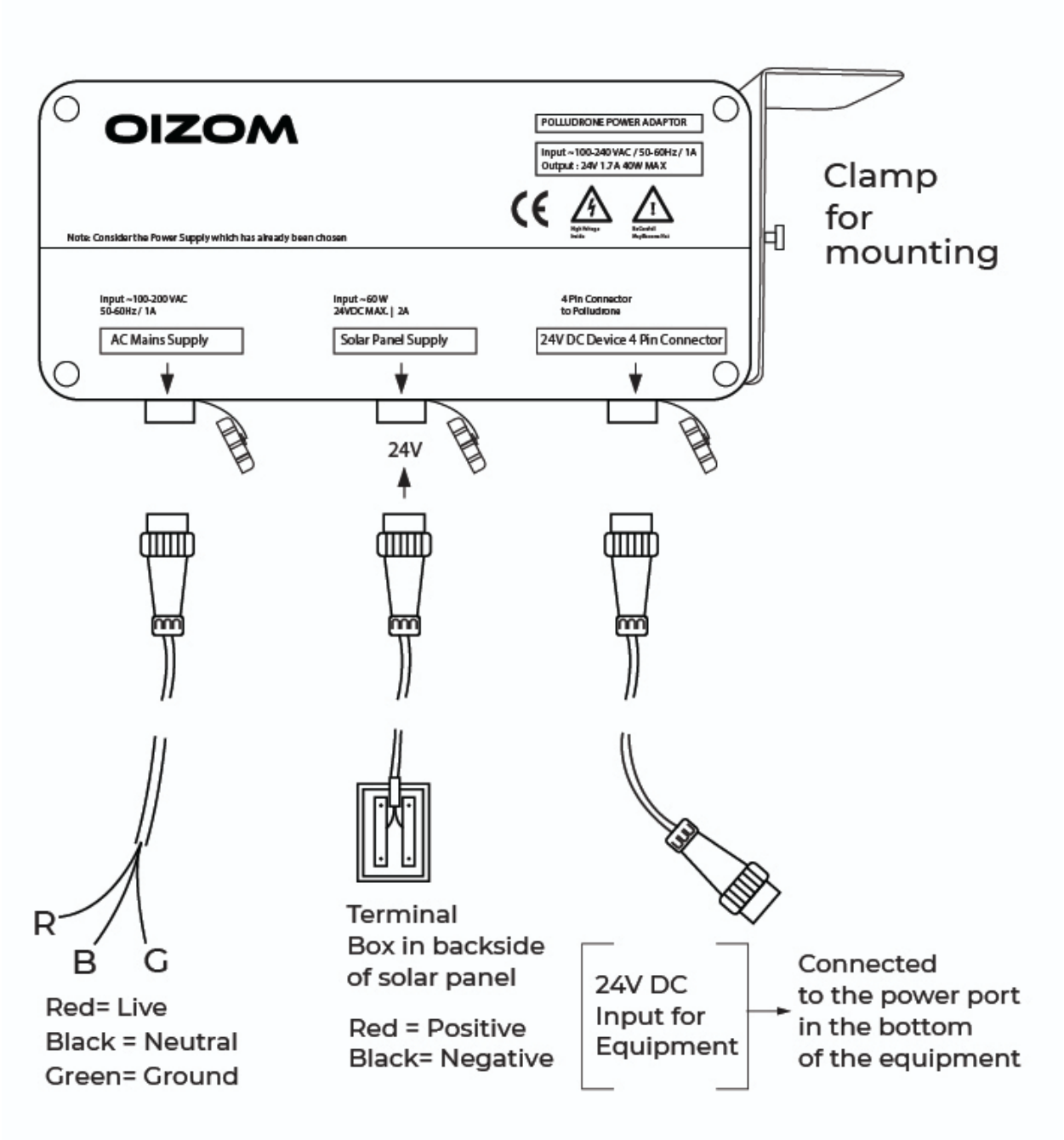


Figure 4.4 Schematic of PSU

4.3.4 Cable

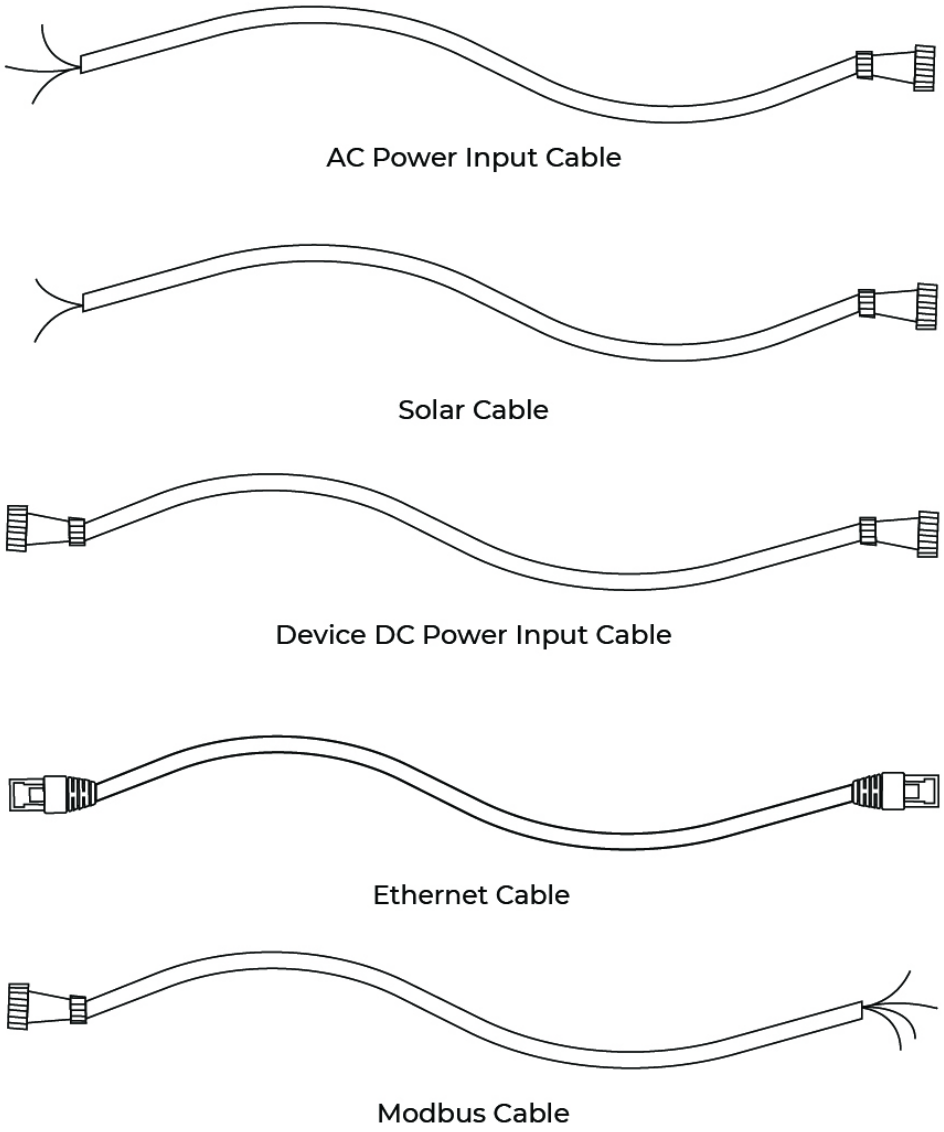


Figure 4.5 Schematic of cables

To connect AC mains, solar panel and accessories with the power adaptor & device, first check for the labelled tags on the cable.

4.3.5 Clamp & Mounting Bracket

Device mounting brackets are fixed on the pole using hose clamps. In case of wall mounting, these brackets are fixed on walls. The hose clamps and the device mounting brackets can be found separately in the package.

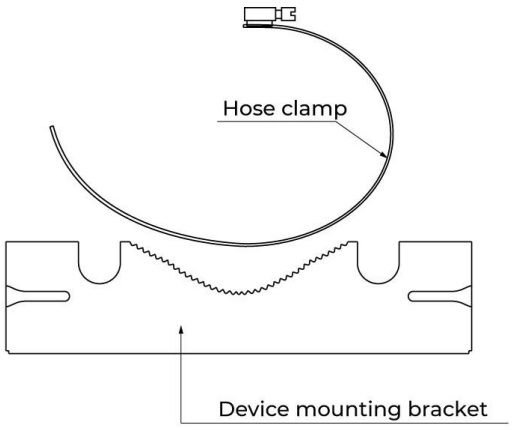


Figure 4.6 Schematic of device mounting bracket and clamps

4.3.6 Device mounting Plate

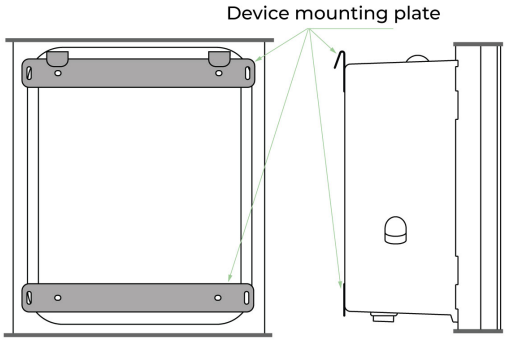


Figure 4.7 Schematic of device mounting plate on the enclosure

With the support of this plate, the monitor can be installed on the device mounting brackets. The device mounting plate can be found attached to the back.

4.3.7 Rain Sensor (if applicable)

Rainfall measurement works on the principle of tipping bucket and is provided with mounting attachment.

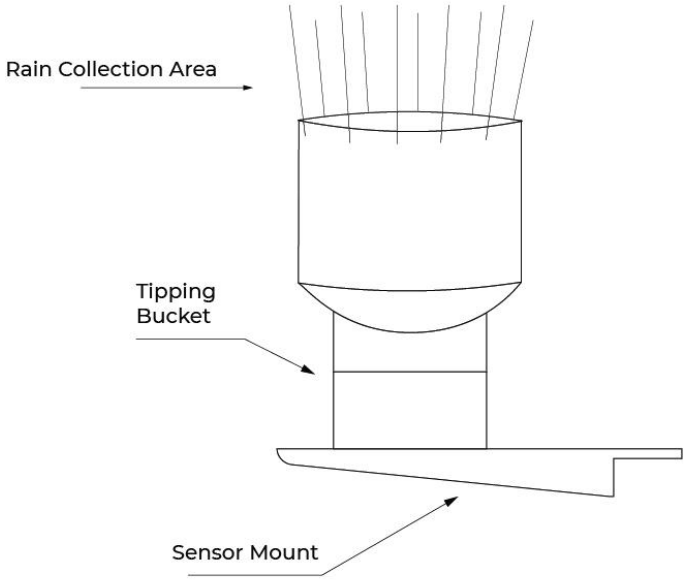


Figure 4.8 Schematic of rain sensor and mount

3.3.8 Wind Sensor (if applicable)

Wind speed & direction measurement works on the principle of ultrasonic sensing and the sensor is provided with mounting attachment. The 🔼 shown at the top of the sensor needs to be aligned accurately, with the North Direction using a compass.

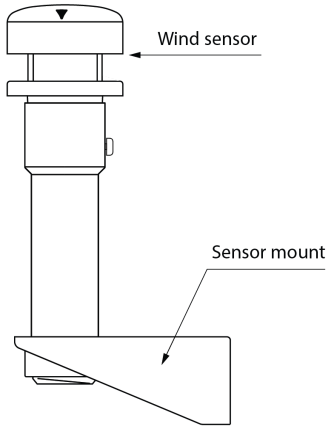


Figure 4.9 Schematic of wind sensor and mount

4.3.9 Flood Sensor (if applicable)

Flood measurement works on the principle of ultrasonic sensing and is provided with mounting attachment.

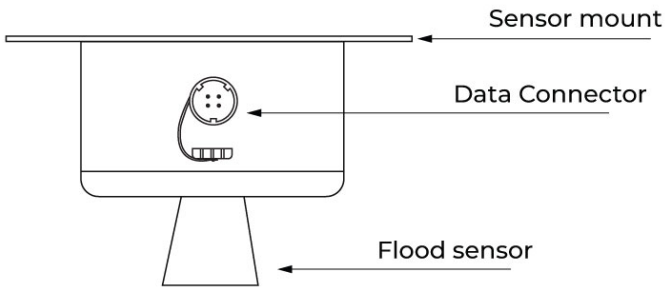


Figure 4.10 Schematic of rain sensor and mount

4.3.10 Solar Panel (if applicable)

Monocrystal solar panel with power rating of 60 Watt, 24 Volts with mounting attachment. (Refer Table 3.3.1 for recommended solar panel specifications)

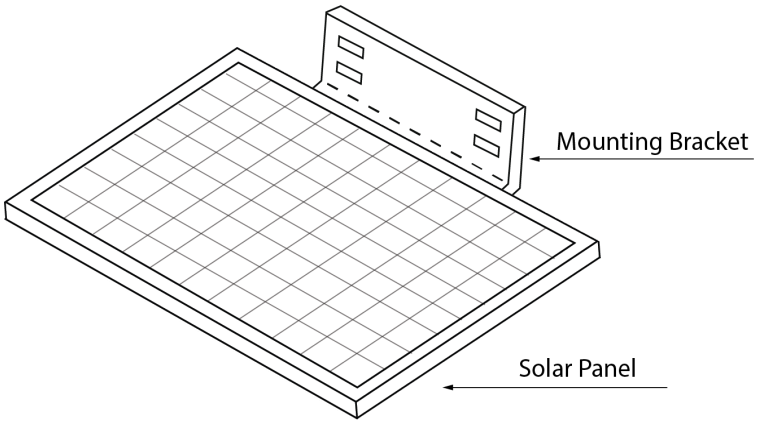


Figure 4.11 Schematic of solar panel

5. Bench Test (Initial Setup)

All Oizom® products are empowered with wireless and wired communication protocols. Multiple communication networks can be easily handled simultaneously. So WiFi, GSM, ethernet & MODBUS can work together with the smart network management protocol.
The devices are compatible with fallback 2G, 3G and 4G networks along with LTE. There are dedicated connectors now for Relay Output & MODBUS. Also, a Mini PCIe port is available on the device for a customized communication module.

Please open the Instrument & connect Battery Cable onto 'Battery' Connector at top left of Motherboard before proceeding.

Note: *The following ports need to be whitelisted over the firewall for connection over GSM/WiFi/Ethernet:-*
Device Management: 19001
Data Collection: 80, 443, 3002

An on-device data visualization tool helps to configure the network.
To access the on-device data visualization tool, the monitor should be powered ON. There will be two conditions under which the monitor will be:

Condition A
The monitor is not connected with any existing WiFi or Ethernet network.
Under this condition, the monitor will be a hotspot. Any smart device can hence be connected to the monitor. To establish connectivity, follow the steps:

Step 1 Connect the smart device (i.e. a laptop, mobile or tablet) by selecting the hotspot network named after your Device ID.

Step 2 The credentials will be:
SSID - [DEVICE ID] *Eg. if the device ID allotted is PM01P0008, the SSID will be PM01P0008*
Default Password - 12345678

Step 3 Open any web browser on your smart device and enter the

following:

[DEVICE ID].local
Eg. if the device ID allotted is PM01P0008, enter
http://pm01p0008.local Or 192.168.45.1
***For Windows OS**, use http://192.168.45.1*

Step 4 Enter the user credentials for the login page:
Email address - admin@oizom.com
Password - oizom@admin

Step 5 The on-device data visualization tool can now be accessed

Condition B
The Monitor is connected to an existing WiFi or Ethernet network. Under this condition, ensure that the smart device is connected to the same network.

Step 1 Open any web browser on your smart device and enter the following:

[DEVICE ID]. local
Eg. if the device ID allotted is PM01P0008, enter pm01p0008.local
Or IP address allotted to the device in the network

Step 2 Enter the default user credentials for the login page:

Email address - admin@oizom.com
Password - oizom@admin

Step 3 The on-device data visualization tool can now be accessed

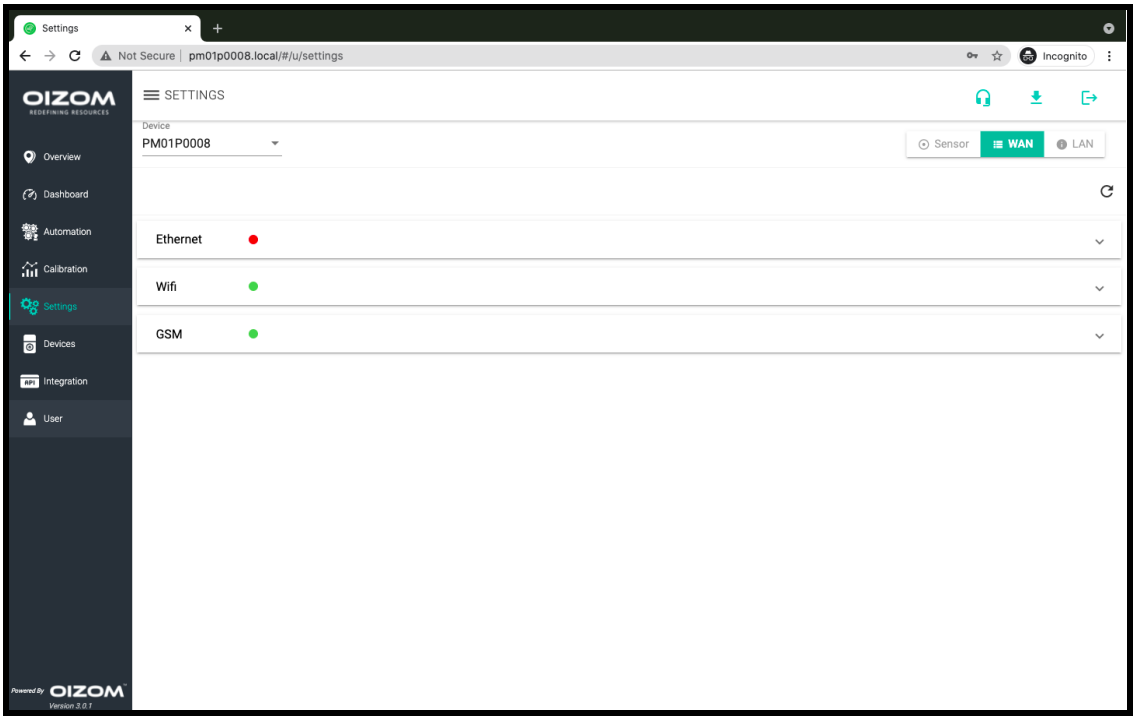


Figure 5.1 On-Device Data Visualization

Once connected, the user will have access to some basic modules. There will be 3 tabs under the **Settings** module:

1. Sensors - For enabling or disabling data of any sensor provided in the monitor. This can be done with the help of a toggle.
2. WAN - Network configuration for GSM, WiFi, Ethernet
3. LAN - Configuration for Relay & MODBUS

Following are the stepwise instructions for configuring the monitor with your preferred communication protocol:

5.1 GSM

If your monitor sends data using GSM, it should have a working SIM card placed inside. The monitor comes with a pre-inserted SIM in most cases. However, in case if under pre-defined terms the SIM card needs to be inserted by the user, the user needs to follow the following instructions:

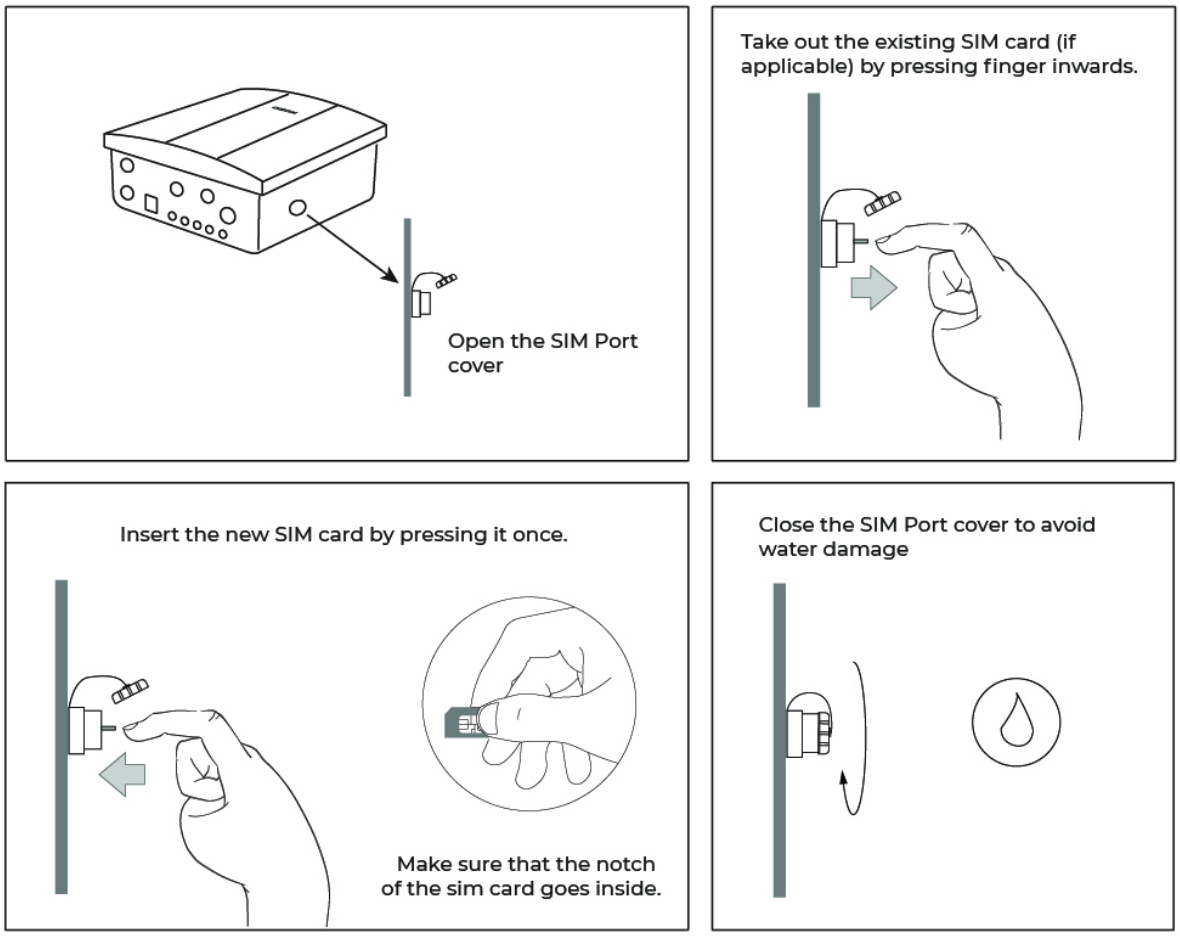


Figure 5.2 SIM card replacement

Step 1 Ensure that you have a working nano-SIM card that is activated by the carrier. Open the cap of the SIM card holder (See fig 7.2)

Step 2 For replacing an existing SIM, gently remove the SIM by pressing it using your finger and then pulling it outwards.

Step 3 Replace with a new SIM by pressing it inwards and gently pushing it using your finger.

Step 4 Put back the cap as it was placed earlier.

Step 5 Select the Settings module and click on GSM. The Red circle shows there is no connection established. This will be shown when no SIM card is inserted.

Step 6 Users can select from Manual or Automatic APN entries. In the case of manual APN, enter your APN of the SIM carrier.

Step 7 Select Submit. The Green circle shows the connection is established.

Step 8 Check for the latest data point in the Overview or Dashboard module

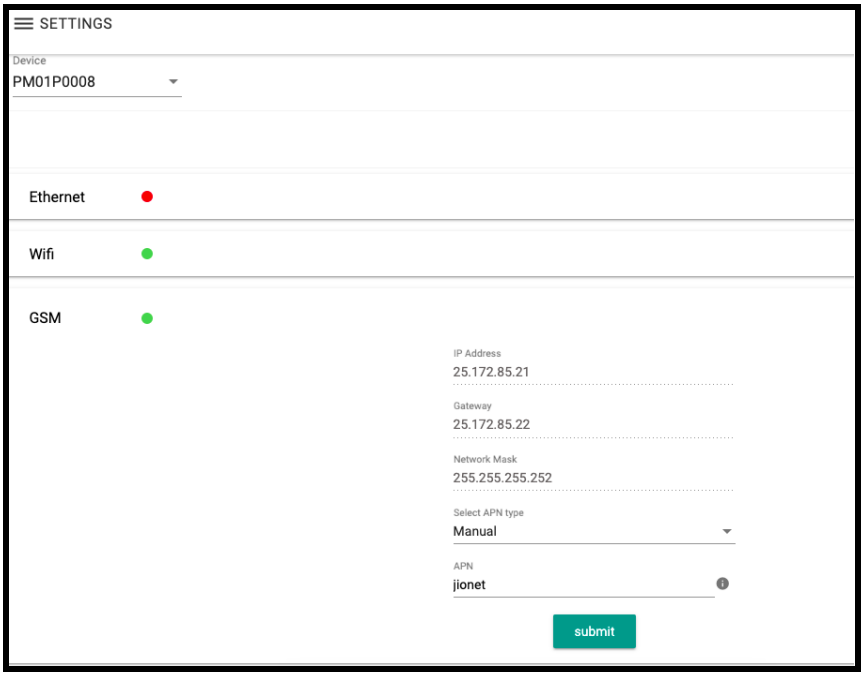


Figure 5.3 GSM configuration

5.2 WiFi

Step 1 Ensure the monitor is in a zone where the WiFi signal is optimum.

Step 2 Select the Settings module and click on WiFi. The Red circle shows there is no connection established.

Step 3 In the dropdown enter the SSID and Password of the WiFi network the monitor needs to get connected.

Step 4 Enter Submit. The Green circle shows the connection is established.

Step 5 Your monitor should be connected to the preferred WiFi network. Check for the latest data point in the Overview or Dashboard module.

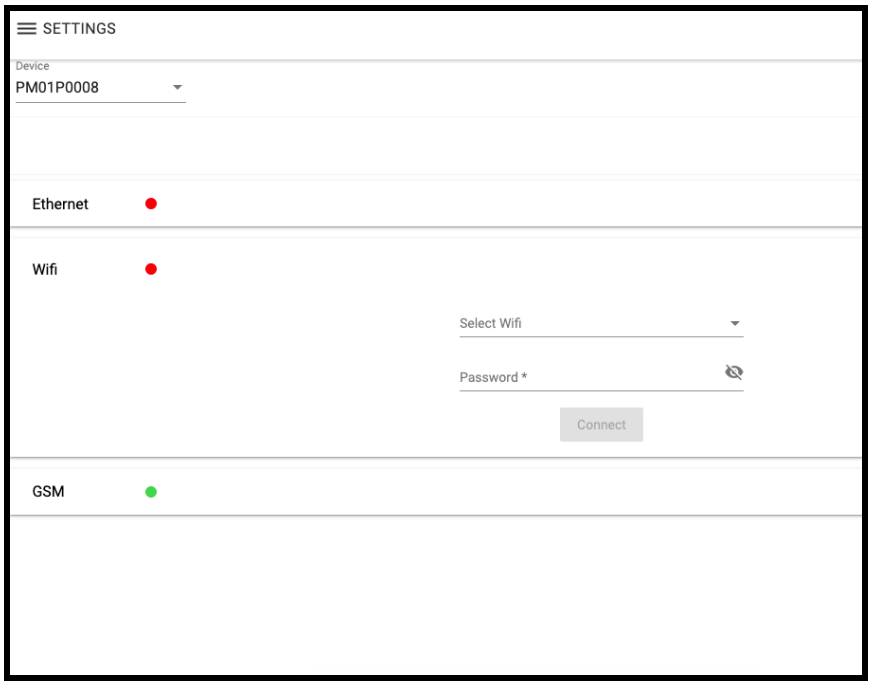


Figure 5.4 WiFi configuration

If you are still not able to connect to the instrument, you can access the on-device tool to setup the device on required communication protocol. For this, we will be creating a mobile hotspot and connecting your laptop to the same network.

Step 1

Create a Mobile Hotspot in your cellphone with following credentials:
SSID: OIZOM
Password: polludrone

Step 2
Restart the device from the switch once, the device should automatically connect to Wifi of the mobile hotspot.

Step 3
Connect your laptop to the same WiFi network & enter the following in the browser: http://deviceid.local, for example http://pm01p0008.local

Now, Enter the default user credentials for the login page:
Email address - admin@oizom.com
Password - oizom@admin
You should now be able to access the on-device tool.

5.3 Ethernet

Step 1 Open the cap of the Ethernet connector.

Step 2 Insert the ethernet cable in the connector.

Step 3 Select the Settings module and click on Ethernet. The Red circle shows there is no connection established.

Step 4 In the dropdown select from DHCP or Static. In the case of Static connectivity enter the details as shown in Fig 7.5.

Step 5 Enter Submit. The Green circle shows the connection is established.

Step 6 Your monitor should be connected to the network. Check for the latest data point in the Overview or Dashboard module.

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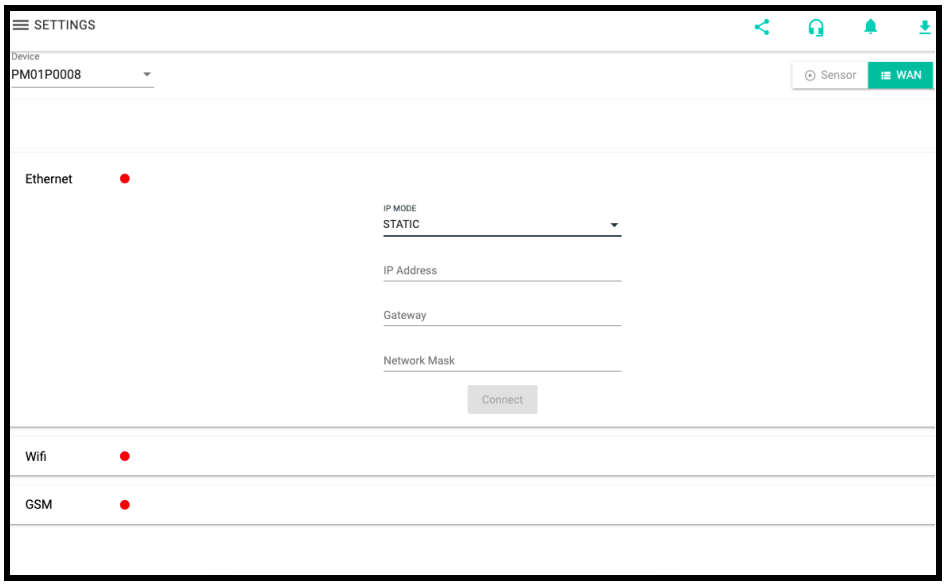


Figure 5.5 Ethernet configuration

5.4 MODBUS

5.4.1 MODBUS RTU

Step 1 Insert the MODBUS cable in the C3 connector on the monitor

The MODBUS cable specification is:

Yellow: B/Data -
Blue: B/Data +
Red: 18-24 V DC
Yellow-Green: GND

Step 2 Connect the third-party device which needs to be configured

Step 3 Select the Settings module and click on LAN.

Step 4 Select Modbus RTU from options.

Step 5 Enter Submit.

Step 6 Your monitor should be connected to the MODBUS RTU network.

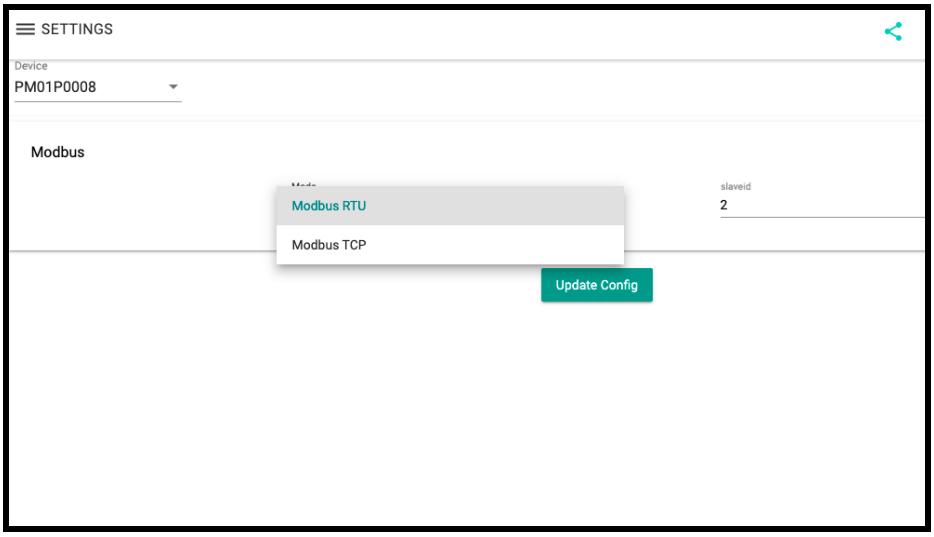


Figure 5.6 MODBUS configuration

5.4.2 MODBUS TCP

Step 1 Connect monitor using Ethernet Cable with MODBUS TCP Supported system.

Step 2 Use DEVICEID.local / Given IP address from the network as IP and 502 as Port.

Step 3 Select the Settings module and click on LAN.

Step 4 Select Modbus TCP from options.

Step 5 Enter Submit.

Step 6 Your monitor should be connected to the MODBUS RTU network.

5.5 Relay / Automation

Step 1 Insert the Relay cable in the C4 connector on the monitor.

The Relay Contact Cable specification is
Yellow: NO K2
Blue: Common K2
Red: Common K1
Yellow-green : NO K1

Step 2 Select the Automation module for configuring the monitor.

Step 3 Select the device from the dropdown from the left top corner for which you wish to add configuration.

Step 4 Click on the plus sign to add a new configuration.

Step 5 Select the Output, Based on which parameter, Default ON or OFF, Value (greater than), Value (less than) for configuration.

Step 6 Enter Submit.

Step 7 The monitor should be restarted for establishing a connection.

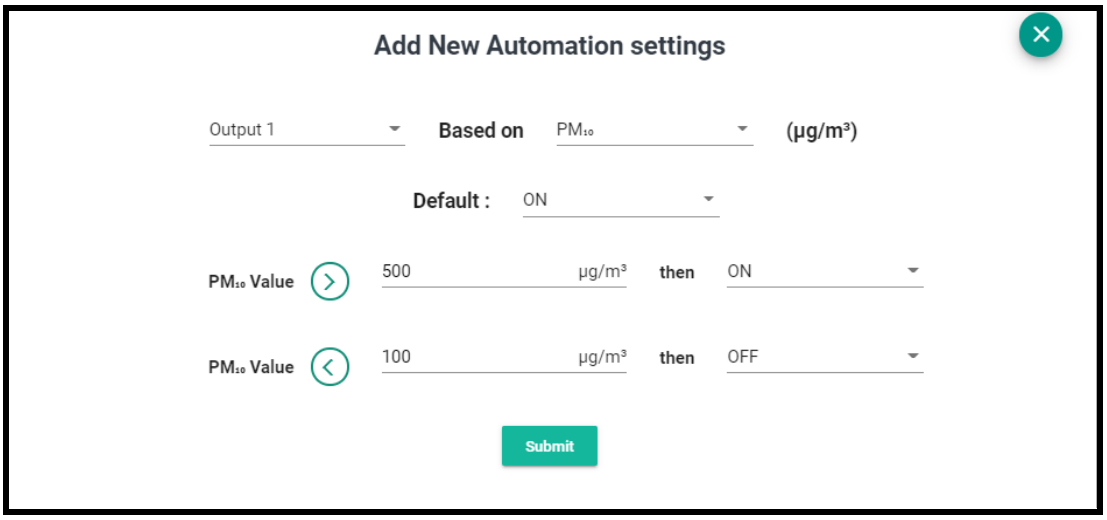


Figure 5.7 Relay configuration

5.6 Device Switch indications

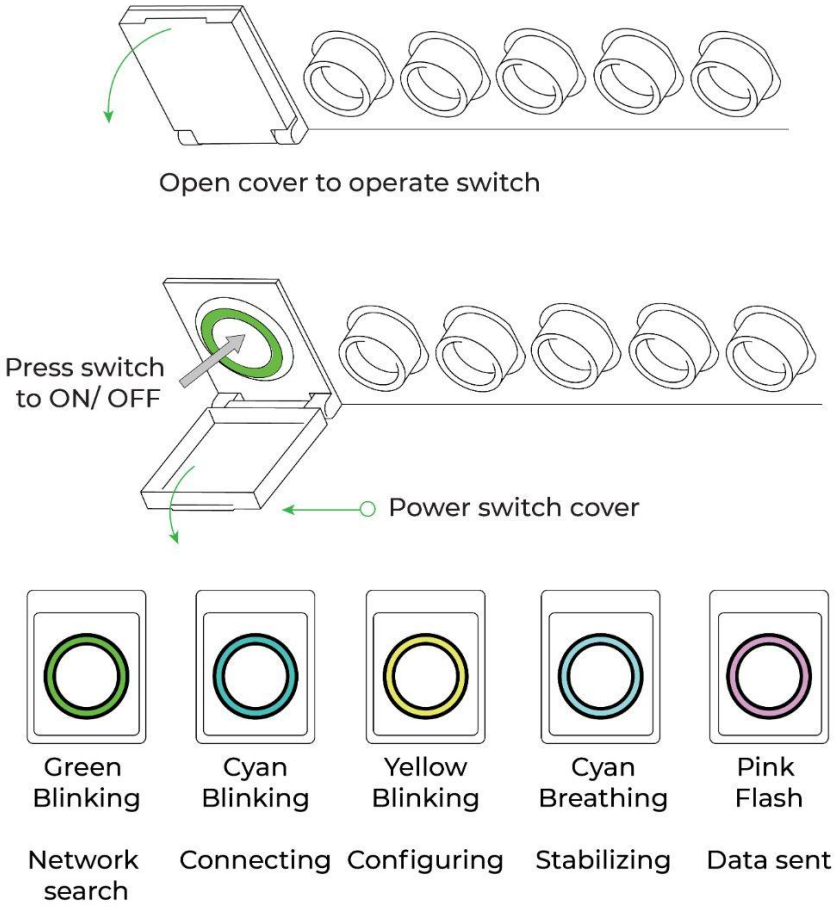


Figure 5.8 Device Switch indications

To switch ON the device, push the Power switch one time. To switch OFF the device, push the power switch again one time. Before switching ON the device, recheck all power cable connections. If you are restarting the unit, wait for at least a minute before switching ON.

The Power ON/OFF switch has LED indication feature. Five different colours signifies different modes of operation. Figure describes the LED functions and their significance.

When powered on, the monitor intakes air samples at a predefined frequency through the air sampling system. Once the air sample is stabilized,

the sensory system takes multiple readings during the sampling time and performs relevant data-processing. During this cycle time, the monitor flushes out old air samples and pulls in a fresh one. After each sampling, the data processing system sends the processed data to the central server using a built-in communication module.

If in case after powering ON, there is no connectivity and you see the Green light blinking, follow the steps mentioned in Section 5.. There could be a chance that the GSM network is not established or you may need to connect to alternate methods of communication.

6. Instructions for proper installation

6.1 Selecting location for installation

1) Proper location selection is critical for optimizing data collection. it varies as per the purpose of the project. According to the USEPA OA handbook (vol II, Section 6.0 rev.1), the selection of locations should be based on monitoring purposes.

2) The monitor should not be located adjacent to walls, buildings or trees as that might obstruct or distort the airflow (Mounting on a pole with a minimum diameter of 50 mm to a maximum diameter of 250mm is advisable).

3) The monitor should be located away from local pollution sources like fire hydrants, sprinklers, standby generators, heat compressors, air exhaust, furnace or incinerator fumes, etc. so that the emissions from these sources will not affect monitoring.

4) The monitor should be located away from absorbing or adsorbing surfaces. Some building materials can absorb pollutants or in some cases, PM_{10} may get deposited on the leafy vegetation nearby. Hence, sites prone to the effects of absorption and adsorption should be avoided.

5) The monitor should be located away from any physical interferences, e.g. location should be away from overhead high-voltage cables to prevent any electrical interference with the device.

6) Sites that are prone to chemical interference should be avoided, eg. roadside ozone monitoring may not be advisable since there are chances of interference from vehicular emissions.

7) The monitor should not be located at road intersections (unless the intersection is a specific objective of the monitoring), instead, it should be located midway along the road. Air quality at intersections is generally unrepresentative and may be better or worse than the rest of the road, depending on congestion and air flows.

8) For traffic pollution monitoring, the monitor should be kept at least 3 meters above the street level to prevent re-entrainment of particulates from the street, to allow free passage of pedestrians and to protect the sampling inlet from vandalism.

9) The monitor should be preferably located at sites where there is an availability of existing structures to mount monitoring equipment as well as the availability of facilities such as electricity of sufficient rating, water, network connectivity, etc.

10) The monitor should not be located at sites vulnerable to vandalism.

11) Site Location of the monitor should be such that there is an availability of easy transportation of tools, instrument repair and the movement of other bulky equipment to and from the site.

12) While selecting a location for the device, changes around the monitoring sites should be taken into consideration. Demolition or construction activities, roadworks resulting in a diversion of traffic or congestion can all have a considerable effect on data.

13) For long-term sites, the presence of small trees close to the site which could grow to be very large over the period of monitoring may be taken into consideration

6.2 Placement of the monitor during installation

1) The monitor should be at least 1 meter away from walls, buildings or trees to allow unrestricted airflow to the device.

2) The monitor should be installed at a height of 12 - 15 feet (4-5 meters) from the ground.

3) The sample inlets should not be within a confined space, in a corner, under or above a balcony in order to allow free airflow to the device. 1-1.5 m from the nearest vertical or horizontal surface.

4) The monitor should be installed in such a way that there is an open airflow in at least three of four quadrants, i.e. 270° around the inlet (180° if the device is placed at the side of a building).

5) A minimum clear-sky angle of 120° is recommended.

6) The monitor should be at least 25 m away from local pollution sources, e.g. domestic chimneys, standby generators, heat compressors, air exhaust, furnace or incinerator fumes, etc. especially if these sources are lower than the sampling point. With larger sources, the distance should be greater.

7) The monitor should be kept at a distance of 200 m from unpaved roads and streets. Its intake should be at least 4-5 meters above the street level and at a horizontal distance of 1 meter from the curb.

8) The monitor should be kept more than 100 meter away from streets having traffic volumes exceeding 500 vehicles/day. Typical locations having negligible traffic are parks, malls or landscaped areas, etc.

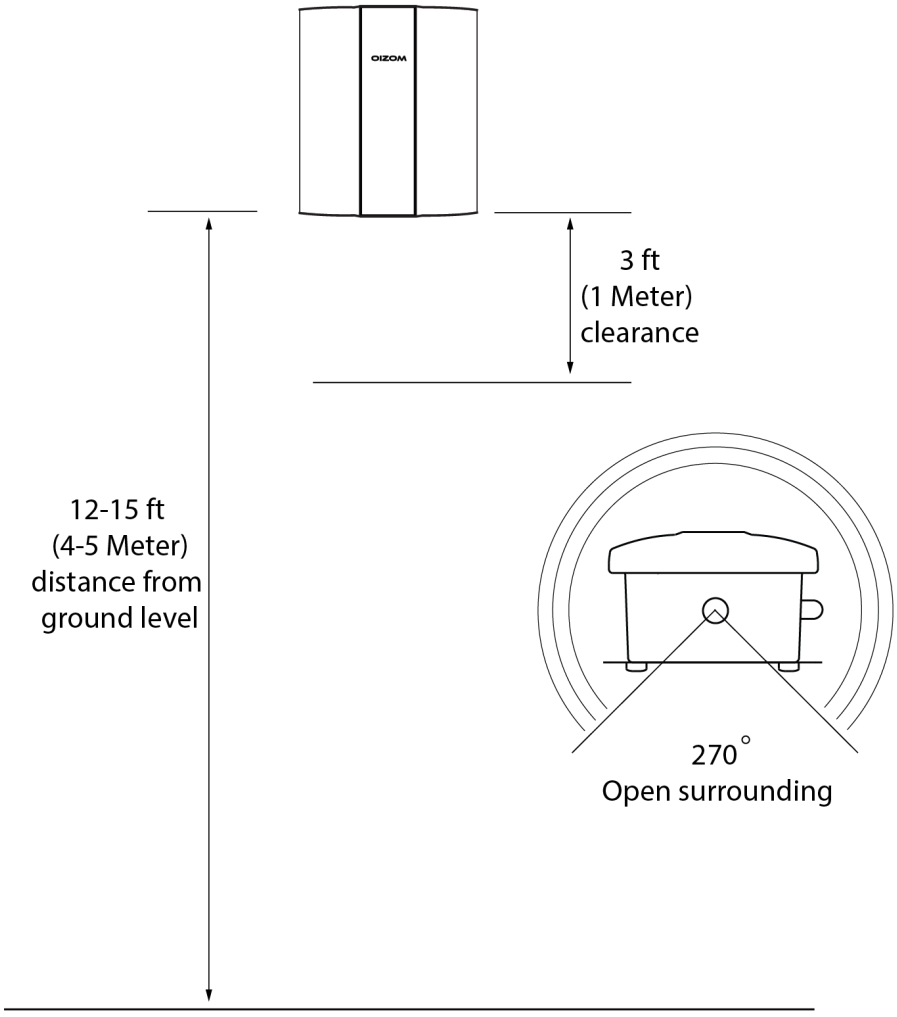


Figure 6.1 Selection criteria of monitor placement

6.3 Safety

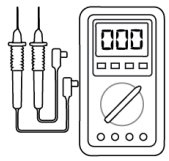
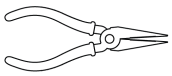
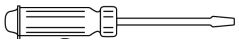
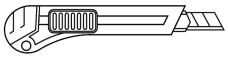
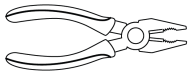
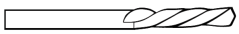
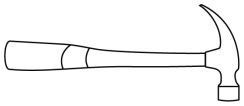
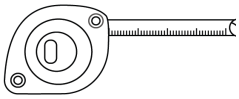
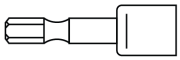
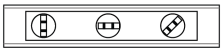
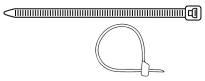
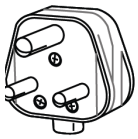
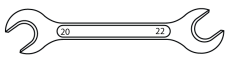
Since devices are usually installed at height, certain safety precautions need to be taken prior to as well as during the installation/maintenance:

1) All necessary personal protective equipment (PPE) with safety helmet must be worn at all times by the engineer
2) A well designed & manufactured ladder to be used for working at heights. In case of difficult approaches, a boom lift should be used.
3) Electrical connections should be checked prior to powering up the device.
4) All necessary permissions to be checked & met prior to installing the device.
5) Personnel with prior electrical experience & working at height may be for hired or any other kind of activity like maintenance & troubleshooting.
6) Anti-static gloves should be used for any kind of troubleshooting inside the device.

6.4 Tools Required

Installation of the monitor will need certain tools. Correct selection of tools is very critical to make the installation process smooth and efficient. The table presents a list of tools required for installation (not included in the package):

Table 6.1 List of tools required

Multimeter - 1 no.	Nose plier - 1 no.	Tester - 1 no.	Cutter - 1 no.
			
Plier - 1 no.	PH 2 Screwdriver - 1 no.	6 mm drill bit - 1 no.	Hammer - 1 no.
			
Measuring Tape - 1 no.	Hex Nut driver 7 mm - 1 no.	0.5 mm x 3 core cable - 1 no.	Heavy RPM drill machine - 1 no.
			
Spirit level - 1 no.	Cable tie - 1 lot.	Plastic or wood wall grip - 1 no.	3 pin Plug - 1 no.
			
AC wireless test probe - 1 no.	Insulation tape - 1 no.	Spanner 20/22 mm - 1 no.	Spanner 18*19 mm - 1 no.
			

7. Installation

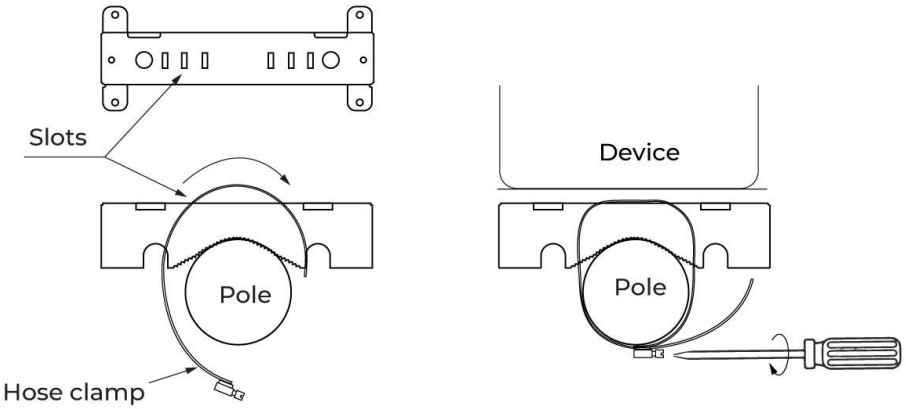


Figure 7.1 Device mounting bracket and clamp assembly

The device mounting brackets need to be fixed on a pole along with the hose clamps. Alternatively, these brackets can also be fixed on a wall.

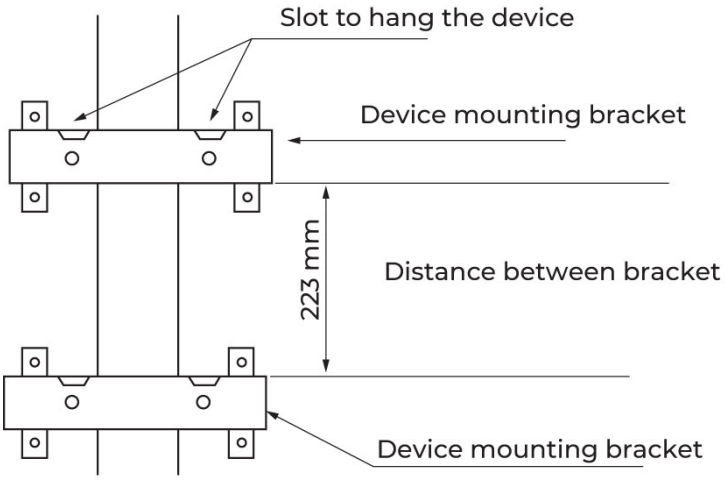


Figure 7.2 Installing device mounting brackets on a POLE

First, place one of the device mounting brackets and fix it on the pole using the hose clamp (refer image). Alternatively, in places with no poles, the brackets can be mounted on a wall. There will be no usage of clamps while fixing the brackets on the wall. The brackets have to be fixed by nailing in the wall using the 4 slots provided in the pole bracket. Ensure the orientation of the bracket as per the image (the slot for hanging the device is at the top).

The lower bracket needs to be placed at a distance of 223 mm. Ensure the brackets are fixed firmly. Also, check the alignment using a spirit level.

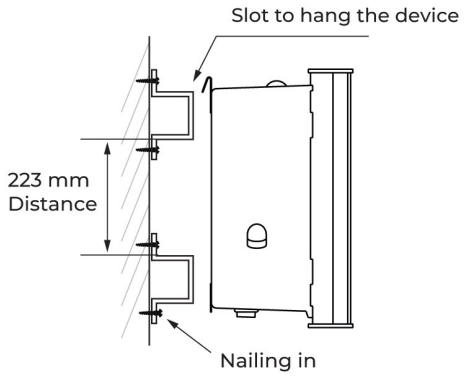


Figure 7.3 Installing device mounting brackets on a wall

7.1 Power Supply Unit (PSU)

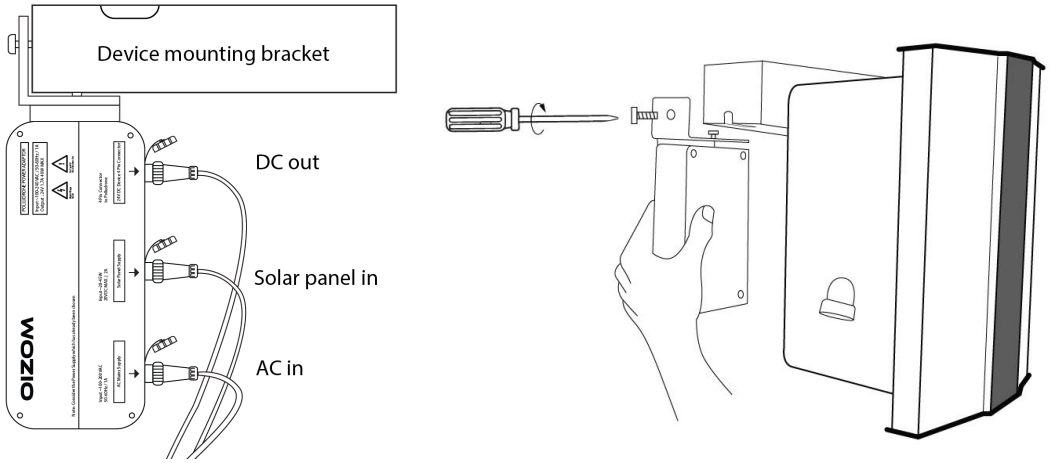


Figure 7.4 Mounting the PSU

Once the device mounting brackets are fixed properly, take the power supply unit (PSU) out of the armour tray. Insert the AC IN cable (3 pin connector) and DC OUT cable (4 pin connector) into the power supply unit (PSU). Ensure the connectors are firmly fixed by rotating the locking nut clockwise.
The PSU comes with a fixed attachment which needs to be slided in the top pole bracket slot, on the left side.. Make sure the screw on the top of the attachment matches the hole in the mounting bracket. Once the PSU is mounted properly, route the cables from behind the bottom mounting bracket. Proper cable routing at this stage is critical.

7.2 Device mounting

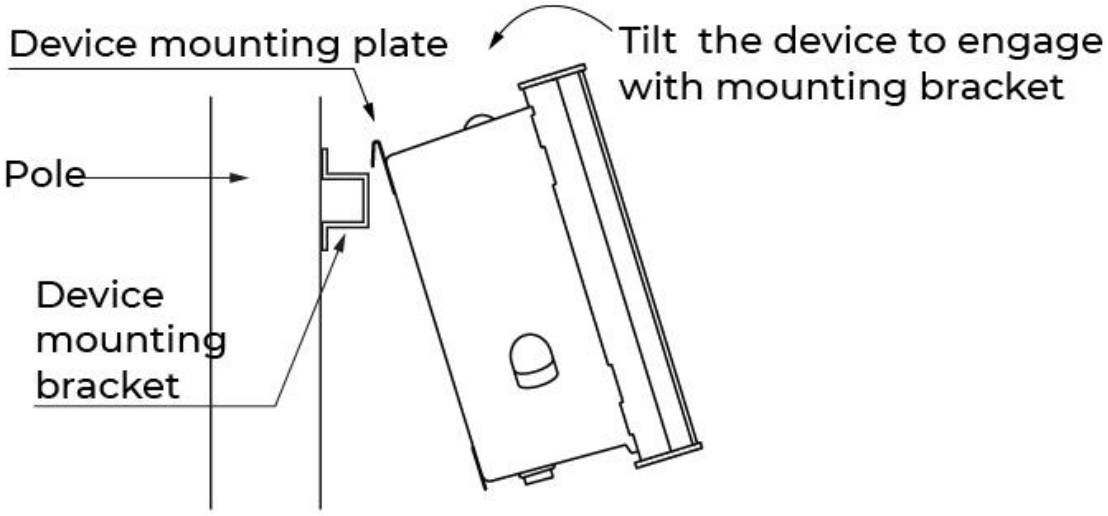


Figure 7.5 Placing the device

The device mounting plate is pre-fixed on the device. Mount the device using the hooks on the mounting plate. A 20° inclination (approximate) from the pole will be ideal for matching the slots on the device mounting bracket.

Once the device is mounted on the device mounting bracket properly, make sure to fix the device mounting plate on the bracket. The mounting plate and the bracket can be fixed using screws on the two slots provided on each of the device mounting brackets.

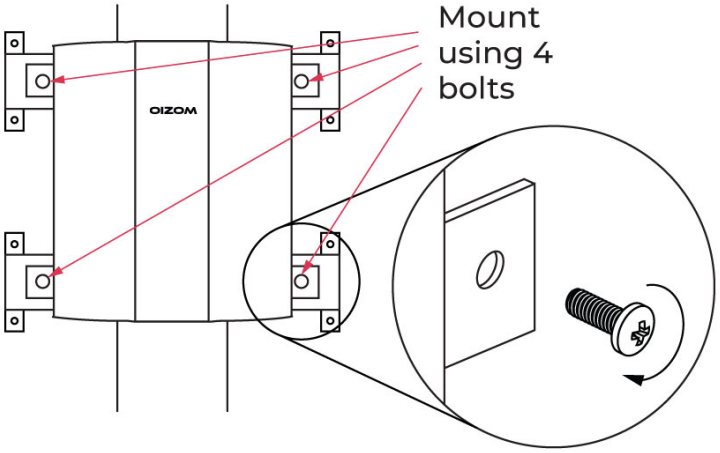


Figure 5.8 Fixing the device mounting plate

7.3 Rain sensor (if applicable)

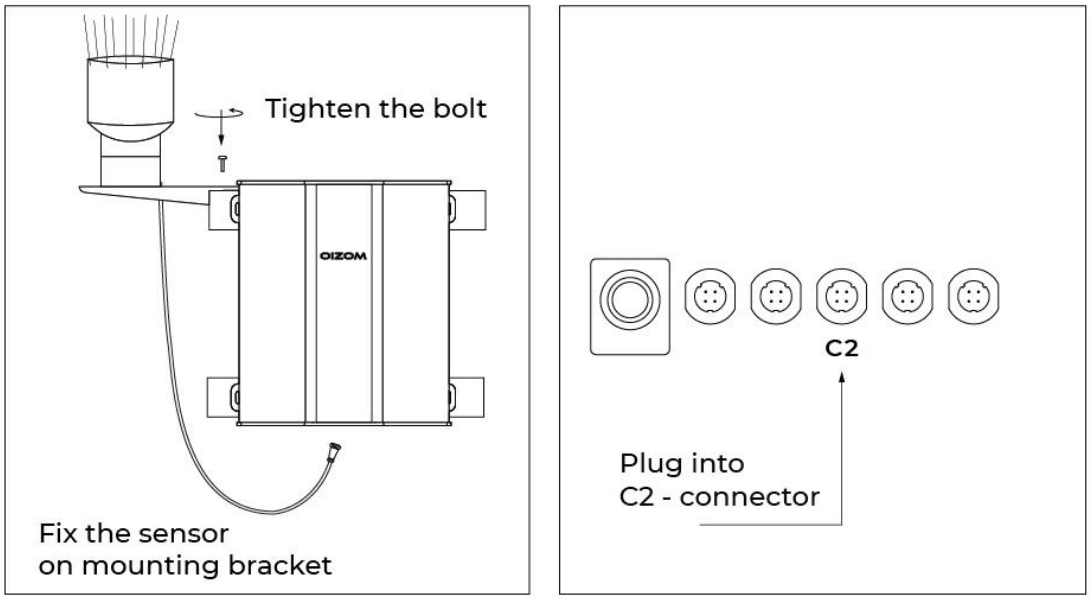


Figure 7.6 Mounting the Rain sensor

Rain sensor needs to be unboxed from the package and fixed with its attachment. The rain sensor along with the attachment needs to be screwed on the rain sensor bracket. On completing this fixture, the bracket needs to be bolted on the bottom/top pole bracket. Selection of top or bottom bracket may vary from site to site. Refer figure for understanding the sensor mounting & its attachments.

7.4 Wind sensor (if applicable)

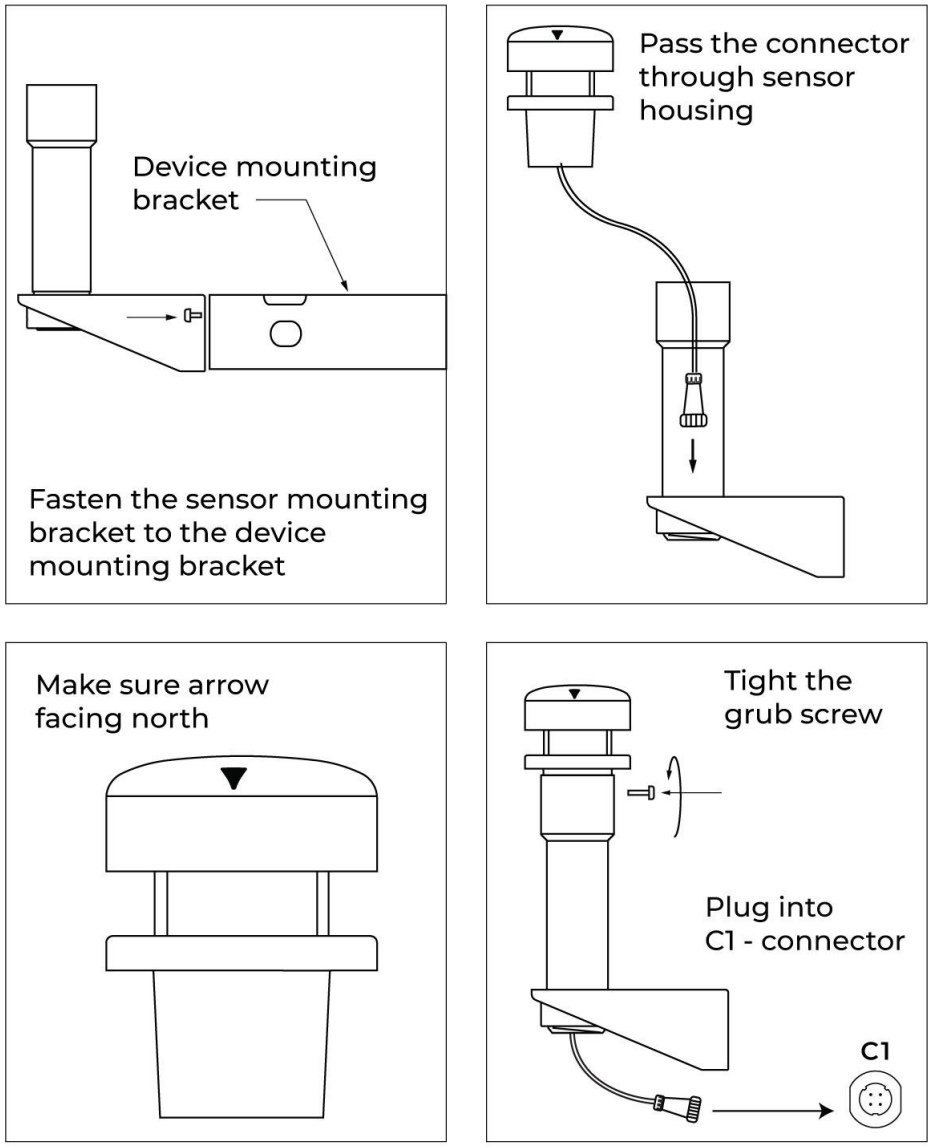


Figure 7.7 Mounting the Wind sensor

The wind sensor needs to be unboxed from the package and fixed with its attachment. First, the wind sensor housing along with the wind sensor bracket needs to be bolted on the bottom/top pole bracket. Now, the wind sensor needs to be placed on the housing. Ensure the cable is first passed through the housing. After proper placement and orientation to the North, fix by tightening the grub screws. Selection of top or bottom bracket may vary from site to site.
Refer figure for understanding the sensor mounting & its attachments.

7.5 Flood sensor (if applicable)

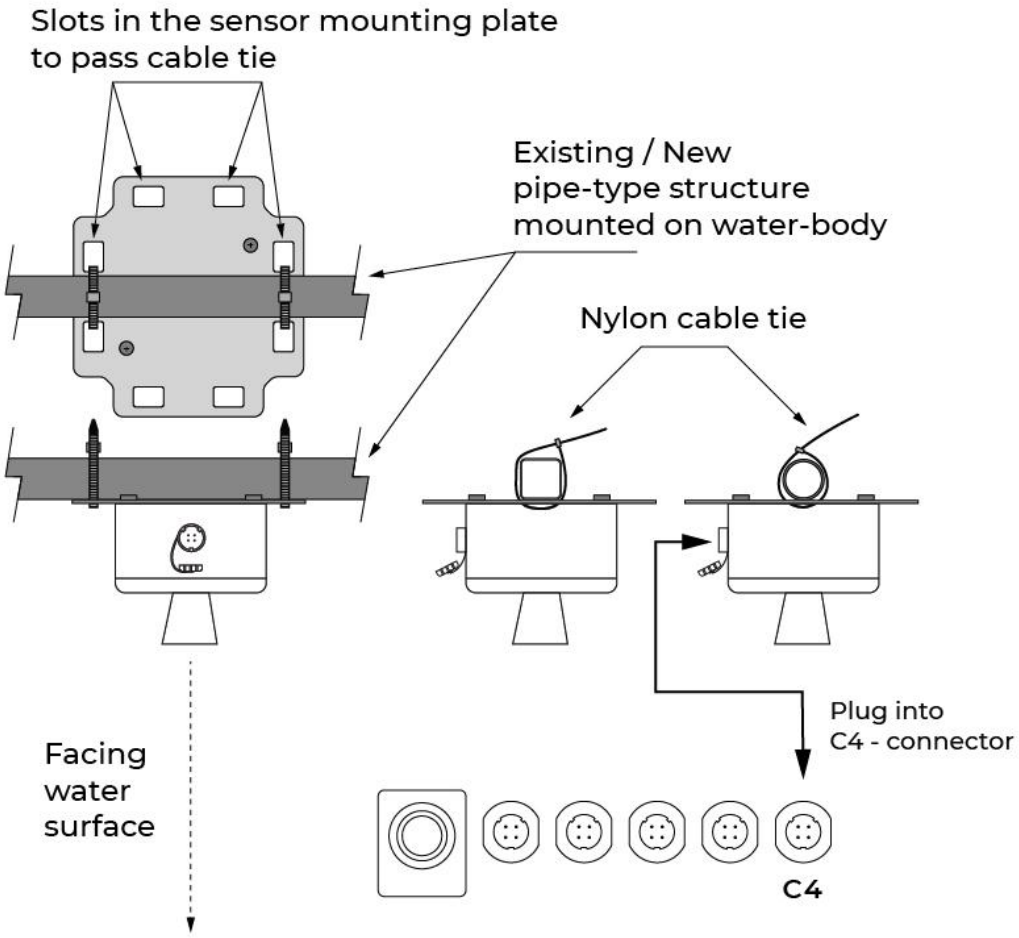


Figure 7.8 Mounting the Flood sensor

The flood sensor needs to be unboxed from the package and fixed with its attachment. The flood sensor along with the attachment needs to be fixed with an existing pipe structure mounted on a water body. Nylon cable ties may be used for proper fixing. Refer figure for understanding the sensor mounting & its attachments.

7.6 Solar panel (if applicable)

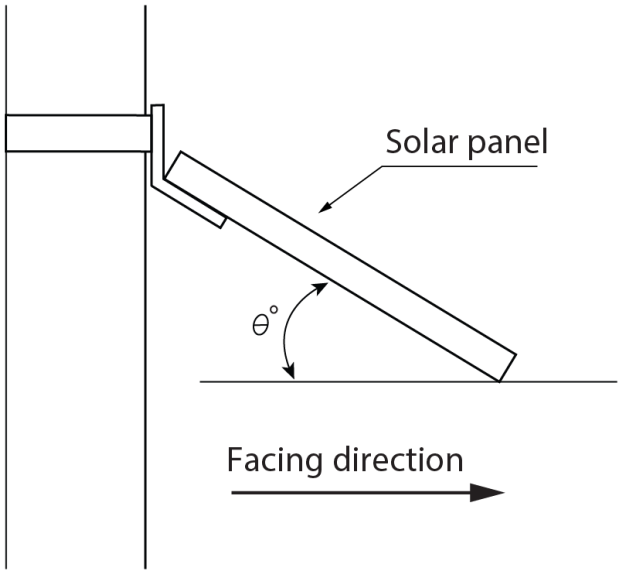


Figure 7.9 Mounting the Solar Panel

Step 1 The Solar panel should be mounted above and opposite to the device. It should be facing the north direction for maximum sunlight. The mounting plate will be attached to the panel.

Step 2 Now take the centre cable of the PSU and check the wires in black and red colour.

Step 3 Flip (Turn around) the solar panel and locate the black filament box where wires will be attached. Slide down the top cover, pass the cable through the given hole and connect the black wire in the negative(-) side and red wire in the positive(+) side. Check the wire connection and slide back the top cover.

Step 4 To install the solar panel on the pole, take the 2 hose clamps and insert it through the hole of the mounting plate attached to the panel. Now tighten the screws of clamps with the help of screwdrivers on the pole.

Step 5 Make sure that the shadow of the solar panel does not fall on the device's top plate, as it may affect the UV/Light measurement. Finally, check that the wires are untangled properly before completing the installation.

Table 5.1 Angle of incidence according to the geography

Countries	θ **angle**	**Facing Direction**
Canada, Russia, Norway	40	South
Ireland, Denmark, Monaco, Spain, France, Ukraine, Spain, Germany	35	South
China, Kazakhstan, Iran, Turkey, Libya, Poland, Italy, UK, USA	30	South
Saudi Arabia	25	South
India, Mexico	20	South
Australia	25	North
South Africa	30	North

7.7 Identification of connectors

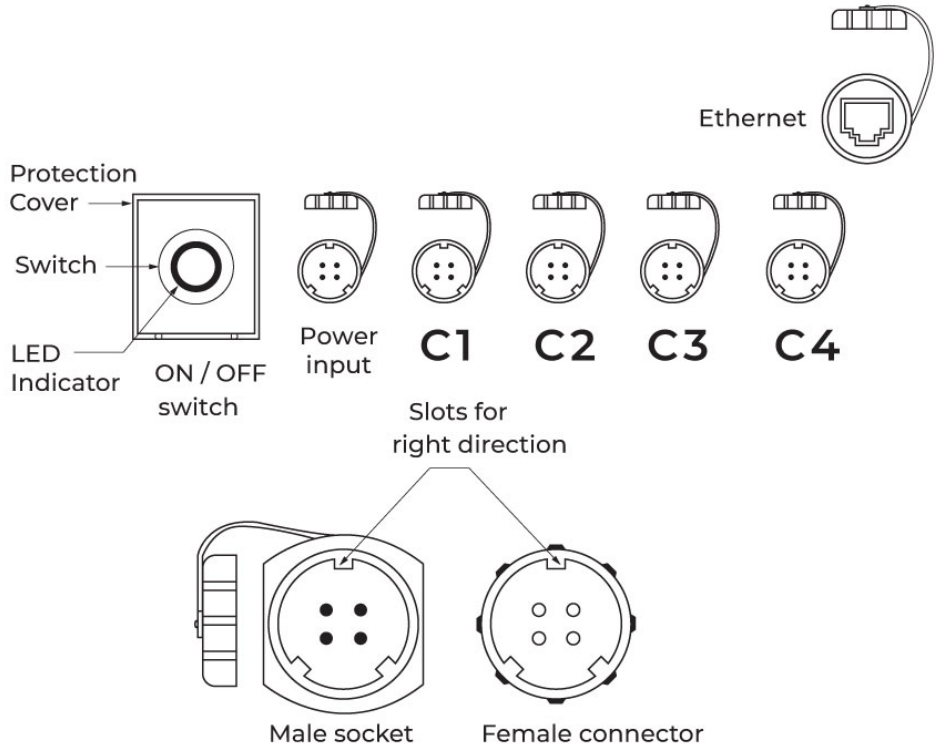


Figure 7.10 Identification of connectors

Step 1 The male connector (4 pin) of the power supply cable needs to be connected to the female connector (4 pin) on the POLLUDRONE. Open the cap of the female connector. Before connecting, have a good look at both the connectors.

Step 2 Check for the 3 slits on both the connectors. One of the 3 slits will be wider than the other two. The widest slit on the female connector on the monitor can be seen beneath the connector labels. To insert the male connector, match this slit with the one on the female connectors and gently insert it in with a little push. The connector must not be forced into the port by any means. Do not try to force the connector into the port by adjusting it in random circular motions. Doing so will damage the connector pin as well as POLLUDRONE.

Step 3 Once the connector is inserted, tighten the protection cover by rotating it in the clockwise direction.

7.8 System connectivity

The connectors provided are used for power and accessories. Users are advised to check for the connector labels and cable tags prior to any connection.

AC Power Supply	Red Cable: Direct (100V-240V AC) (50-60Hz) Black: Neutral Green cable: Earth
Supply of solar panels (if any)	Red: Positive solar energy (+) Black: Negative Solar Energy (-)
4 pin connector	To the device.

Note: Check cable tags before connecting any wires to the power source.

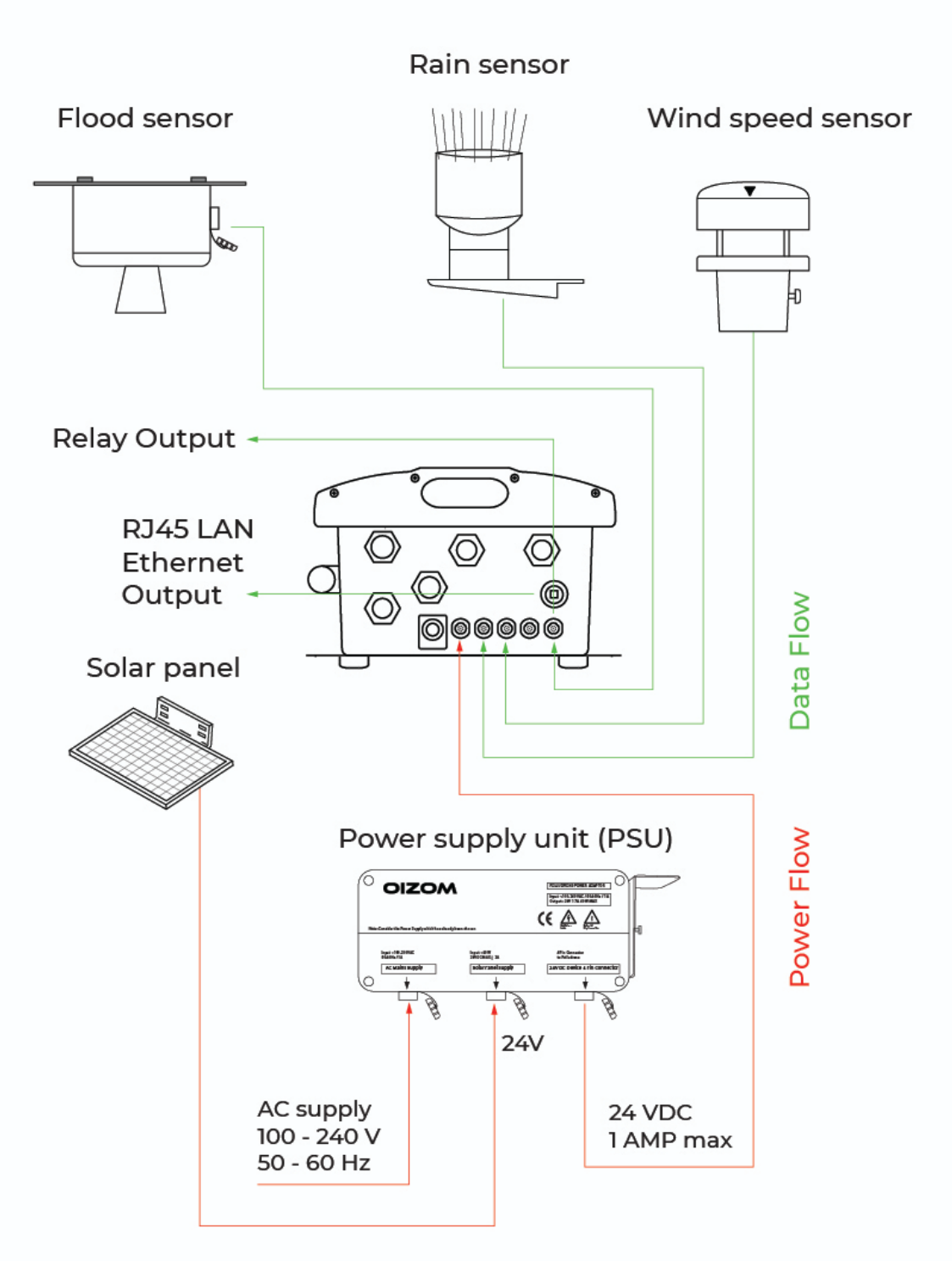


Figure 7.11 Cable management

8. WebApp: Envizom

Envizom™ is a Web-application to visualize and analyze the data from the device. It can be accessed from any browser. To go to Envizom™, type in your browser: https://terminal.oizom.com and hit Enter. Use your login credentials to access the application. The application is powered by several modules like Overview, Dashboard, Cluster, Display, Reports, Alerts, Analytics, User & Device management, etc.

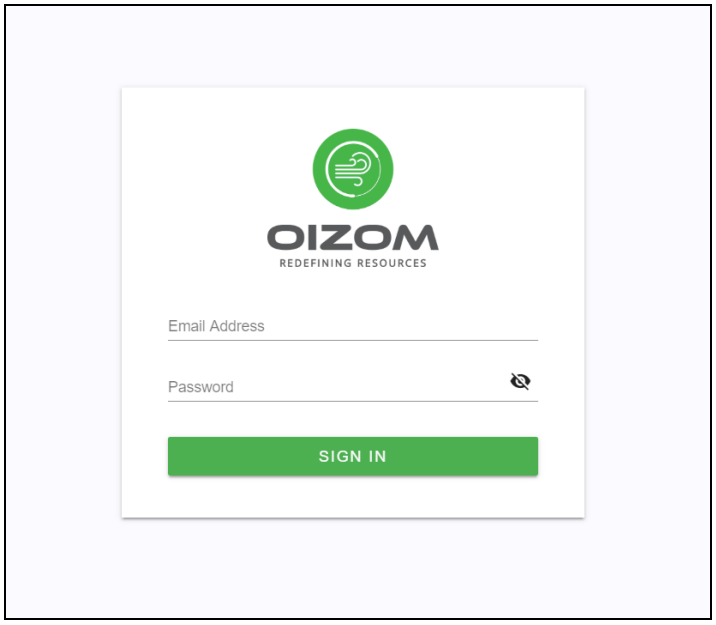


Figure 8.1 Login page-Envizom™

8.1 Device configuration in Envizom™

Set location

From the Devices Module user can set the location of the device, Go to Edit device then set the location by entering the lat long or by moving the pin on the provided map which will set the lat long accordingly.

Configure device name

In the edit, device section users can set Device Name/Label as per the specific requirement.

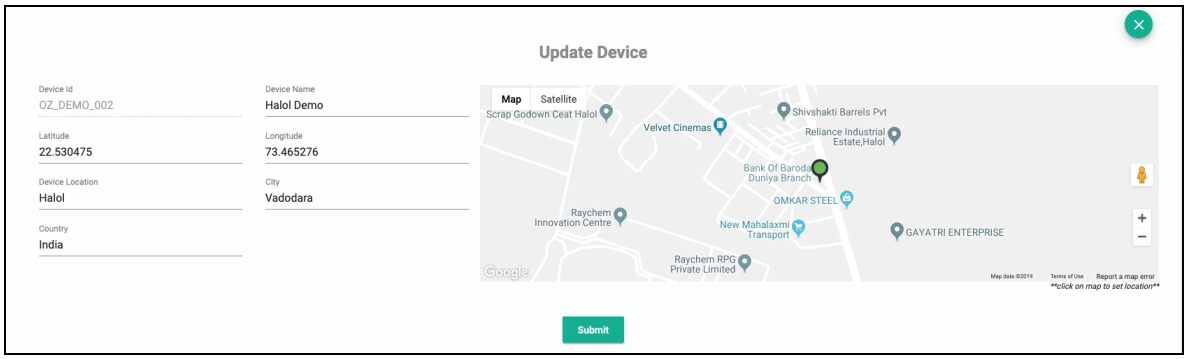


Figure 8.2 Devices Page-Envizom™

Configure units

For configuring the units go to the User module, then from the top right corner go to the Units section. It can be used to change the units of any parameter.

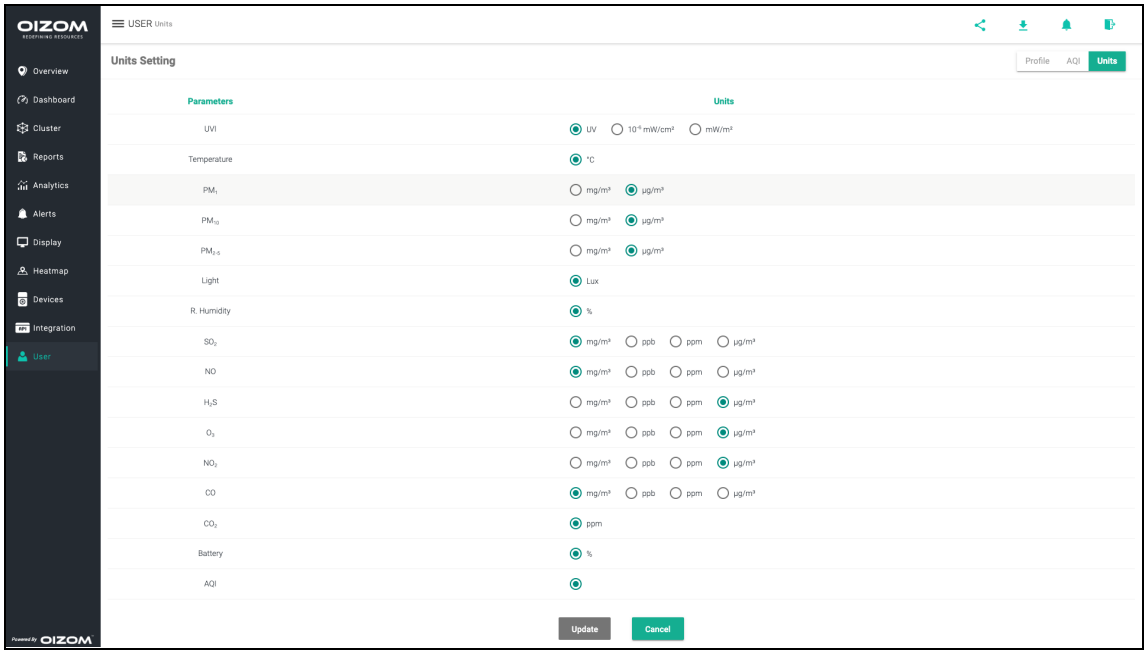


Figure 8.3 User page-Envizom™

9. Operation

9.1 Cleaning

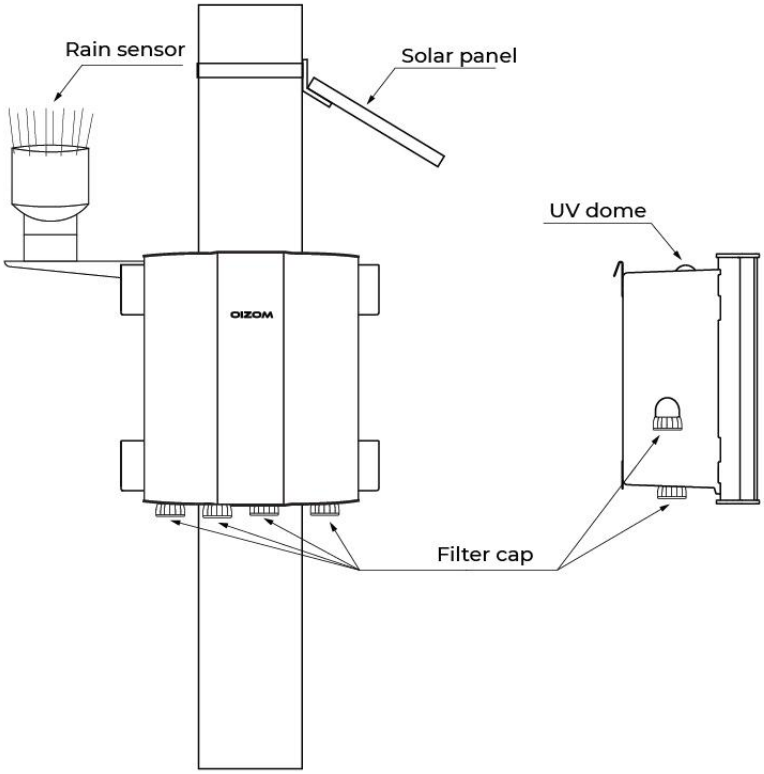


Figure 9.1 Exterior cleaning

While the monitor will not need frequent maintenance, it is highly advisable to keep regular checks. Periodic cleaning is important to ensure optimum performance. Monthly or quarterly regular maintenance activity has to be carried out depending upon the surroundings. The activity includes cleaning the dome for the light sensor, air inlet, and outlet mesh & general cleaning of the exterior. The below steps need to be followed for the cleaning of the device

9.1.1 Solar panel

Clean the solar panel using a brush or a cloth. Ensure no dust deposition is seen. If needed a damp cloth or water with a squeegee may be used for cleaning. The frequency of the cleaning may vary depending on the location.

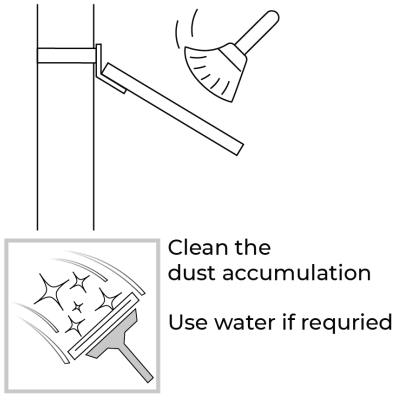


Figure 9.2 : Cleaning of Solar Panel

9.1.2 UVL sensor dome

Clean the UV dome with a soft cloth to ensure no dust deposition is found. The frequency of the cleaning may vary depending on the location.

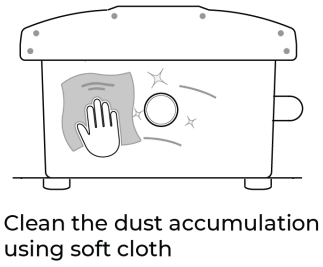


Figure 9.3 : Cleaning of UVL Sensor Dome

9.1.3 Rain sensor

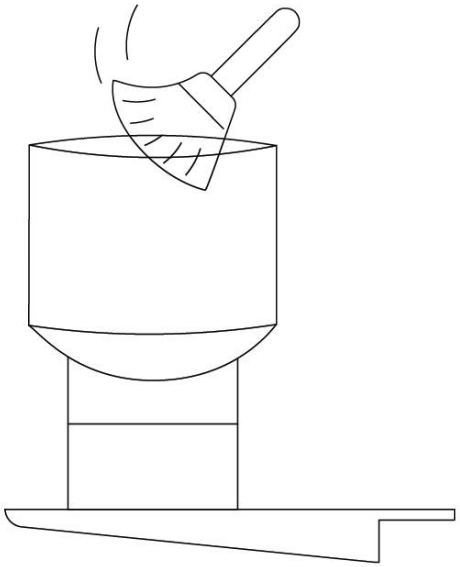


Figure 9.4 : Cleaning of Rain Sensor

Clean the rain sensor using a brush. Ensure deep cleaning is done by removing any dirt deposition or debris found inside the enclosure. Remove the enclosure and clean if required. Once the dust is removed, pour water to clean the tipping bucket inside the enclosure. The frequency of the cleaning may vary depending on the location.

9.1.4 Air sample inlets and outlets

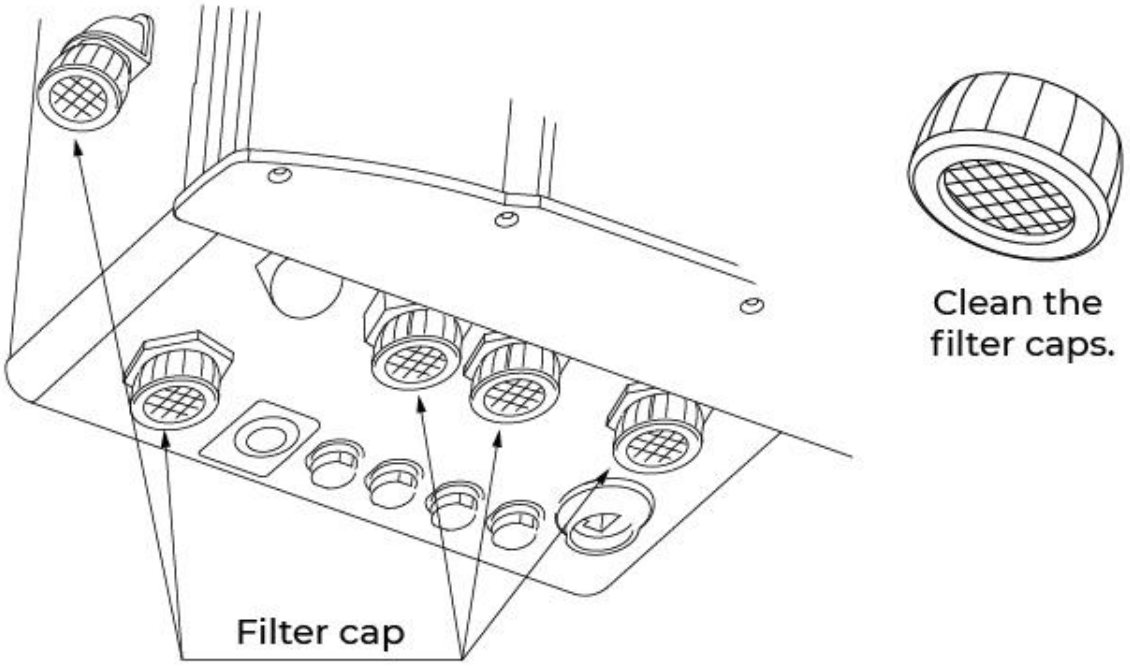


Figure 9.5 Cleaning of air sample inlets and outlets

Locate the air sample inlets and outlets. One filter cap is on the left side of the monitor whereas 3 filter caps are located at the bottom. Remove the filter cap by rotating it anticlockwise. Ensure that you remove the filter cap and not the nut and gasket. Clean the filter mesh with a soft cloth or a brush followed by blowing air into the filter mesh for removing dust or debris. Once cleaned thoroughly, rotate the filter cap clockwise to fix.

9.2 Sensor Configuration

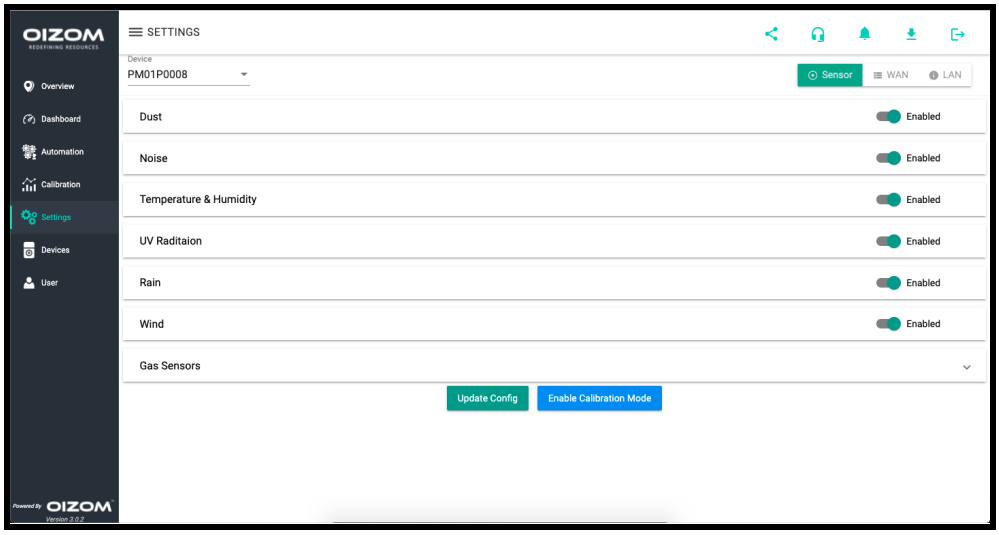


Figure 9.6 Sensor configuration

To enable or disable any sensor, click on the Settings module from the on-device data visualization tool.

Click on the toggle to enable or disable as per the preference for any sensor. Click on Update Config to update the recent configuration. Check the next data point to validate the changes.

9.3 Spot-Calibration

Spot Calibration is carried out by collocating the monitor with a reference standard. The reference standard can either be a stationary reference station (or equivalent “gold standard” instrument), mobile reference instrument or a freshly calibrated monitor.

The monitor is operated adjacent to the reference standard in real-world conditions for a definite period of time (ideally 5 - 6 days). After the collocation period, the results acquired from both the devices are compared to determine the offset (i.e. drift) and gain (i.e. sensitivity) error for the device, if any.

Gas sensors need to be calibrated and periodically checked to ensure sensor accuracy and system integrity. The intervals between calibration can vary for different sensors.

For optimum results, it is recommended that the monitor data is calibrated and validated with a reference standard every 6 months. Additionally, it is recommended to calibrate the monitor when relocated, post-maintenance or replacement.

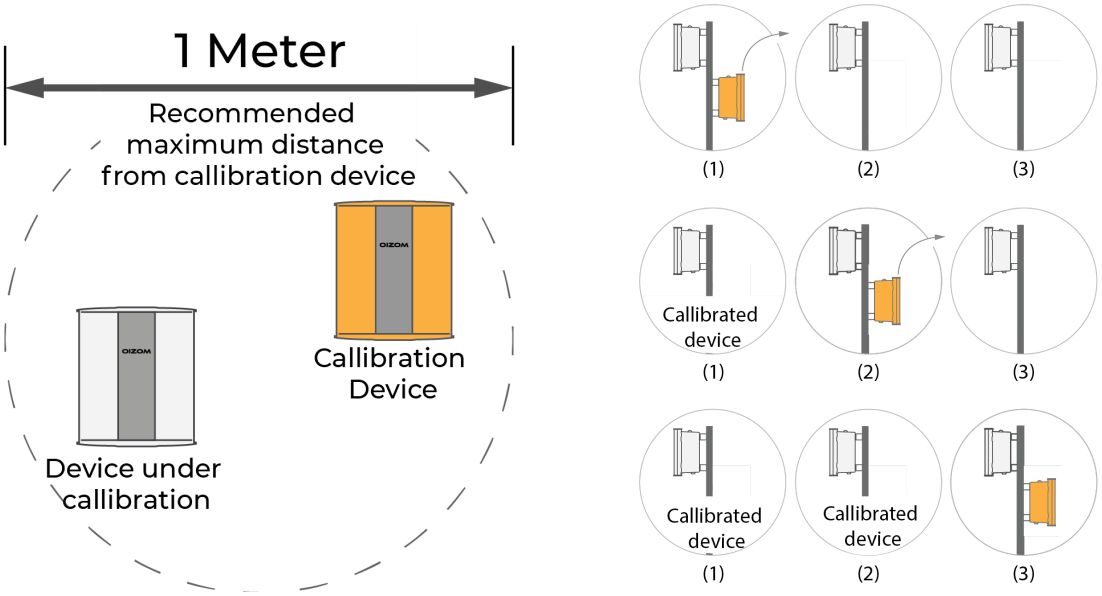


Figure 8.7 Spot calibration methodology

10. Replacements

10.1 Power supply unit (PSU)

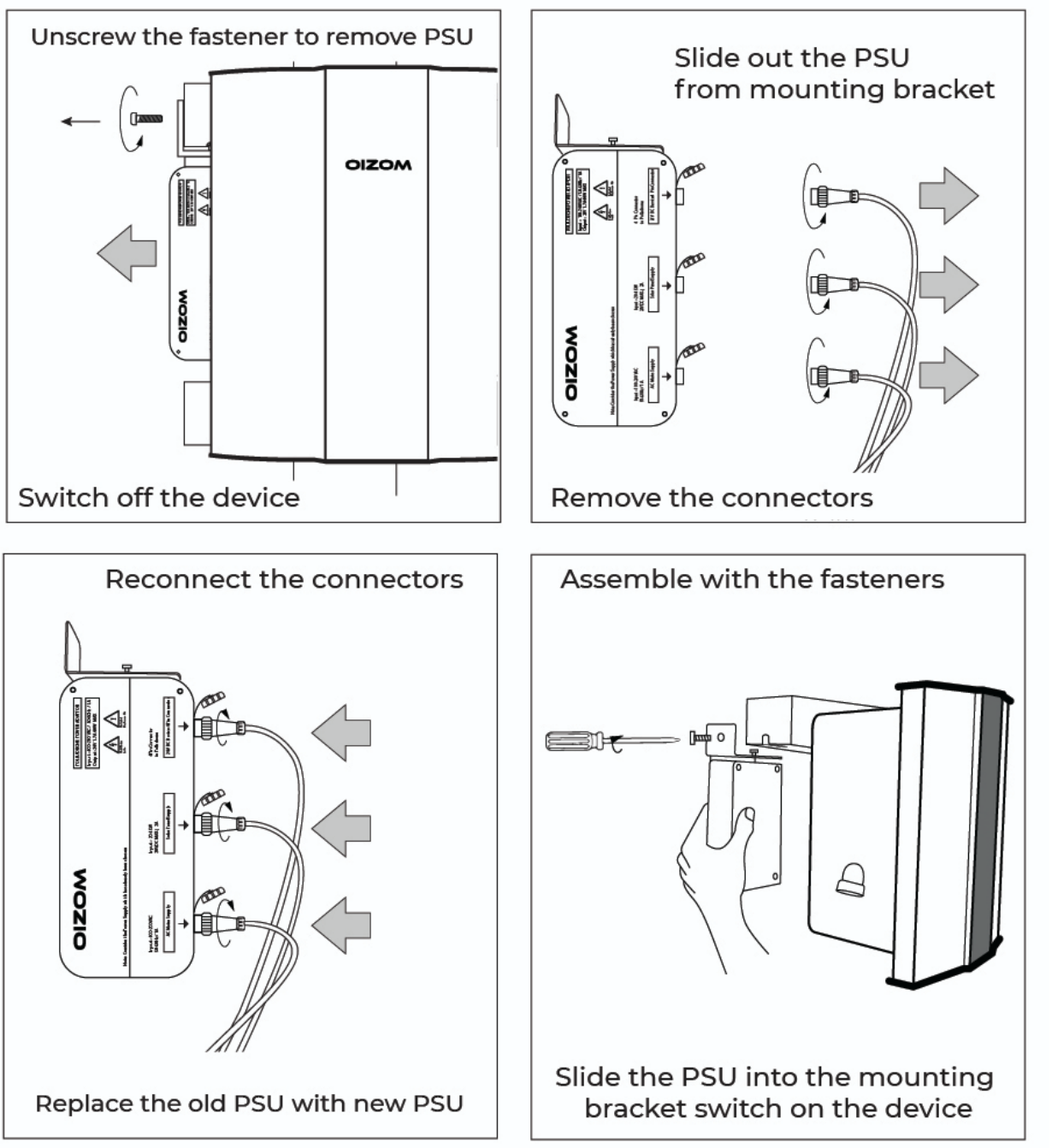


Figure 10.1 Replacement of PSU

Refer the image above for replacing the PSU. **Switch OFF the monitor before starting any replacement activity.** By unscrewing the fastener on the device mounting bracket, slide the PSU in the outward direction. Carefully remove the connectors. Now replace the old PSU with the new one and reconnect the connectors as per mentioned labels. Slide the PSU on the mounting bracket inwards and screw it with the fasteners. Switch ON the device.

10.2 Battery

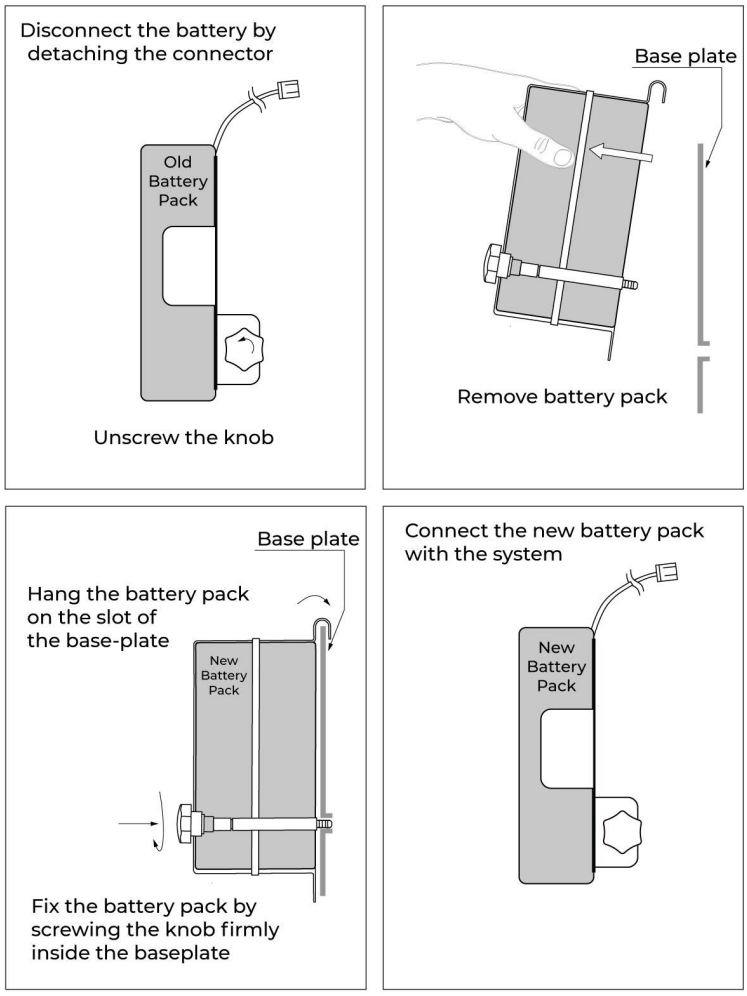


Figure 10.2 Replacement of battery

The battery is placed inside the enclosure. **Ensure the monitor is switched OFF** before performing the replacement activity. Open the enclosure and you can locate the battery on the top left side. Firstly, remove the battery connector to discharge it from the main circuit. Now unscrew the knob by rotating it anti-clockwise. Once done, remove the battery pack from its base plate by lifting it slightly. Carefully cut the cable tie using a pair of scissors. Now, replace the battery with the new one by pulling the old battery out of the metallic housing. Place the new battery inside the housing and fix it using a new cable tie. Fix the battery pack to the base plate and screw the knob by rotating it clockwise. Reconnect the battery to the main circuit. Close the enclosure and switch ON the device.

10.3 Sensors

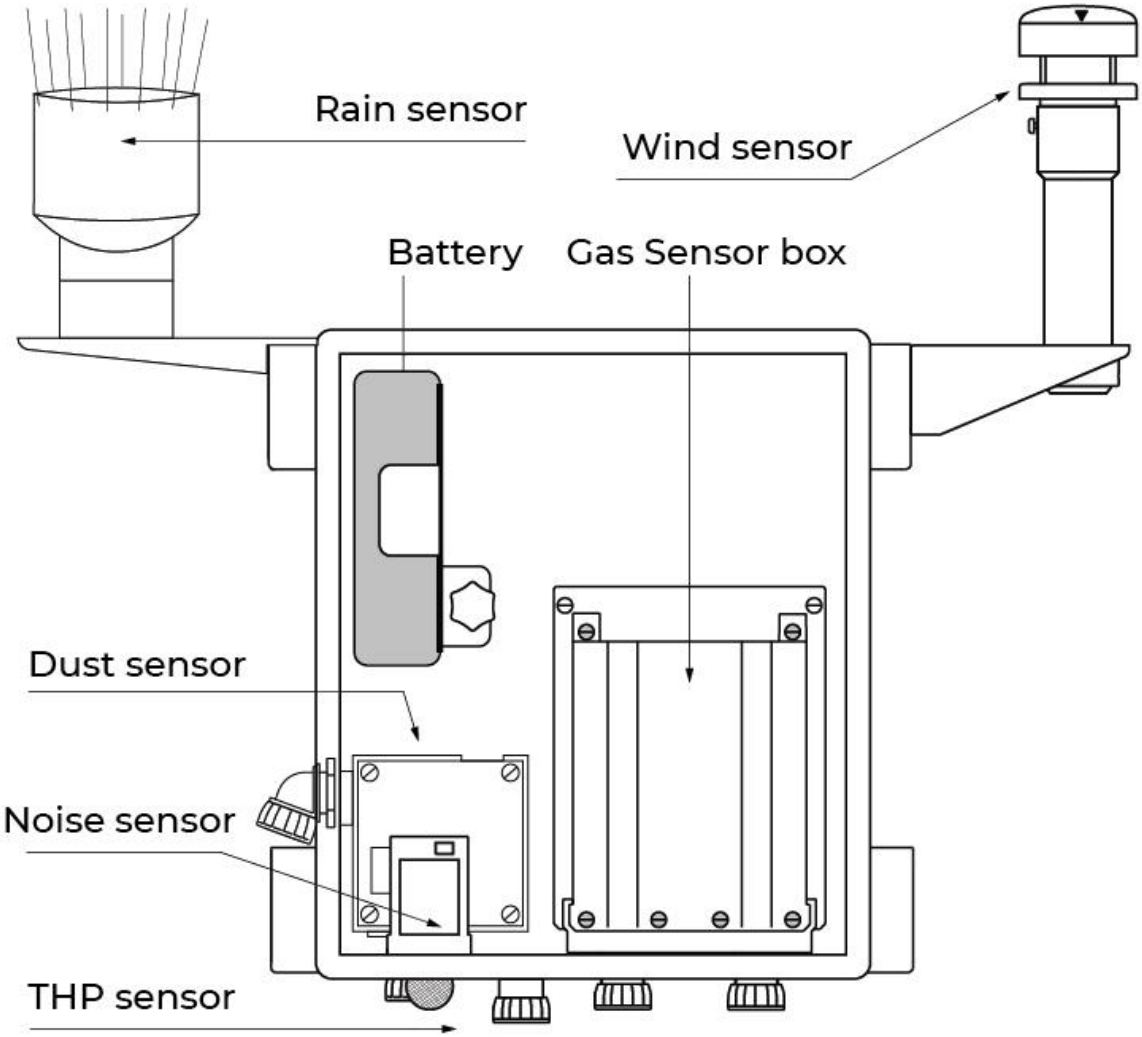


Figure 10.3 Schematic of the monitor and the sensors

Every sensor has a limited life span. The sensor life depends on the average pollutant concentration in the area. The sensors need to be replaced once their performance starts to deteriorate and the system starts giving unstable data.

Table 9.1 Life span of different sensors

ID	Parameter	Expected life for replacement
PM_1	Ultra Fine Particulate Matters with size less than 1µ	12-18 months
$PM_{2.5}$	Suspended Particulate Matters with size less than 2.5µ	12-18 months
PM_{10}	Suspended Particulate Matters with size less than 10µ	12-18 months
PM_{100}	Suspended Particulate Matters with size less than 10µ	12-18 months
CO_2	Carbon Dioxide	36 months
CO	Carbon Monoxide	24 months
SO_2	Sulfur Dioxide	24 months
NO	Nitric Oxide	24 months
NO_2	Nitrogen Dioxide	24 months
O_3	Ozone	24 months
H_2S	Hydrogen Sulfide	24 months
NH_3	Ammonia	24 months
CH_2O	Formaldehyde	24 months
CH_3SH	Methyl Mercaptan	24 months
NO_2	Nitrogen Dioxide	24 months
SO_2	Sulfur Dioxide	24 months
Cl_2	Chlorine	24 months
TVOC	Total Volatile Organic Compounds	6 months
Ns	Ambient Noise	36 months
Li	Light Intensity	36 months
UV	UV Radiation (0-12 UVI)	36 months
Lv	Visible Light Intensity	36 months
Temp	Temperature	36 months
Hum	Humidity	36 months
Bmp	Barometric Pressure	36 months
Ws	Wind Speed	36 months
Wd	Wind Direction	36 months
Fl	Flood Monitoring	36 months
Rm	Rainfall Monitoring	36 months

10.3.1 Noise sensor

Ensure that the monitor is switched OFF prior to performing the replacement activity. Open the enclosure and you can locate the noise sensor. First, detach the connector and then remove the nut & gasket by rotating it anti clockwise. Pull the noise sensor out after it is detached completely from the body. Now replace the old sensor with a new one and fix it by rotating it clockwise. Fix the gasket and nut. Attach the connector and close the enclosure. Switch ON the device.

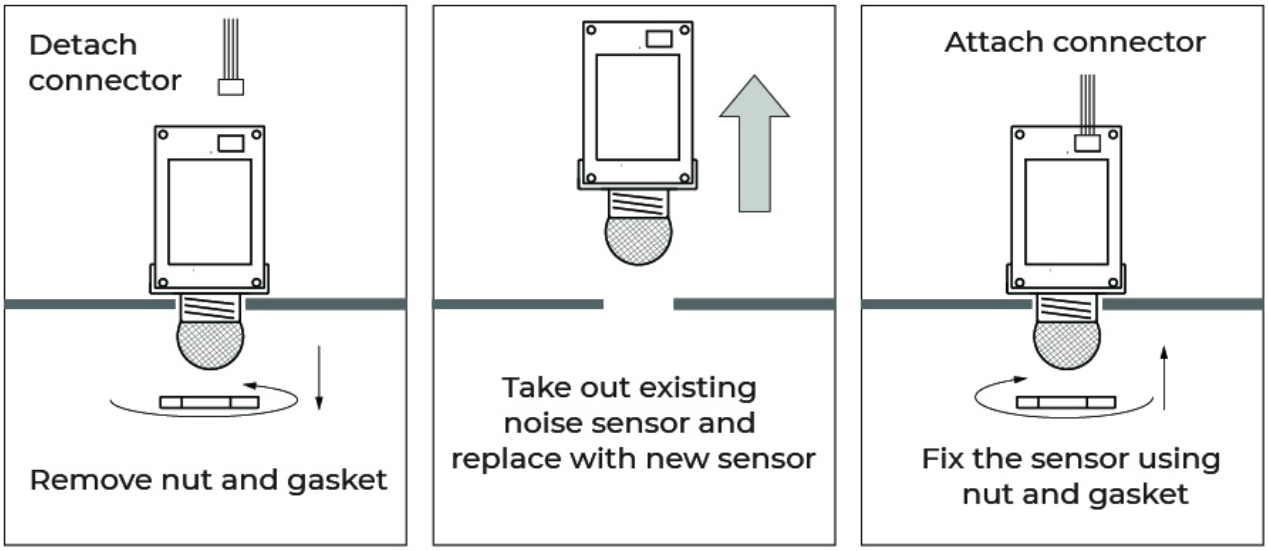


Figure 10.4 Replacement of noise sensor

10.3.2 Dust sensor

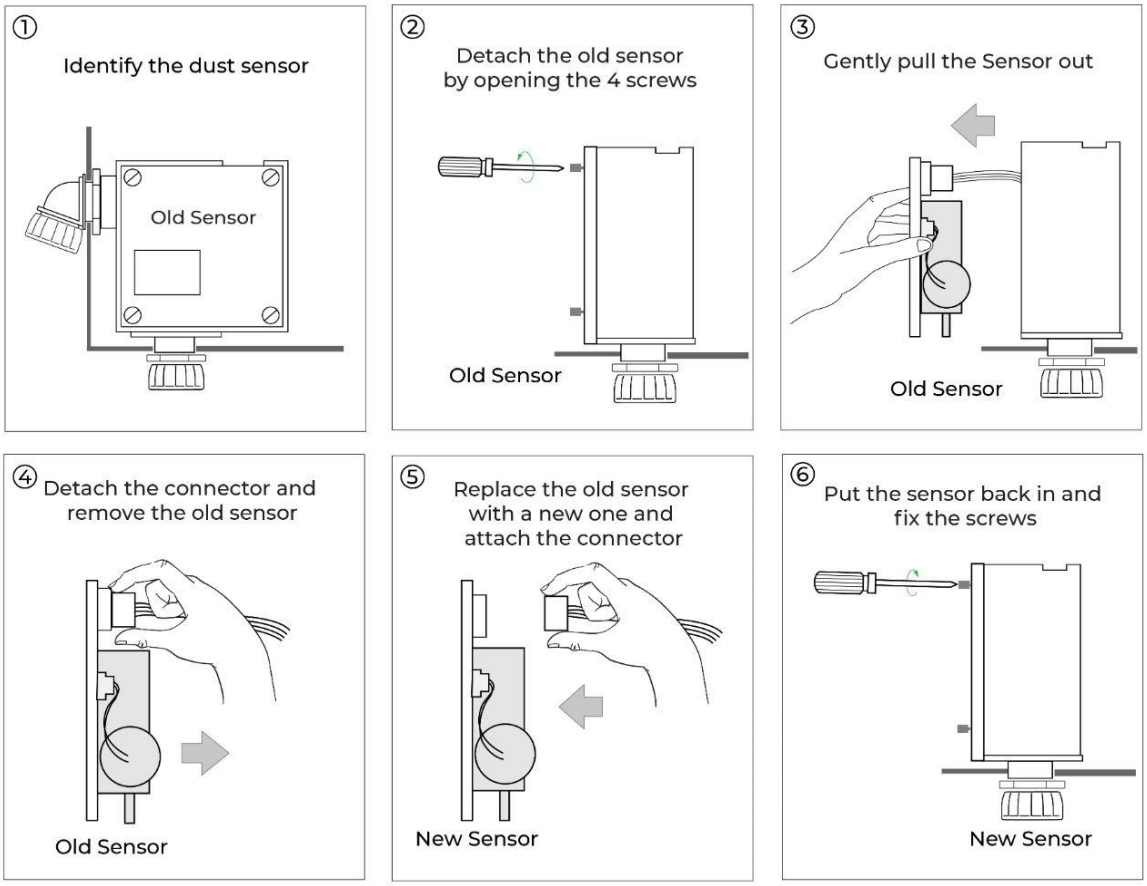


Figure 10.5 Replacement of dust sensor

Ensure that the monitor is switched OFF prior to performing the replacement activity. For removing the Dust sensor, the Noise sensor is required to be removed. Open the enclosure and you can locate the noise sensor. First, detach the connector and then remove the nut & gasket by rotating it anti clockwise. Pull the noise sensor out after it is detached completely from the body. You can now locate the dust sensor. First, detach the connector and remove the lock nut from both ends of the dust sensor. Once loosened, remove the dust sensor and replace it with a new one. Fix the dust sensor by fastening the lock nuts on both ends. Now, fix the Noise sensor as mentioned in Figure 9.4. Attach the connector and close the enclosure. Switch ON the device.

10.3.3 THP (Temperature, Humidity, Pressure) Sensor

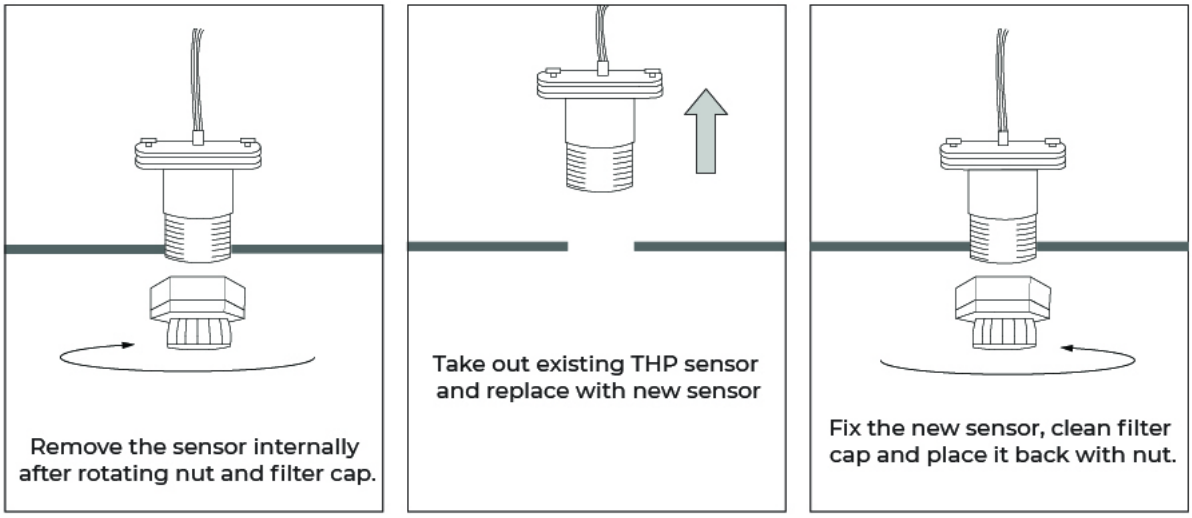


Figure 10.6 Replacement of THP sensor

Ensure that the monitor is switched OFF prior to performing the replacement activity. Open the enclosure and you can locate the THP sensor. Now detach the connector and remove the sensor using anti clockwise motion of the nut and gasket. Hold the disc and cone body of the THP sensor to assist the removal of the THP sensor. Replace the old sensor with a new one and fix it by a clockwise motion using the nut and gasket. Place the disc and cone body after cleaning on the exterior to assist the fixing of the sensor. Close the enclosure and switch ON the device.

10.3.4 Oizom® Gas sensors (OGS)

Ensure that the monitor is switched OFF prior to performing the replacement activity. Open the enclosure and you can locate the sensor box. Remove the 6 thumb screws as shown in the image above. Now carefully remove the sensor box by pulling in the outward direction. Place the screws safely for using it later. Identify the OGS by the label showcasing the parameter. Replace the old OGS by pulling out gently & placing the new OGS at the same location. Ensure the new sensor is fixed firmly as loose contact may lead to loss of data. Carefully place the sensor board and attach it back with the 6 screws. Close the enclosure and switch ON the device.

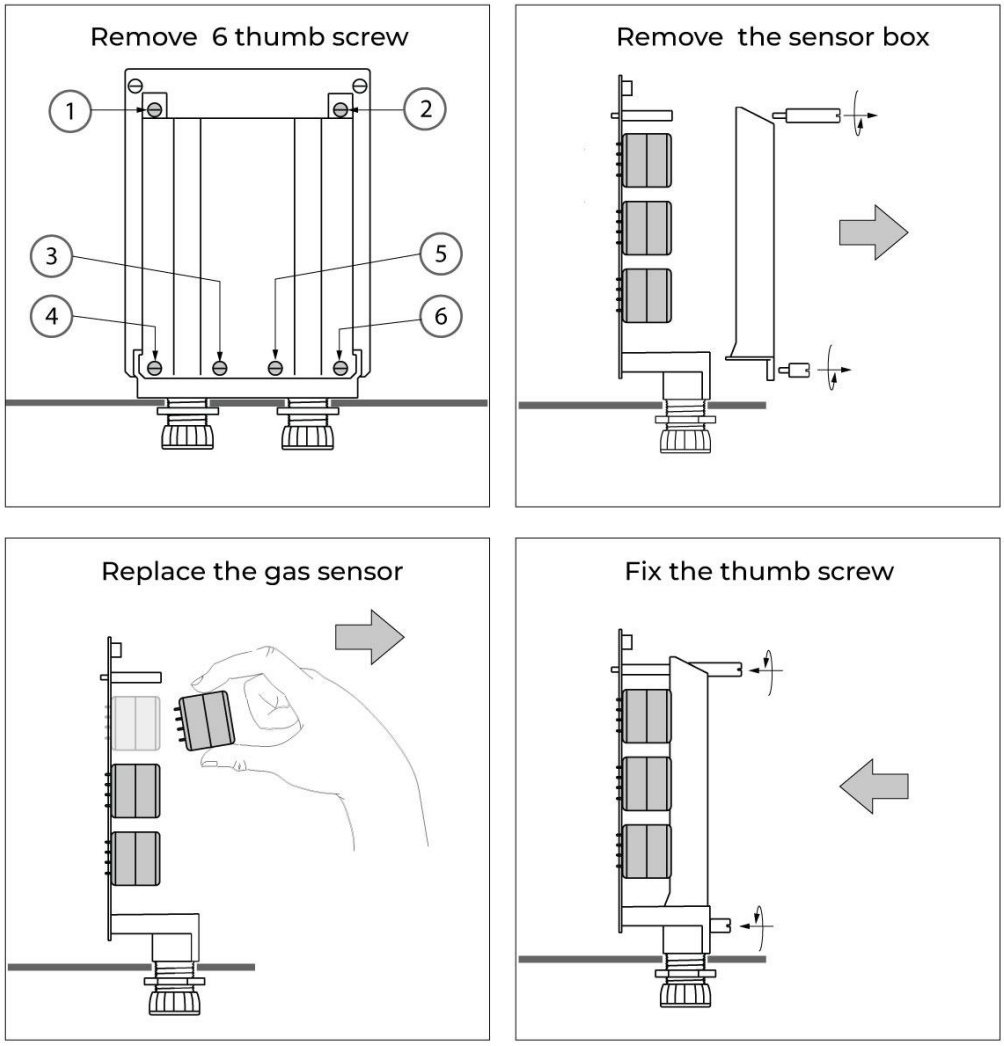


Figure 10.7 Replacement of OGS

10.3.5 Rain sensor

Ensure that the monitor is switched OFF prior to performing the replacement activity. Remove the rain sensor connector from the device. You can locate the connector by viewing the labels on the bottom of the device. Now, unscrew the rain sensor bracket from the device mounting bracket as shown in the figure. Replace the old sensor with a new one and attach it on the device mounting bracket. A spirit level on the rain sensor may be used for alignment. After proper alignment of the sensor, firmly fix the sensor on the device mounting bracket by screwing. Fix the connectors and switch ON the device.

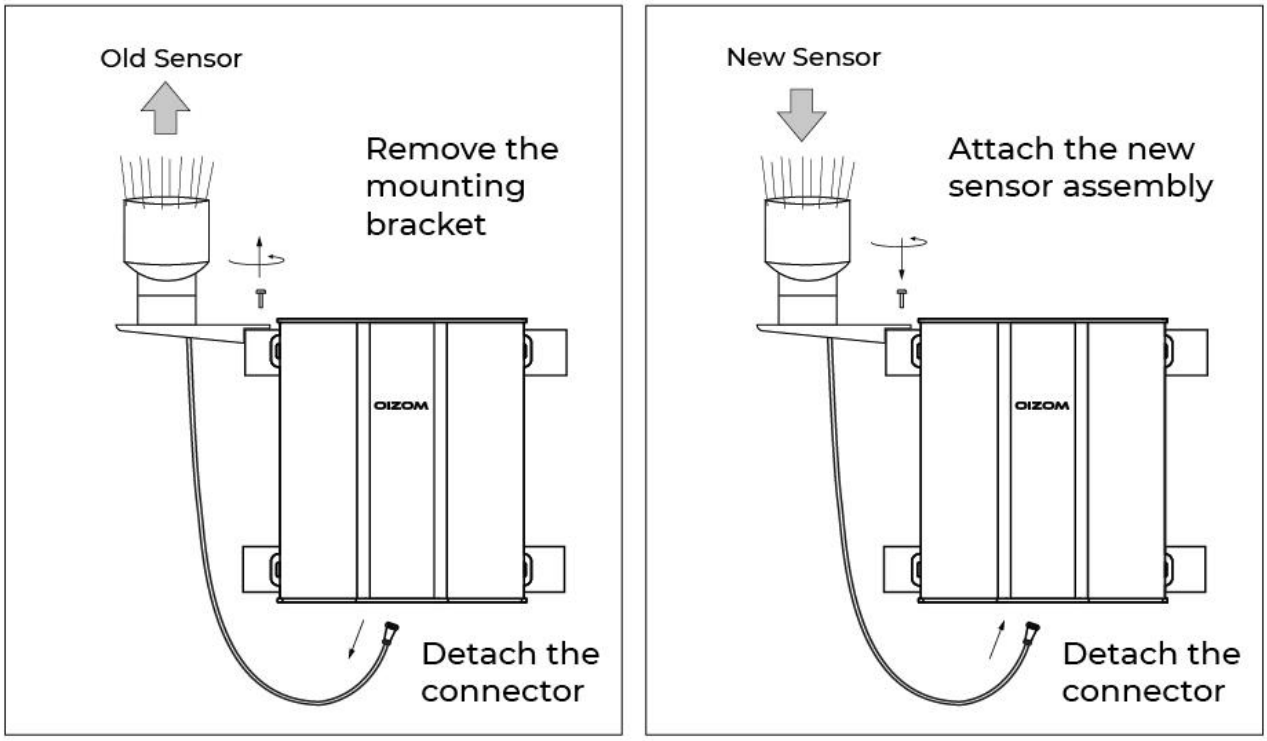


Figure 10..8 Replacement of rain sensor

10.3.6 Wind sensor

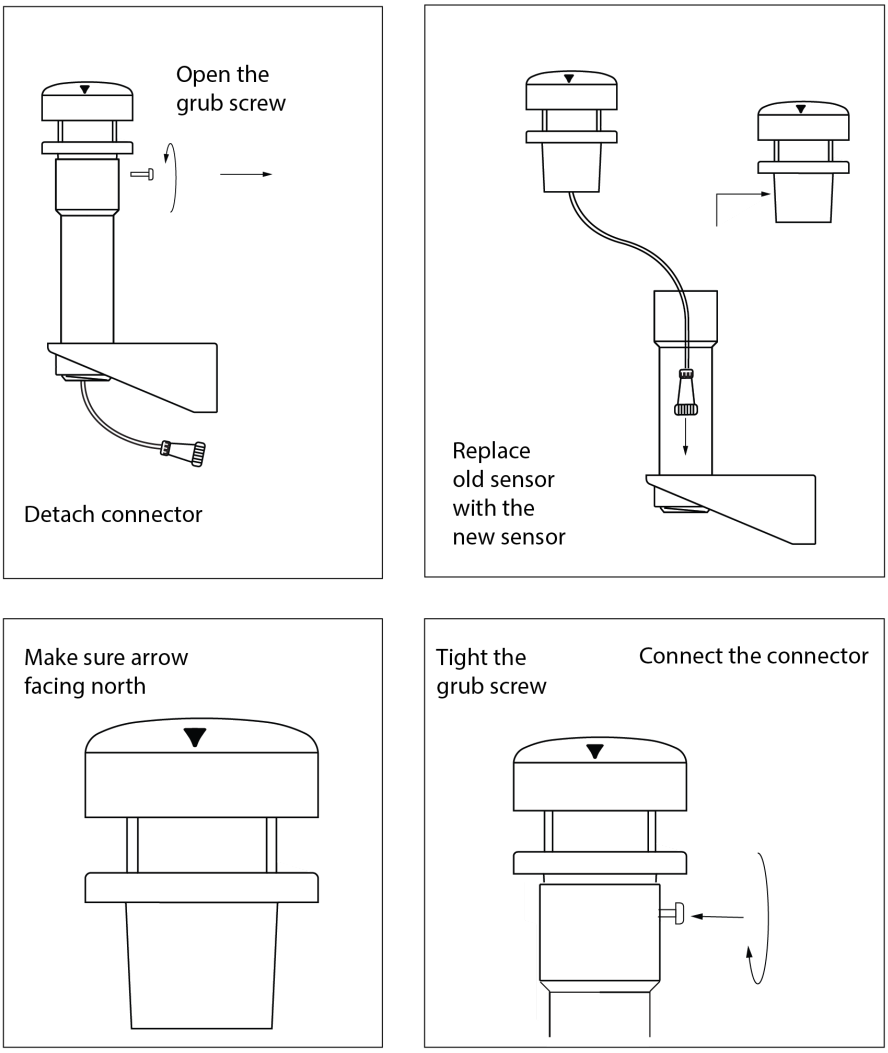


Figure 10.9 Replacement of wind sensor

Ensure that the monitor is switched OFF prior to performing the replacement activity. Remove the wind sensor connector from the device. You can locate the connector by viewing the labels on the bottom of the device. Now, unscrew the rain sensor and detach it from the mount. Replace the old sensor with a new one and fix it by screwing it on the mount. Ensure the arrow on the wind sensor faces the NORTH direction. Fix the wind sensor connector and switch ON the monitor.

10.3.7 Flood sensor

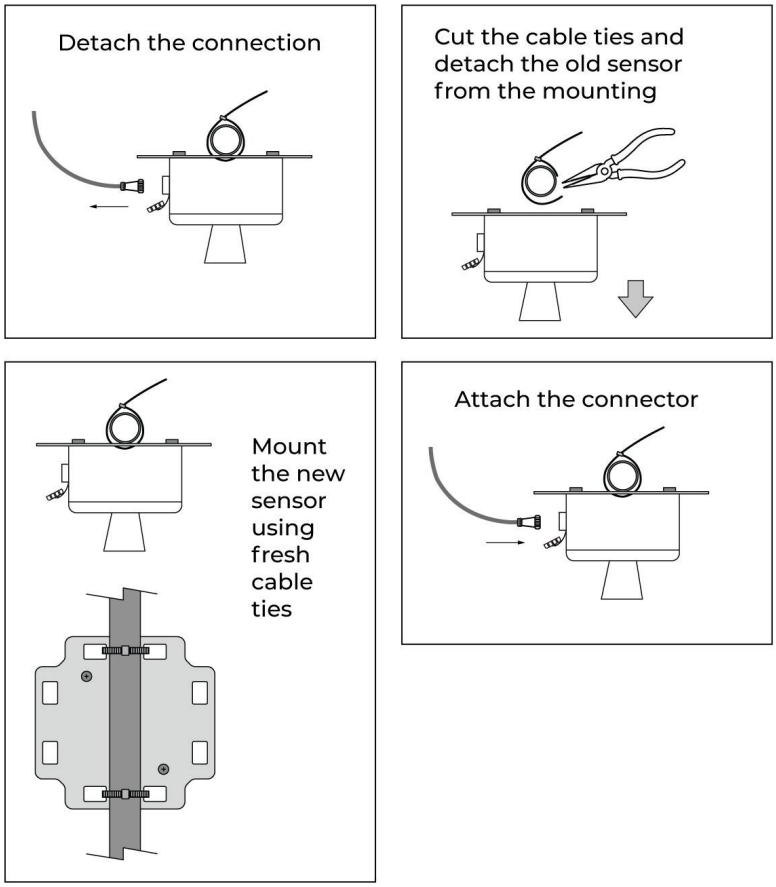


Figure 10.10 Replacement of flood sensor

Ensure that the monitor is switched OFF prior to performing the replacement activity. Remove the flood sensor connector from the device. You can locate the connector by viewing the labels on the bottom of the device. Now, unscrew the flood sensor mount from the device mounting bracket as shown in the figure. Remove the fasteners on the mount and replace the old sensor with a new one. Fix the new sensor on the mount with the help of fasteners. Firmly fix the flood sensor mount on the device mounting bracket by screwing. Fix the connectors and switch ON the monitor.

11. Diagnosis/Debugging

Power and network availability are the prime checks in case of equipment failure. If the issue is still unresolved after remote diagnosis, on-site troubleshooting can be planned by an engineer. Below table lists the types of alerts users can receive based on the faults.

Table 11.1 List of alerts

Parameter	Error Values (device data)	Message / Label
General	after installation (or relocation)	Stabilizing (for next 24 hrs)
General	if monitor online after 2 days due to battery discharge or power cut	Stabilizing (for next 24 hrs)
General	during calibration	Under Calibration
General	during maintenance	Scheduled Maintenance
General	battery > 5% & missing values for less than 24 hours	Possible Network issue
General	battery > 5% & missing values for more then 24 hours	Under Troubleshooting
CO2, CO, O2, Temperature, Humidity, Pressure, Noise	continuously 0 (for 24 hr)	Sensor Fault
CO2	< 200 ppm (for 24 hr)	Calibration Required
O2	< 19 or > 22% (for 24 hr)	Calibration Required
NO2, SO2, O3, NO,	continuously < 0 or > 20 ppb (for 2 days)	Calibration Required
Dust	> 900 (for 2 day)	Sensor Fault
Dust	0 (for 24hr)	Sensor Fault
Battery	< 5%	No Power Available
Rain	> 20" (24 hours)	Sensor Fault

12. Customer Support

Our remote support team is available for troubleshooting. Our system generates automated alerts in case of any malfunctioning and these alerts are received by our support team and issues are raised for our on-field well-trained service team who are equipped with tools and components provided by OIZOM. If you have any query or issue regarding the installation or functioning of our products, please reach out to our customer support team at the below-given contacts:

Generate Ticket: https://oizomsupport.freshdesk.com/support/login

Contact No: +91-8866660083 **Email Id:** support@oizom.com

Glossary

Enclosure	The Outer Body Of The Device.
Reference Station	Reference Grade Continuous Ambient Air Quality Monitoring Station (CAAQMs)
Co-location	Correlating Data By Placing Two Devices Side By Side
Spot Calibration	Calibration Of The Devices At The Site
Ambient Monitoring	Monitoring Of The Ambient Air Quality
Active Monitoring Technology	Air Sampling Technology Where The Sample Is Taken Inside The Device By Creating A Bio Mimicry Of The Human Lung
Odorant Dispersion Plume	Representation Of The Patter Of Odour Spread Due To Atmospheric Conditions, Terrains And Odour Sources
Odour Atmospheric Dispersion	The Phenomenon Of Odour Spread Due To Atmospheric Conditions
Suspended Particulate Matters (SPM)	Particulate Matter With Concentration Less Than 10 Microns
Respiratory Particulate Matters (RSPM)	Particulate Matter With Concentration Less Than 2.5 Microns
Total Suspended Particulates (TSP)	Particulate Matter With Concentration Less Than 100 Microns
Mounting Brackets	Metal Structure For Device Mounting On Pole Or Wall
Hose Clamps	Metal Device Use For Fixing The Mounting Bracket On The Pole
Mounting Plate	Metal Structure For Mounting The Device On The Mounting Bracket
Tipping Bucket	The Rain Sensor Mechanism Used For Measuring Rainfall
Ultrasonic Sensing	The Working Principle Where-Object Distance Is Measured By Ultrasonic Waves
Spirit Level	Instrument To Check Alignment
Flood Sensor Bracket	Metal Structure For Flood Sensor Mounting On Pole Or Wall
Motherboard	The Main Printed Circuit Board (Pcb) Placed Inside The Enclosure
Inlet Outlet Mesh	The Filter Caps Placed For Restricting Large Sized Dust Particles To Enter The Device.
Squeegee	A Scraping Implement With A Rubber-edged Blade Set On A Handle, Typically Used For Cleaning Windows.
UV Dome	The Dome Placed On The Top Of The Device Which Is For Sensing Uv And Visible Light
PSU	Power Supply Unit
Unstable Data	Any Data That Is Not Usual Or Varies Abruptly
Sensor Box	The Box Securing The Gas Sensors Inside The Enclosure
Thumb Screws	Hand Operated Screw For Opening/Closing The Sensor Box
Flood Sensor Mount	Metal Structure For Fixing The Flood Sensor On The Flood Sensor Bracket