Airborne Underwater Geophysical SIGNALS

AirSENCE™

ADVANCED
ACCURATE
AFFORDABLE

Continuous Ambient Air Quality
Micro-Monitoring Station
(micro-*CAAQMS*)

Low-cost sensor-based air monitoring systems are ready to meet the ambient air quality monitoring needs of today

AirSENCE is an **Advanced**, **Accurate** & **Affordable** continuous ambient air quality monitoring micro-station (micro-CAAQMS) which provides continuous, real-time, accurate, and reliable measurements of air pollution and local weather data.

It provides concentrations for gaseous pollutants including NO, NO_2, CO, O_3, SO_2, VOC, H_2S, CO_2, NH_3 (ammonia), and CH_4 (methane) in addition to all particulate matter fractions such as PM_{10}, $PM_{2.5}$, and PM_1. Local weather and environmental data such as wind speed and direction, noise, rainfall, and light can also be measured. Temperature, humidity, and atmospheric pressure are included in all devices.

AirSENCE has been developed in collaboration with the **Southern Ontario Centre for Atmospheric Aerosol Research** (SOCAAR) at the **University of Toronto**, a leading research institute in its domain. It incorporates a fast-response, multi-parameter sensor array and robust machine learning-based signal processing and data fusion to provide an Internet of Things (IoT) network for real-time, 24/7 ambient air monitoring.

AirSENCE is applicable for a variety of ambient air monitoring applications including:

- **Urban pollution monitoring**
- **Industrial fence-line monitoring**
- **Ambient air quality research**
- **Air monitoring linked to quick action plans**
- **And many more….**

AirSENCE is highly effective for applications that demand a fast response to air pollution events like school air quality measurements, particulate monitoring on railway stations and/or loading stations, air monitoring of airports and seaports, early wildfire detection and localization, etc. It is also an ideal and economical solution for large, critical projects like urban baseline data collection.

AirSENCE can be a cost-effective partner for your air monitoring needs as it provides accurate data, simple operation, portability, advanced communication, and secured cloud storage with minimal maintenance requirements. It is everything that you expect in a low-cost air monitoring station.

AirSENCE is ideally suited by design to complement and support stationary ambient air quality stations by enabling efficient and accurate ambient air mapping.

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AirSENCE – SALIENT FEATURES

ACCURATE DATA

Data generated by **AirSENCE** shows high correlation with reference system data.

HIGH RESOLUTION DATA

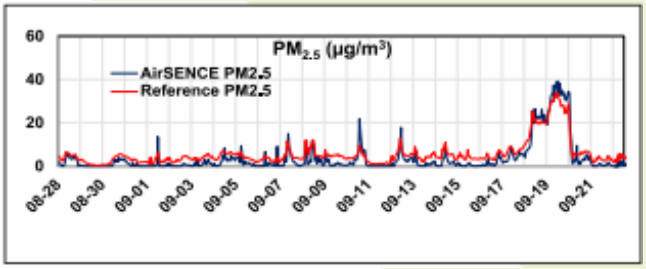
AirSENCE provides high temporal resolution by generating continuous real-time data every minute. Users may opt for data with longer intervals, depending on requirements.

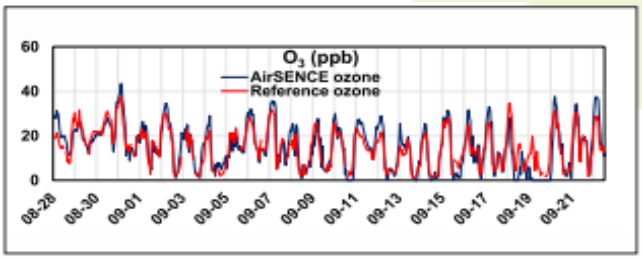
LOW POWER CONSUMPTION

AirSENCE has an average power consumption of only 5 Watts and can be operated using direct power, solar power, or external battery.

MODULAR DESIGN

AirSENCE has a plug-and-play sensor design and sensors can be replaced on the field in minutes.





TINY FOOTPRINT

AirSENCE is small and lightweight, making it portable and easy to install.

ANYWHERE INSTALLATION

AirSENCE can be installed on a pole or on any vertical surface.

WEATHERPROOF ENCLOSURE

AirSENCE has an IP65 rated weatherproof polycarbonate enclosure that allows installation in virtually any climate.

MULTIPLE COMMUNICATION MODES

AirSENCE offers different communication modes including Wi-Fi, Ethernet, Worldwide Cellular (2G-5G), LoRaWAN, and Modbus over RS485 or TCP/IP.

DATA STORAGE & ACCESS

Every **AirSENCE** device stores data on a cloud server with web-browser-based secure access having individual user-ID and password. Users can access data anytime from anywhere using a computer or any mobile device.

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GENERAL SYSTEM SPECIFICATIONS

Physical

Dimensions	322mm × 239mm × 177 mm (12.7" × 9.4" × 7.0")
Weight	2.2 kg (4.8 lbs)
Operating Temperature Range	-35 – +55°C
Operating Pressure Range	30 – 110 kPa (4.35 – 15.95 psi)
Humidity Range	0 – 95% RH
Communication	Ethernet, Wi-Fi, Worldwide Cellular Coverage (2G – 5G), LoRaWAN, Modbus over RS485 or TCP/IP
Enclosure Details	
Material	Polycarbonate
Rating	NEMA 4 / 4X IP65 sealing
Mounting Options	Pole mount or wall mount (kits available)

Electrical

Power Supply	9 – 36 VDC; PoE support
Power Consumption	Typical 5 W, Max 8 W
Certification	CE

DATA MANAGEMENT

Data Computing and Storage

AirSENCE has an on-board micro-computer with the following specifications:

Computer Type	Micro-computer for IoT applications
Brand	Onion Omega
Mounting	Surface Mount
Computing	Drop-in Wi-Fi-enabled Linux computing
Dimensions	34 x 20 x 2.8 mm
Components	Built-in CPU, memory and flash storage
Processor	580 MHz MIPS MT7688AN CPU
Other Features	USB, Ethernet, 2xUART's, I^2C, GPIOs interfaces
Storage	32 GB (stores data for >5 years)

Data Accessibility

- Data is recorded at 1-minute intervals and is user-configurable for longer intervals.
- Finalized data is transferred from **AirSENCE** to **AirSENCE** cloud server or user's private server.
- Data is never handled by external software during transfer from **AirSENCE** to cloud server.
- Data can be viewed on **AirSENCE** dashboard using individual secure login credentials.
- Users can view and compare data of multiple **AirSENCE** devices on a single dashboard.
- Downloading data can be averaged over configurable intervals such as 1-minute, 2-minute, 15-minute, 30-minute, or 1-hour.

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SENSORS SPECIFICATIONS

Parameter/Pollutant	Detection	Optional Weather Sensor
Particulate Matter <10 µm (PM_{10})	0–6,000 µg/m^3	Wind Speed & Direction
Particulate Matter <2.5 µm ($PM_{2.5}$)	0–6,000 µg/m^3	Rain Gauge
Particulate Matter <1 µm (PM_1)	0–6,000 µg/m^3	Noise
Nitric Oxide (NO)	0–6,000 ppb	Solar & UV Radiation
Nitrogen Dioxide (NO_2)	0–10,000 ppb	
Carbon Monoxide (CO)	0–8,000 ppb	
Ozone (O_3)	0–10,000 ppb	
Sulfur Dioxide (SO_2)	0–10,000 ppb	
Carbon Dioxide (CO_2)	0–10,000 ppm	
Hydrogen sulfide (H_2S)	0–2,000 ppb	
Volatile Organic Compounds (VOCs)	0–40 ppm	
Ammonia (NH_3)	0–10,000 ppm	
Methane (CH_4)	0–10,000 ppm	

RECONFIGURED MODELS

AirSENCE DUST-WATCH

Configuration:

PM Sensor (PM_{10}, $PM_{2.5}$, PM_1),
Temperature, humidity, wind speed and wind direction, ambient noise

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AirSENCE STANDARD

Configuration:

NO, NO_2, CO, O_3, SO_2, PM (PM_{10}, $PM_{2.5}$, PM_1),
Temperature, humidity, wind speed and wind direction

AirSENCE PRO

Configuration:

NO, NO_2, CO, O_3, SO_2, PM (PM_{10}, $PM_{2.5}$, PM_1),
Temperature, humidity, wind speed and wind direction, ambient noise

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AirSENCE ELITE

Configuration:

NO, NO_2, CO, O_3, SO_2, VOC, CO_2, H_2S, PM (PM_{10}, $PM_{2.5}$, PM_1),
Temperature, humidity, wind speed and wind direction, ambient noise, rainfall

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URBAN CITY MONITORING

Air monitoring in urban areas has become a necessity due to the exponential growth of cities. Emissions from increasingly dense vehicular and infrastructure activities are the major sources of air pollution in these areas and have completely changed the air quality characteristics of major cities around the world. Most of these cities still lack comprehensive air pollutant baseline data which is a major hurdle in formulating development strategies and infrastructure planning.

Conventional air monitoring systems have severe limitations for creating spatial and temporal pollution maps because of their size and cost. Cities currently in need of air mapping require networks of low-cost air monitoring systems rather than measurements at just a few locations.

The Advanced, Accurate and Affordable features of **AirSENCE** are the perfect fit for creating urban air mapping networks. Its small footprint, low initial cost of procurement, accuracy of results, ease of installation, operation and maintenance, and autonomous operation and data handling make it an ideal choice for urban air quality monitoring.

Recommended Model: AirSENCE PRO

THERMAL POWER PLANT

Coal-based power plants continue to be operated on a massive scale around the world. They are major contributors to the world's air pollution because of the sheer volumes of coal they burn coupled with insufficient treatment of their emissions.

Major air pollutants emitted to the atmosphere from coal-based thermal power plants are particulates, NO_X and SO_X. Particulate matter generated during coal combustion includes fly ash as well as fine particles of sulphate, nitrate, and un-combusted coal. Due to the great height of power plants stacks, severe effects of these emissions show up several kilometers downwind of these plants and can extend for several hundred kilometers.

As a micro-CAAQMS, **AirSENCE** provides real-time continuous measurements of all PM fractions and other gaseous pollutants along with essential weather parameters. Its unique features make it an ideal solution to monitor ambient air around thermal power stations.

Since most of these plants are situated at remote locations, features like low cost of procurement, ease of installation, autonomous operation, low maintenance cost, remote data storage, accessibility of data on smartphone, and networking of devices make **AirSENCE** the best solution for this highly critical application.

Recommended Model: AirSENCE STANDARD

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CEMENT PLANTS

While cement is an essential raw material for the development and continued growth of any country, its production is a major contributor to the world's total air pollution load. Every aspect of the cement industry contributes to the problem, including extraction & transportation of raw materials, manufacturing, and transportation of the finished product.

The cement industry heavily emits both gaseous as well as particulate pollutants. Major gaseous pollutants emitted during the manufacturing process are CO_2, CO, NO_X, and VOCs. Particulate pollutants are produced at every stage of cement manufacturing from raw material extraction to finished product transportation, and include all PM fractions: PM_{10}, $PM_{2.5}$, and PM_1.

As a micro-CAAQMS with sensors for NO, NO_2, CO_2, VOC and PM, as well as wind speed and direction, **AirSENCE** provides a tailor-made solution for real-time continuous monitoring of ambient air in and around cement industries. Features like cost effectiveness, operational simplicity, lack of routine maintenance protocols, and ease of data storing and viewing makes it the complete air monitoring solution for cement manufacturers.

Recommended Model: AirSENCE STANDARD

CHEMICAL INDUSTRIES, REFINERIES & INDUSTRIAL AREAS

Chemical industries and refineries are major global sources of many gaseous pollutants, particularly VOCs. These industries are critical contributors to the world's overall air pollution load as they emit pollutant gases not only during their manufacturing processes but also during the transportation of raw materials and finished products.

VOCs emitted from such plants are now a major cause of concern for authorities and citizens situated around them, as these compounds are an indirect but major contributor in smog generation. VOCs and NO_2 in ambient air generate tropospheric O_3 in the presence of sunlight. This tropospheric O_3 generates smog when combined with $PM_{2.5}$ particles and NO_2, and is a major nuisance around the world as it leads to road accidents and respiratory diseases.

AirSENCE is a micro-CAAQMS with a full range of gas sensors making it an ideal solution for continuously monitoring ambient air in and around such chemical plants and refineries. **AirSENCE** can be effectively used by authorities to carry out air pollution monitoring of areas with chemical industries as well as residential areas in their vicinities. Data provided by **AirSENCE** can be best utilized by authorities to understand how and to what magnitude these air pollutants infiltrate into residential areas and take appropriate remedial measures.

Recommended Model: AirSENCE ELITE

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AIRPORTS / RAILWAY STATIONS / SEAPORTS

Nowadays it has become essential to monitor air in and around mass commuting areas like airports, railway stations, and even seaports.

Ambient air around any airport usually has high concentrations of particulate matter and gaseous pollutants like NO, NO_2, and VOCs, which are emitted as a result of aircraft operation as well as transportation and fueling. These pollutants are able to infiltrate into airport terminals and severely affect the well-being of travelers and employees. High commuter turnouts also elevate CO_2 and noise levels inside the terminals.

AirSENCE, with sensors for all gaseous and PM pollutants combined with ambient noise sensing, provides a tailor-made solution for airport authorities to monitor external and internal air. The advanced features and accurate data of **AirSENCE** allow authorities to take immediate corrective actions.

Railways and seaports also have remarkably high concentrations of particulate & noise pollution. Continuous movement of trains causes particulate matter to enter inside railway stations, while high commuter volumes, public address announcements, and train horns increase noise pollution and affect commuters adversely. Similarly for seaports, the continuous loading and unloading of ships generate substantial amounts of particulate pollution, as well as very high levels of noise coming from high decibel ship horns.

Recommended Model: **For Airports** AirSENCE ELITE
For Railway Stations & Seaports AirSENCE DUST-WATCH

SCHOOL PREMISES MONITORING

Various studies by well-known universities have explicitly shown that air pollution in schools is a major cause of poor performance and attendance of students since they spend much of their time on school premises.

Due to increased social awareness, parents around the world are now knowledgeable of the high health hazards associated with air pollution and they are raising their concerns with school authorities regarding this issue.

AirSENCE, with its small footprint, ease of operations and maintenance, and the capability to display air monitoring results on LCD screens, is a first-rate solution for school management. Online displays of air quality measurement results impart much-needed confidence to parents and enhance a school's reputation.

Recommended Model: AirSENCE STANDARD

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AIR QUALITY RESEARCH

In recent decades there have been major technological developments in air monitoring instrumentation and methods. Air quality research institutes are working on various applications like determining the sources and compositions and transportation of air pollution, conducting exposure assessments, improving monitoring capabilities, and supporting public health research.

The extensive research done at these institutes enables the formulation of more effective and targeted air quality management solutions. Researchers are developing, evaluating, and applying measurement and monitoring capabilities to better characterize source emissions, air quality, and human and environmental exposures for both individual pollutants and mixtures of air pollutants.

AirSENCE, a comprehensive micro-CAAQMS with all relevant gas, particulate, and weather sensors, provides a powerful tool for researchers to carry out short- and long-term studies at various locations. Features like small footprint, light weight, easy portability, ability to operate in all climates, accurate data, easy operation, low maintenance, and smartphone accessibility make **AirSENCE** a premium tool for modern air quality research.

Recommended Model: AirSENCE ELITE

AIR MONITORING AROUND LANDFILL SITES

Megacities produce vast quantities of solid waste, and landfills create major headaches for municipalities around the world. In addition to obnoxious odours, major components of landfill emissions include CO, NO_X, SO_2, CO_2, particulate matter, and VOCs.

AirSENCE, a micro-CAAQMS, provides an effective solution for fence-line monitoring of landfill sites. All relevant gas and particulate sensors are integrated in a small and lightweight enclosure, making **AirSENCE** the perfect tool for monitoring landfill air emissions. Easy installation, autonomous operation, low maintenance, and smartphone accessibility enable authorities to measure air pollutants of such hazardous sites very effectively from remote locations.

Recommended Model: AirSENCE ELITE

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We are worldwide!

Find AirSENCE deployments in 15 countries across 4 continents to date.