

Polludrone®

Ambient Air Pollution Monitoring System

Polludrone is a Continuous Ambient Air Quality Monitoring System (CAAQMS). It is capable of monitoring various environmental parameters related to air quality, noise, odour, weather, radiation etc. It measures the particulate matter and gaseous concentrations in the ambient air in real-time. Using external probes, it can also monitor other auxiliary parameters like traffic, disaster etc.

Polludrone is an ideal choice for smart cities as well as urban infrastructure applications like roadside, campus, and airport monitoring. It is easily integrable with a Smart Pole/Intelligent Pole.

Product Variants

Variant Name	Application	Parameter
Polludrone Lite	General Purpose	PM _{2.5} , PM ₁₀ , CO ₂ , CO, Noise, Light, UV-Radiation, Temperature, Humidity
Polludrone Smart	Extensive	PM _{2.5} , PM ₁₀ , CO ₂ , CO, SO ₂ , NO, NO ₂ , O ₃ , Noise, Light, UV-Radiation, Temperature, Humidity
Polludrone Pro	Critical	PM ₁ , PM _{2.5} , PM ₁₀ , TSP, CO ₂ , CO, SO ₂ , NO, NO ₂ , O ₃ , H ₂ S, Noise, Light, UV-Radiation, Temperature, Humidity
External Modules	Optional	Wind Speed & Direction, Rainfall, Flood (integrable with all the 3 variants)



Smart City

Pollution monitoring at strategic locations in a smart-city empowers city authorities to obtain actionable insights for pollution control.



Road-side & Tunnels

Pollution monitoring at roads and tunnels can enable authorities to layout a pollution mitigation action plan.



Campus Monitoring

Pollution monitoring at key locations on campus allows stakeholders to spread awareness about environmental conditions of the premises.



Airports

Pollution and noise monitoring at taxiways and terminal surroundings facilitates airport authorities to analyze its impact on travellers and surrounding neighbourhoods

Product Features

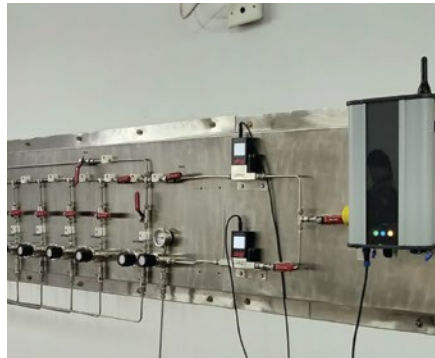
-  **Patent Pending Technology:** Works on innovative e-breathing technology for higher data accuracy
-  **Weather Resistant:** IP63 grade enclosure for endurance against harsh weather conditions
-  **Solar Powered:** Capable of running independently on solar power
-  **Tamper Proof:** Comes with a security system to avoid tampering / malfunction / sabotage
-  **Retrofit Design:** Plug and play design for ease of implementation
-  **Over-The-Air Update:** Automatically upgradeable from a central server without any onsite visit
-  **Compact:** Light-weight and compact system installed at 12-15 feet (4-5 m) height
-  **Real-Time Data:** Continuous monitoring and real-time data transfer at configurable intervals
-  **Ultimate Durability:** Made of high-grade engineering-metal and composite polymers for long life
-  **Network Agnostic:** Supports a wide range of connectivity options like GSM / WiFi / LoRa / NBIoT/ Ethernet
-  **Identity & Configuration:** Each equipment carries its unique identity with geo-tagging through wireless configuration
-  **3-level Calibration:** Can be calibrated by a third party nodal agency, reference station co-location and spot calibration for ultimate precision

Levels of Calibration



Factory Calibration

The sensors are bump tested at Oizom factory to check their proper functioning for each parameter.



Lab Calibration

Laboratory calibration is done in a controlled environment for all parameters to compensate for cross-sensitivity and ensure higher data accuracy.

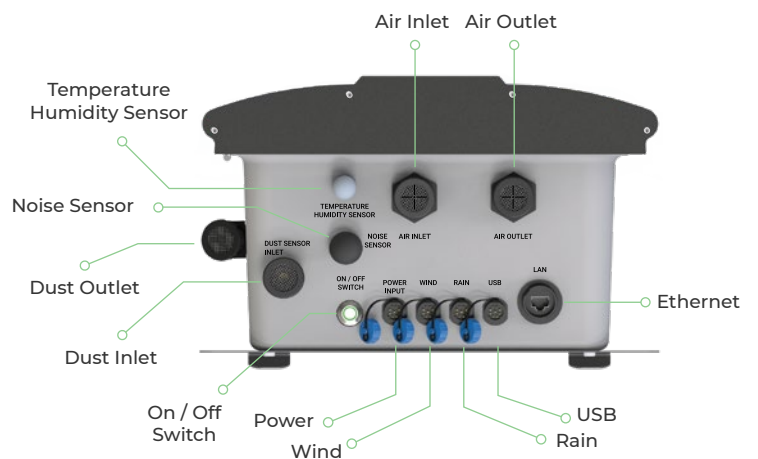


Collocation Calibration

The sensors are calibrated against a reference station before installation and their performance is tested in the ambient condition before final deployment.

General Specifications

Size	360mm (H) x 328mm (W) x 200mm (D)
Weight	9.8 Kg
Material	Aluminum Magnesium Alloy, Mild-steel (With Powder Coating), FRP
Certifications	CE & FCC Certified, PTCRB Certified Communication Module



Communication

Data Interval	2-30 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) for remote diagnosis, FOTA updates, and cloud calibration

Power

Avg. Power Consumption	2.5 Watt (Actual consumption depends upon the number of parameters)
Power Input Options	External 110-230V AC 50-60Hz, 40Watt Monocrystal Solar Panel
SMPS Specs	24V, 2Amps output from either of the power inputs
Battery Backup Time	Up to 48 Hours
Battery Specs	Lithium iron phosphate (LiFePO4) battery cell with rated voltage 12.8V Capacity 6Ah

	Connectivity Options	Specification
Wireless	GSM	Global 2G / 3G
	LORA	868 MHz, 915 MHz
	LTE	CAT-M1
	NB-IoT	CAT-NB1
	Sigfox	868 to 869 MHz, 902 to 928 MHz
Wired	Ethernet	10BaseT/100BaseTx
	Modbus	RS485 RTU

Environmental Performance

Operating Temperature	-20 °C to 60 °C
Optimum Temperature	25 °C to 35 °C
Optimum Humidity	0-95%
Weather Protection	IP63

Parameters

ID	Parameter	Range	Resolution	Min. Detection	Error / Drift	Working Principle	Measurement Principle	Sample Rate	Expected Sensor Life
PM _{2.5}	Suspended Particulate Matters with size less than 2.5µ	Upto 1000 µg/m ³	0.1 µg/m ³	1 µg/m ³	Upto ±10 %	Light Scattering & Optical Particle Counter for Polludrone Pro	Active Sampling	1 L /min	1 year & 1.5 year for Polludrone Pro
PM ₁₀	Suspended Particulate Matters with size less than 10µ	Upto 5000 µg/m ³ for Polludrone Pro							
PM ₁	Ultra Fine Particulate Matters with size less than 1µ	Upto 5000 µg/m ³							
PM ₁₀₀	Total Suspended Particulates (TSP)	Upto 30000 µg/m ³							
CO ₂	Carbon Dioxide	Up to 5000 ppm	1 ppm	20 ppm	< ±5 ppm / Year	NDIR		325 mL per sample	2 years
CO	Carbon Monoxide	0-1000 ppm	10 ppb	100 ppb	< ±100 ppb / Year	Electrochemical			
SO ₂	Sulfur Dioxide	0-20 ppm	1 ppb	10 ppb	< ±20 ppb / Year				
NO	Nitric Oxide	0-20 ppm	1 ppb	10 ppb	< ±50 ppb / Year				
NO ₂	Nitrogen Dioxide	0-20 ppm	1 ppb	10 ppb	< ±20 ppb / Year				
O ₃	Ozone	0-20 ppm	1 ppb	10 ppb	< ±20 ppb / Year				
H ₂ S	Hydrogen Sulfide	0-100 ppm	1 ppb	10 ppb	< ±100 ppb / Year				
Noise	Ambient Noise	Upto 140 dB	1 dB	30 dB	2% / Year	Capacitance	Passive Monitoring	N.A.	3 years
Li	Light Intensity	Up to 1,00,000 Lux	1 Lux	1 Lux	N.A.	Photo-conductivity			
UV	UV Radiation (0-12 UVI)	0.1-100,000 uW/cm ²	0.1 uW/cm ²	0.1 uW/cm ²	N.A.				
Lv	Visible Light Intensity	Up to 5000 Lux	0.1 Lux	0.1 Lux	N.A.				
Temp	Temperature	-20 to +85 °C	0.01°C	-20 °C	N.A.	Solid state semi conductor sensing			
Hum	Humidity	Up to 100% Rh	0.1%	0.1%	N.A.				
Bmp	Barometric Pressure	300-1100 hPa	0.18 Pa	300 hPa	±1.0 hPa / Year				

External Modules

(optional)

1  **Rain Sensor:**
 Tipping Bucket
 In mm / inch

2  **Wind Sensor:**
 Ultrasonic sensor
 360°, 0-60 m/s

3  **Flood Sensor:**
 Ultrasonic sensor
 Upto 765 cm

Functional Specification

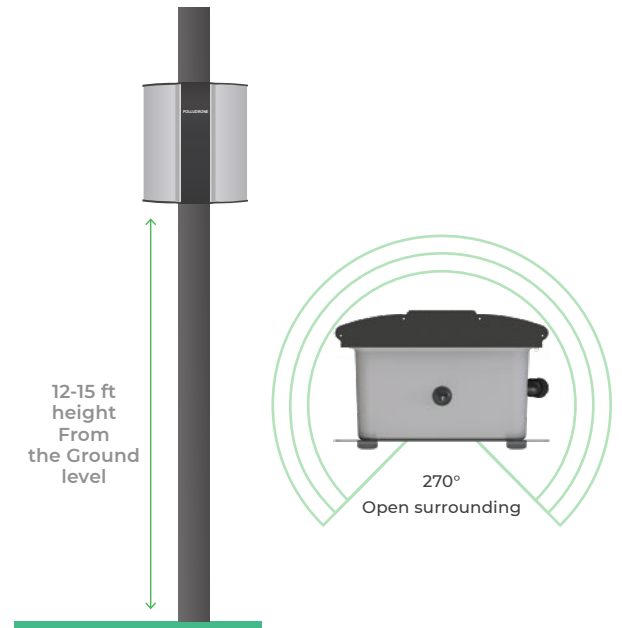
Strategic Location Selection:

Proper location selection is critical for optimized data collection. It varies as per the purpose of the project. According to USEPA QA handbook (Vol II, Section 6.0 Rev.1), the selection of locations should be based on monitoring purposes such as:

- Real-time air quality public reporting
- Research monitoring
- Trends monitoring
- Compliance monitoring
- Emergency episode monitoring

Installation:





Preferred Mounting	Pole / Wall (preferably 270° open surrounding)
Installation Height	12-15 feet (4-5 meters)
Direction	As per maximum direct sunlight exposure (if ambient-light monitoring is a preference)
Power Availability	Constant AC supply within a 5-meter range from the unit or solar panel
Network Availability	Uninterrupted network connection



Operation:

When the device is powered on, the device 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 device flushes out old air sample 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

Maintenance:

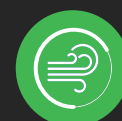
-  **Cleaning:** Periodic cleaning is important to ensure optimum device performance. Monthly or quarterly regular maintenance activity has to be carried out depending upon the surrounding. The activity includes cleaning the dome for the light sensor, air inlet, and outlet mesh & general cleaning of the exterior.
-  **Sensor Replacement:** 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.
-  **Spot-Calibration:** The frequency of calibration is decided based on atmospheric conditions and individual sensor drift to ensure data accuracy. Spot calibration can be performed using reference equipment which can also be a recently calibrated Oizom device.
-  **Diagnosis/Debugging:** Power and network availability are the prime check in case of equipment failure. If the issue is still unresolved after remote diagnosis, on-site troubleshooting can be planned by an engineer.



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