OUTDOOR AIR QUALITY MONITORING Ensure good air quality by measuring pollution accurately

The most advanced and reliable solution



Measure multiple pollutants accurately with the most versatile air quality solution.

About us

With clients in more than 60 countries and devices operating all over the five continents, Kunak is today a reference in technological development and innovation in the field of environmental monitoring, with an annual growth rate higher than 90% in the last 6 years.

We design, manufacture and market innovative products and solutions for the environmental, air quality and pollution monitoring market.

We are a reference company for the measurement of gases, particles and odours present in the air with a great international recognition endorsed by air quality experts such as the United States Environmental Protection Agency (US EPA), the French Environmental Agency, the World Health Organisation (WHO) and the United Nations Environment Programme (UNEP).

We manufacture reliable solutions for accurate gas & particles analysis and environmental monitoring.

Awarded by US EPA and Airparif

MCERTS certification

More than 200 customers

Devices deployed in 60+ countries

Patented technology

A comprehensive solution



Kunak AIR Pro Air quality monitor



Kunak AIR Lite Air quality station





Smart cartridges Air quality sensor

Kunak AIR Cloud Air quality software

Companies that rely on us











BR

PETROBRAS













www.kunakair.com 3



Kunak AIR Pro

Air quality monitor





Measure air pollution with accurate and reliable data.

SENSOR BASED | NEAR REFERENCE DATA

Monitor up to 5 gas pollutants and particles simultaneously and get continuous and real-time data on the ambient air. Kunak AIR Pro allows you to measure various air pollutants in different environments, obtaining near-reference data.

All collected data can be visualised and analysed anywhere and anytime via Kunak AIR Cloud web platform.

Get the most versatile solution. The patented smart gas cartridge technology allows you to choose different pollutants depending on the project needs. Switch them whenever you need to.

Data quality is guaranteed. All of our sensors are factory calibrated and tested according to Class 1 of the European CEN/TS 17660.

Data traceability to reference standards: European Directive 2008/50/ EC and USEPA 40 CFR Part 53.



Patented cartridge system



Traceable back to reference standards



Multiple pollutants



Remote calibration



MCERTS certified CSA MC230418/00



Simplify your daily operations. Make better decisions.

Kunak AIR Pro air quality station was awarded The Most Accurate Multi Pollutant Sensor in 2021 and 2023 AIRLAB Microsensors Challenge editions organised by Airparif.

Our solution has been tested by the world's leading air quality experts:















4 www.kunakair.com

South Coast



Kunak AIR stations offer performance levels close to reference standards, providing reliable, accurate data according to Class 1 of the European CEN/TS17660 and traceable data to international recognised standards (European Directive 2008/50/EC and USEPA 40 CFR Part 53).

Specifications

Dimensions	257 x 270 x 225 mm
Weight	< 3.5 kg
Enclosure	PMMA & Polycarbonate & Stainless steel
Operating temp.	-20 °C to 60°C
Operating RH	0 to 99 %RH
IP rating	IP65
Battery	Lithium 26 Ah
External supply	7 - 12 Vdc. charger or solar panel
Autonomy	24/7 with charger or solar panel 9-30 days operation on battery (depending on configuration)
Power consumption	0.08 - 1.2W (depending on configuration)
Communications	Multi-Band 2G/3G/4G, Ethernet and Modbus RTU Slave
GNSS	GPS and GLONASS

Gas sensors	$CO, CO_2, NO, NO_2, O_3, SO_2, H_2S, NH_3, CH_4, VOC, HCI$
PM sensor	$\text{PM}_{\text{\tiny 1}^{\text{\prime}}}\text{PM}_{\text{\tiny 2.5}},\text{PM}_{\text{\tiny 4}},\text{PM}_{\text{\tiny 10}}\text{TSP}\text{and}\text{TPC}$
Internal status	Temperature, battery, charging voltage and current, and signal
Built-in sensors	Temperature, humidity, atmospheric pressure and dew point
Connectors	 #1: Power 7V to 12V or Ethernet #2: Modbus RTU Slave #3: Sound meter, UV #4: WBGT, Pyranometer, Modbus RTU Master #5: Anemometer & Rain Gauge
Sampling freq.	3Hz gases, 0.25Hz particles
Avg. periods	From 10 seconds to a maximum of 24 hours
Sending periods	From 5 minutes to a maximum of 24 hours
Remote management	Bidirectional communications Remote configuration and calibration
SIM	Embedded eSIM and SIM extra holder



Kunak AIR Lite

Air quality station



Take quick and effective actions based on accurate and reliable data.

INDUSTRY GRADE DESIGN | NEAR REFERENCE DATA

Monitor pollution levels and make quick and effective decisions to protect human health and the environment. With the Kunak AIR Lite air quality monitoring station, you get accurate data on different pollutants easily, quickly, and cost-effectively.

Designed for industrial applications and massive deployments in cities.

Thanks to the patented smart cartridge technology, you can measure particulate matter (PM₁, PM_{2.5} and PM₁₀) and 2 gases simultaneously. Replace the cartridges as your project changes without the need of sending the device back to the factory.

Designed for projects where no more than 2 gases and particles need to be measured.

Data quality is guaranteed. All of our sensors are factory calibrated and tested according to Class 1 of the European CEN/TS 17660.

Data traceability to reference standards: European Directive 2008/50/ EC and USEPA 40 CFR Part 53.





Patented cartridge system



Traceable to reference standards چې ا

2 gases and particles



Autonomous operation



Proven accuracy



All collected data can be visualised and analysed anywhere and anytime via the Kunak AIR Cloud web platform.



Kunak AIR Lite air quality station was awarded The Most Accurate Multi Pollutant Sensor in the latest AIRLAB Microsensors Challenge edition organised by Airparif.

Our solution has been tested by the world's leading air quality experts:

















6 www.kunakair.com



Kunak AIR stations offer performance levels close to reference standards, providing reliable, accurate data according to Class 1 of the European CEN/TS17660 and traceable data to international recognised standards (European Directive 2008/50/EC and USEPA 40 CFR Part 53).

Specifications

Dimensions	200 x 153 x 185 mm
Weight	< 2.3 kg
Enclosure	PMMA & Polycarbonate & Stainless steel
Operating temp.	-20 °C to 60°C
Operating RH	0 to 99 %RH
IP rating	IP65
Battery	Lithium 20 Ah
External supply	7 - 12 Vdc. charger or solar panel
Autonomy	24/7 with charger or solar panel 9-20 days operation on battery (depending on configuration)
Power consumption	0.08 - 0.55W (depending on configuration)
Communications	Multi-Band 2G/3G/4G, Ethernet and Modbus RTU Slave
GNSS	GPS and GLONASS

Gas sensors	$CO, CO_2, NO, NO_2, O_3, SO_2, H_2S, NH_3, CH_4, VOC, HCI$
PM sensor	$\text{PM}_{1},\text{PM}_{2.5}\text{and}\text{PM}_{10}$
Internal status	Temperature, battery, charging voltage and current, and signal
Built-in sensors	Temperature, humidity, atmospheric pressure and dew point
Connectors	 #1: Power 7V to 12V #2: Several options to choose from: Option 1: Anemometer & Rain Gauge Option 2: Modbus RTU Master Option 3: Sound meter Option 4: Modbus RTU Slave Option 5: Ethernet
Sampling freq.	3Hz gases, 1Hz particles
Avg. periods	From 10 seconds to a maximum of 24 hours
Sending periods	From 5 minutes to a maximum of 24 hours
Remote management	Bidirectional communications Remote configuration and calibration
SIM	Embedded eSIM and SIM extra holder

Manage air quality with reliable and accurate data.

Smart gas cartridges

Description

Kunak AIR stations are sensor-based devices equipped with slots to insert the smart gas cartridges. These cartridges solve many of the known issues of sensor technology as sensor variability, factory and field calibration, automatic data invalidation, sensor replacement, network operation and maintenance work.

The Smart gas cartridges ensure measurement control throughout the life cycle of each sensor.

Kunak AIR stations are the most sustainable solution on the market as most of the electronic and mechanical parts can be reused and recycled, making them the most sustainable air quality solution on the market.



Near reference data Traceable QC & QA







Endless combinations

Accurate real-time pollutant value without the need for external instruments or reference data Each cartridge is calibrated and validated individually in lab against traceable reference standards. Consistent readings across all equipment and locations, correcting implicit sensor variability.



Patented GasPlug[™] technology

All cartridges are the same size and fit into any of the available slots. Inside the cartridge, we install the sensor into a PCB that stores all the information regarding type, age, and factory calibration. When you plug the cartridge, the basestation just reads the information, configures itself and starts working.

Select the pollutants you need to measure. Replace them anytime.



Carbon monoxide

Where is it found?

Carbon monoxide (CO) is found in fumes produced any time fuel burns in cars or trucks, small engines, stoves, lanterns, grills, fireplaces, gas ranges, or furnaces.

Improperly ventilated appliances and engines, particularly in a tightly sealed or enclosed space, may allow carbon monoxide to accumulate until dangerous levels.

Why is it harmful?

CO is an odourless and colorless pollutant. When CO is inhaled into the body, it mixes with the blood avoiding oxygen absorption.

The CO exposure of a person at high concentrations over a certain period of time can cause illness and even death.

CO cartridge

The carbon monoxide cartridge has a built-in electrochemical sensor with very low electronic noise allowing the measurement from very low concentrations (ppb) up to several ppm. To cover different applications, there are two measurement ranges:

- Type A: measures most common concentration range up to 12,000 ppb.
- Type B: optimised for a higher range version that can measure up to 500 ppm, not so precise at low concentrations.

This cartridge is very stable over time and, in non-extreme environments, can last several months longer than specified.

Туре	Electrochemical	Limit of
Unit of measurement	µg/m³, ppb ^(A) mg/m³, ppm ^(B)	Repeat
Measurement range (1)	0 - 12,000 ppb ^(A) 0 - 500 ppm ^(B)	Respor
Resolution ⁽²⁾	1 ppb ^(A) 0.01 ppm ^(B)	Typical
Operating temp. range (3)	-30 to 50 °C	Typical
Operating RH range ⁽⁴⁾	0 to 99 %RH	Typical
Recommended RH range (4)	15 to 90 %RH	
Operating life (5)	> 24 months	Туріса
Guarantee range (6)	1,000 ppm	DQO - 1

Limit of Detection (LOD) (7)	10 ppb ^(A) 0.02 ppm ^(B)
Repeatability ⁽⁸⁾	20 ppb ^(A) 0.05 ppm ^(B)
Response time (9)	< 30 sec ^(A) < 180 sec ^(B)
Typical accuracy ^{(11) (12)}	± 80 ppb ^(A) ± 0.1 ppm ^(B)
Typical precision R ^{2 (10)}	> 0.85
Typical slope (10)	0.78 - 1.29
Typical intercept (a) (10)	$-50 \text{ ppb} \le a \le +50 \text{ ppb}^{(A)}$ -0.1 ppm $\le a \le +0.1 \text{ ppm}^{(B)}$
DQO - Typical U(exp) (13)	< 20%
Typical Intra-model variability (14)	< 3 ppb ^(A) < 0.05 ppm ^(B)

' See notes on page 24

Carbon dioxide



Carbon dioxide (CO_2) is a result of normal cell function when it is breathed out of the body. Besides, it is an essential element in photosynthesis, the process by which plants make food and energy. Levels of atmospheric CO_2 have increased since the Industrial Revolution.

The primary causes are deforestation and the burning of fossil fuels such as coal, for electricity, heat production and for transportation (cars, ships, planes, etc.). It could also be formed, as a secondary pollutant, by CO oxidation.

Why is it harmful?

CO₂ is the fourth most abundant gas in the Earth's atmosphere being the main greenhouse gas. It is an odourless, colourless, and non-toxic gas although its emission is an environmental global problem, being the main gas pollutant contributing to the climate change.

Besides, it is a contributor to acid rain, and ocean acidification and could displace oxygen (O_2) and nitrogen (N_2) . CO_2 is removed from the atmosphere when it is absorbed by plants and algae as part of the biological carbon cycle.

CO_2 cartridge

The CO₂ cartridge has a built-in non-dispersive infrared sensor (NDIR) ideal for measuring typical atmospheric concentrations for climate change applications (300-400 ppm) as well as high concentrations from industrial processes (until 5,000 ppm).

The cartridge includes an automatic baseline correction (ABC) algorithm to background levels to maintain long-term stability.

Туре	NDIR
Unit of measurement	mg/m³, ppm
Measurement range (1)	0 - 5,000 ppm
Resolution ⁽²⁾	0,01 ppm
Operating temp. range (3)	-20 to 50°C
Operating RH range (4)	0 to 90 %RH
Recommended RH range (4)	15 to 95 %RH
Operating life (5)	> 4 years
Guarantee range ⁽⁶⁾	-

Limit of Detection (LOD) (7)	-
Repeatability (8)	-
Response time ⁽⁹⁾	< 30 sec
Typical accuracy (11) (12)	± 20 ppm
Typical precision R ^{2 (10)}	> 0.8
Typical slope (10)	0.6 - 1.66
Typical intercept (a) (10)	-170 ppm ≤ a ≤ 170 ppm
DQO - Typical U(exp) (13)	-
Typical Intra-model variability (14)	< 0.5 ppm



Nitric oxide (NO) is emitted from automotive engines and the burning of coal, oil, diesel fuel, and natural gas, specially from electric power plants. It is also emitted by cigarettes, gas stoves, wood burning, and silos that contain silage.

Why is it harmful?

NO is a colorless toxic gas originated by the oxidation of nitrogen. It contributes to climate change and its inhalation affects human health. When it reacts with sunlight or other chemicals, it forms nitrogen dioxide (NO_2) and tropospheric ozone (O_3), leading to photochemical smog and acid rain.

The inhalation of high levels of nitric oxide can cause respiratory problems, particularly in vulnerable groups, such as asthmatics, and it affects to cardiovascular and immune systems.

NO cartridge

The NO cartridge has a built-in electrochemical sensor ideal for measuring very low ppb concentrations in ambient air, up to several ppm found near pollution sources (vehicles, industries...). This cartridge is very accurate and stable, it has a good temperature correction algorithm and can easily work beyond two years under non-extreme environments.

The cartridge can suffer from a small zero drift (some ppb) over time, which can be easily corrected remotely with the Kunak Calibration Tool available on Kunak Cloud Software.

Туре	Electrochemical
Unit of measurement	µg/m³, ppb
Measurement range (1)	0 - 5,000 ppb
Resolution ⁽²⁾	1 ppb
Operating temp. range (3)	-30 to 45°C
Operating RH range (4)	0 to 99 %RH
Recommended RH range (4)	15 to 85 %RH
Operating life (5)	> 24 months
Guarantee range ⁽⁶⁾	20 ppm

Limit of Detection (LOD) (7)	2 ppb
Repeatability (8)	4 ppb
Response time ⁽⁹⁾	< 30 sec
Typical accuracy (11) (12)	±4 ppb
Typical precision R ^{2 (10)}	> 0.9
Typical slope (10)	0.9 - 1.12
Typical intercept (a) (10)	$-2 \text{ ppb} \le a \le +2 \text{ ppb}$
DQO - Typical U(exp) (13)	< 20%
Typical Intra-model variability (14)	< 1 ppb

Nitrogen dioxide

Where is it found?

The major source of nitrogen dioxide (NO_2) is combustion of fossil fuels: coal, oil and gas. Most of the NO_2 in cities is derived from motor vehicle's exhausts.

Other sources of NO_2 are petrol and metal refining, electricity generation from coal-fired power stations, other manufacturing industries and food processing.

Why is it harmful?

 NO_2 is a pollutant criterion that contributes to the formation of photochemical smog, which has significant impact on human health and the environment.

Inhalation of NO $_2$ can cause respiratory tract irritation, exacerbation of chronic respiratory diseases such as asthma and bronchitis, and increased risk of respiratory infections. The result is wheezing, coughing, colds, flu and bronchitis, as well as more frequent and intense asthma attacks.

NO₂ cartridge

The NO_2 cartridge contains an electrochemical sensor with an embedded O_3 filter, which eliminates the interferences produced by ozone, making the cartridge ideal for measuring the concentrations found in the atmosphere that may vary from very low levels in clean environments to high concentrations in polluted areas of cities or industries.

The new Kunak algorithm corrects the effects of temperature and humidity in this cartridge, significantly mitigating the effect that these sensors suffer from fast humidity transients.

Туре	Electrochemical
Unit of measurement	µg/m³, ppb
Measurement range (1)	0 - 5,000 ppb
Resolution ⁽²⁾	1 ppb
Operating temp. range (3)	-30 to 45°C
Operating RH range (4)	0 to 99 %RH
Recommended RH range (4)	15 to 85 %RH
Operating life (5)	> 24 months
Guarantee range (6)	20 ppm

Limit of Detection (LOD) (7)	2 ppb
Repeatability (8)	4 ppb
Response time ⁽⁹⁾	< 60 sec
Typical accuracy (11) (12)	±5ppb
Typical precision R ^{2 (10)}	> 0.85
Typical slope (10)	0.78 - 1.29
Typical intercept (a) (10)	$-4 \text{ ppb} \le a \le +4 \text{ ppb}$
DQO - Typical U(exp) ⁽¹³⁾	< 25%
Typical Intra-model variability (14)	< 1 ppb

' See notes on page 24



Ozone (O_3) is found in the troposphere and it is the result of the atmospheric reaction of a number of precursor pollutants, which come from both natural and anthropogenic sources.

Precursor pollutants are originated by human activities and include hydrocarbons and nitrogen oxides. They are largely emitted by cars and other vehicles, fossil fuel power plants, oil refineries, the agriculture sector and a number of other industries.

Why is it harmful?

 $\rm O_3$ is a reactive gas that exists in two layers of the atmosphere: the stratosphere (upper layer) and the troposphere (at ground level and up to 15 km). Ozone, in the upper layer, is essential to protect the Earth from the sun's ultraviolet rays.

At lower levels, it is an important greenhouse gas and an air pollutant, which is harmful to human and ecosystem's health. It is also the major component of urban smog.

O₃ cartridge

The O_3 cartridge has a built-in electrochemical sensor responsive to NO_2 and O_3 concentrations. Hence, in order to measure accurately the O_3 concentration, it is required to install in the same device the NO_2 cartridge.

The Kunak algorithm considers both concentrations allowing for accurate O_3 measurements with no NO₂ influence, even at high temperatures which are related to higher O_3 concentration due to the solar radiation.

Туре	Electrochemical
Unit of measurement	µg/m³, ppb
Measurement range (1)	0 - 2,000 ppb
Resolution ⁽²⁾	1 ppb
Operating temp. range (3)	-30 to 45°C
Operating RH range (4)	10 to 99 %RH
Recommended RH range (4)	15 to 85 %RH
Operating life (5)	> 24 months
Guarantee range ⁽⁶⁾	20 ppm

Limit of Detection (LOD) (7)	3 ppb
Repeatability (8)	4 ppb
Response time ⁽⁹⁾	< 70 sec
Typical accuracy (11) (12)	± 8 ppb
Typical precision R ^{2 (10)}	> 0.9
Typical slope (10)	0.85 - 1.18
Typical intercept (a) (10)	$-3 \text{ ppb} \le a \le +3 \text{ ppb}$
DQO - Typical U(exp) (13)	< 20%
Typical Intra-model variability (14)	< 1 ppb

' See notes on page 24



Most of the hydrogen sulphide (H_2S) present in the atmosphere originates naturally from the decomposition of organic matter. Anthropogenically, it occurs in processes in which sulphur compounds and organic matter are involved at high temperatures.

Some industrial activities that emit this gas include paper pulp manufacturing, oil refining, water treatment plants and the viscose manufacturing textile industry.

Why is it harmful?

 $\rm H_2S$ is highly toxic to humans and other living organisms, even at low concentrations and affects mainly to the respiratory system with the first symptoms being nose, throat and eyes irritation. This compound begins to be detected by the human sense of smell at concentrations much lower than those that can have harmful effects on health.

Short-term exposures of high concentrations can cause headache, dizziness and vomiting.

H₂S cartridge

The H₂S cartridge has a built-in electrochemical sensor very sensitive to its target pollutant allowing to detect small changes in H₂S concentration. This cartridge also responds to **methyl mercaptan (CH₄S)** and other **total reduced sulphur compounds (TRS)**. To cover different applications, there are 2 measurement ranges:

- **Type A:** detects low ppb concentrations in real environments. Although the Kunak algorithm corrects the temperature variations well, it is not recommended to use this cartridge to measure levels below 15 ppb.
- Type B: a higher range version that can measure up to 20 ppm, not so precise at low concentrations.

Туре	Electrochemical	Limit of Detection (LOD) ⁽⁷⁾	2 ppb ^(A) 0 01 ppm ^(B)
Unit of measurement	µg/m³, ppb ^(A) mg/m³, ppm ^(B)	Repeatability ⁽⁸⁾	4 ppb ^(A)
Measurement range (1)	0 - 2,000 ppb ^(A) 0 - 20 ppm ^(B)	Response time (9)	< 60 sec
Resolution ⁽²⁾	1 ppb ^(A) 0.01 ppm ^(B)	Typical accuracy ^{(11) (12)}	± 10 ppb ^(A) ± 0.05 ppm ^(B)
Operating temp. range (3)	-30 to 50 °C	Typical precision R ^{2 (10)}	> 0.8
Operating RH range (4)	0 to 99 %RH	Typical slope (10)	0.78 - 1.29
Recommended RH range (4)	15 to 90 %RH	Typical intercept (a) (10)	$-5 \text{ ppb} \le a \le +5 \text{ ppb}^{(A)}$ -0.05 ppm $\le a \le +0.05 \text{ ppm}^{(B)}$
Operating life (5)	> 24 months	DQO - Typical U(exp) ⁽¹³⁾	-
Guarantee range (6)	100 ppm	Typical Intra-model variability (14)	< 2 ppb ^(A) < 0.02 ppm ^(B)

See notes on page 24



Sulphur dioxide (SO_2) is an invisible gas and has a nasty smell. It is produced by the combustion of any substance that contains sulphur. The main anthropogenic source of SO_2 in the atmosphere comes from combustion of coal or fossil fuels while small sources can be found in metallurgical industry and naturally like volcanic eruptions.

Locomotives, ships and other vehicles that burn fuel with a high sulphur content are other emission sources. Besides, it can react with other compounds in the atmosphere contributing to the formation of particulate matter.

Why is it harmful?

 SO_2 gas is a respiratory tract and eye irritant that affects humans very quickly (within 10-15 minutes). Long exposures affect lung defences and may aggravate the existing cardio vascular diseases.

It also causes damage to ecosystems and it contributes to acid rain when oxidized to sulphuric acid. This provokes acidification of ecosystems, injuries and necrosis in vegetation and deterioration of materials.

SO_2 cartridge

The SO₂ cartridge has a built-in electrochemical sensor which presents high cross-sensitivities with O_3 , NO_2 and CO. When used together with the NO_2 , O_3 and CO cartridges, the Kunak algorithm can correct these cross-sensitivities, improving the accuracy of the measurements. However, it is not recommended for applications requiring accurate SO₂ measurements at very low concentrations (<20 ppb).

Туре	Electrochemical
Unit of measurement	µg/m³, ppb
Measurement range (1)	0 - 10,000 ppb
Resolution ⁽²⁾	1 ppb
Operating temp. range (3)	-30 to 45 °C
Operating RH range ⁽⁴⁾	0 to 99 %RH
Recommended RH range (4)	15 to 90 %RH
Operating life (5)	> 24 months
Guarantee range (6)	100 ppm

Limit of Detection (LOD) (7)	3 ppb
Repeatability ⁽⁸⁾	5 ppb
Response time ⁽⁹⁾	< 60 sec
Typical accuracy (11) (12)	± 15 ppb
Typical precision R ^{2 (10)}	> 0.7
Typical slope (10)	0.78 - 1.29
Typical intercept (a) (10)	$-5 \text{ ppb} \le a \le +5 \text{ ppb}$
DQO - Typical U(exp) (13)	< 25%
Typical Intra-model variability (14)	< 3 ppb

16



Ammonia (NH_3) is a colourless gas with a pungent odour that can be detected by humans at 0.4-1 ppm, being the exposure limit 50 ppm. NH_3 is originated from both natural and anthropogenic sources, the main ones being agriculture (fertiliser application and fabrication) and livestock (manure management), followed by waste and water management (slurries, composting and landfills). Other sources are household and industrial cleaners, which can directly affect humans exposed to them.

Why is it harmful?

 $\rm NH_3$ is a volatile gas poisonous if inhaled at high concentrations, causing respiratory tract and eye irritation, while causing throat and skin irritation in lesser amounts. It is highly soluble in water, so it is associated with acid deposition and eutrophication, affecting land and water ecosystems by reducing biodiversity.

Besides, it is explosive when mixed with air or oxygen at very high concentrations. NH₃ also contributes to the formation of particulate aerosols in the atmosphere as a secondary particulate precursor.

NH₃ cartridge

The NH₃ cartridges contain electrochemical sensors capable of accurately measuring NH₃ in different ranges. There are 3 types of NH₃ cartridges for different applications:

- **Type A:** is used to detect from low concentrations up to 50 ppm with a typical noise of less than 0.3 ppm when the ambient temperature is less than 25 °C. This sensor is responsive to H₂S when present at high concentrations (ppm level), which is relevant since the two substances can coexist in the same environment. Therefore, to accurately measure NH₃, it is necessary to have the H₂S cartridge installed in the same device (in case of high H₂S concentrations, ppm level). Thus, thanks to Kunak's algorithm which considers both concentrations, it is possible to correct the interference of H₂S and obtain precise measurements of NH₃.
- **Type B:** a higher range version that is used to carry out continuous measurements of concentrations up to 1,500 ppm, not so precise at low concentrations. Both Type A and Type B sensors are specially conceived for industrial leak detection, and not for environments with continuous background NH₂ concentrations (i.e. livestock).
- **Type C**: cartridge is able to measure continuous (background) concentrations of NH₃, with a range up to 50 ppm. It is responsive to H₂S, which is why it is recommended to install an H₂S cartridge in the same device to correct this interference when H₂S is present at high concentrations (ppm level). This cartridge is recommended for continuous NH₃ monitoring applications such as farms and livestock.

Туре	Electrochemical	Limit of Detection (LOD) ⁽⁷⁾	0.02 ppm ^(A-C) 0.15 ppm ^(B)
Unit of measurement	mg/m³, ppm		0.03 ppm ^(A)
Measurement range (1)	0 - 50 ppm ^(A-C) 0 - 1.500 ppm ^(B)	Repeatability ⁽⁸⁾	0.5 ррт ^(в) 0.1 ррт ^(С)
Resolution ⁽²⁾	0.01 ppm	Response time (9)	< 45 sec ^(A) < 90 sec ^(B-C)
Operating temp. range ⁽³⁾	-10 to 50°C ^(A) -20 to 43°C ^(B) -20 to 40°C ^(C)	Typical accuracy (11) (12)	± 0.3 ppm ^(A) ± 1.5 ppm ^(B) ± 0.5 ppm ^(C)
Operating RH range (4)	0 to 99 %RH	Typical precision R ^{2 (10)}	-
Recommended RH range (4)	15 to 90 %RH	Typical slope (10)	-
Operating life (5)	> 24 months	Typical intercept (a) (10)	-
Guarantee range ⁽⁶⁾	100 ppm ^(A) 5,000 ppm ^(B) 200 ppm ^(C)	DQO - Typical U(exp) ⁽¹³⁾	-
		Typical Intra-model variability (14)	< 0.1 ppm ^(A-C) < 0.2 ppm ^(B)

notes on page 24

See



Most volatile organic compounds (VOCs) are produced by anthropogenic sources such as combustion of materials like wood, coal or petrol, transport or industrial activities.

They also enter the atmosphere from the evaporation of gasoline, paints and solvents in above-ground storage tanks. To a lesser extent, VOCs are emitted by biogenic sources such as vegetation or the decomposition of organic matter.

Why is it harmful?

Many VOCs are toxic and can cause cancer, mutations, and/ or other serious health problems. One of the most harmful compounds is the benzene, which can cause leukaemia.

Some of them contribute to ozone formation with associated health effects, environmental and climate effects. They also contribute to the formation of secondary organic aerosols that can warm and cool the atmosphere, respectively.

See notes on page 24

VOCs cartridge

The VOC cartridge has a built-in photoionization detector (PID) sensor equipped with a 10.6 eV light energy source to measure accurately hundreds of VOCs commonly found in indoor and outdoor environments. Its cutting-edge design avoids any undesirable humidity effect, giving 10,000 hours of continuous operation.

To cover different applications, there are 2 measurement ranges:

- Type A: detects low ppb concentrations found in outdoor environments. Kunak algorithm corrects the temperature, humidity and pressure variations allowing accurate measurements from very low concentrations (<5 ppb) up to >3,000 ppb, with very low variability between sensors.
- **Type B:** higher range version that can measure up to 40 ppm. It is not recommended to use this cartridge to detect levels below 1 ppm, since the accuracy of this Type B sensor at low concentrations decreases.

Туре	Photoionization detector	Limit of Detection (LOD) (7)	1 ppb ^(A)
Unit of measurement	μg/m³, ppb ^(A) mg/ m³, ppm ^(B)	Repeatability ⁽⁸⁾	5 ppb ^(A)
Measurement range (1)	0 - 3,000 ppb ^(A) 0 - 40 ppm ^(B)	Response time ⁽⁹⁾	< 12 sec ^(A)
Resolution ⁽²⁾	1 ppb ^(A) 0.01 ppm ^(B)	Typical accuracy (11) (12)	
Operating temp. range (3)	-40 to 60°C	Typical precision R ^{2 (10)}	-
Operating RH range (4)	0 to 99 %RH	Typical slope (10)	-
Recommended RH range (4)	0 to 99 %RH	Typical intercept (a) (10)	-
Operating life (5)	10,000 hours	DQO - Typical U (exp) (13)	-
Guarantee range (6)	50 ppm ^(A) 60 ppm ^(B)	Typical Intra-model variability (14)	< 3 ppb ^(A)



Methane (CH₄) is the most abundant organic molecule in the atmosphere, being one of the most important greenhouse gases. It is colourless, odourless and insoluble in water. The main anthropogenic emission sources are due to the production and transport of coal, natural gas, and oil. CH₄ emissions also result from livestock and other agricultural practices, land use and solid waste landfills. Other natural sources include reduced, anoxic portions of wetlands and portions of ecosystems undergoing organic decomposition.

Why is it harmful?

High levels of CH₄ can result in vision problems, memory loss, nausea, vomiting, and headache. In severe cases, there may be changes in breathing and heart rate, balance problems, numbness, and unconsciousness. Long-term or large quantity exposures to it may cause death. CH₄ contributes to the formation of tropospheric ozone and particulate pollution.

Moreover, methane is a much more potent greenhouse gas than $\rm CO_{2^1}$ contributing significantly to global warming and climate change.

CH₄ cartridge

The methane cartridge can contain two types of sensors designed for different applications and measurement ranges:

- **Type A:** is a non-dispersive infrared (NDIR) sensor specific for the detection of CH₄ leaks in industrial processes. This sensor has a detection limit of 1000 ppm and can measure concentrations up to 50,000 ppm.
- Type B: is a sensor based on MEMS technology to monitor fugitive measurements from very low concentrations (<100 ppm) to high concentrations of CH₄, with a measurement range from 60 to 300,000 ppm. It is not recommended for background environments or continuous CH₆ concentrations.

Both cartridges include an automatic baseline correction (ABC) algorithm to background levels to maintain long-term stability.

Туре	NDIR ^(A) MEMS ^(B)	Limit of Detection (LOD) (7)	1,000 ppm ^(A) 60 ppm ^(B)
Unit of measurement	mg/m³, ppm	Repeatability ⁽⁸⁾	500 ppm ^(A)
Measurement range (1)	1,000 - 50,000 ppm (5% vol) ^(A) 60 - 300,000 ppm (30% vol) ^(B)	Response time ⁽⁹⁾	< 90 sec ^(A) < 10 sec ^(B)
Resolution (2)	100 ppm ^(A) 1 ppm ^(B)	Typical accuracy ^{(11) (12)}	±3 % of F.S. ^(A) ±30 ppm + 10% of reading ^(B)
Operating temp. range ⁽³⁾	-20 to 50°C ^(A) -35 to 70°C ^(B)	Typical precision R ^{2 (10)}	-
Operating RH range (4)	0 to 99 %RH	Typical slope ⁽¹⁰⁾	-
Pecommended PH range ⁽⁴⁾	0 to 95 %RH (A)	Typical intercept (a) (10)	-
Recommended RH range	0 to 99 %RH ^(B)	DQO - Typical U(exp) ⁽¹³⁾	-
Operating life (5)	> 4 years	Typical Intra-model variability ⁽¹⁴⁾	< 500 ppm ^(A)
Guarantee range (6)	100% vol	rypical intra-model variability "*	x 300 ppm; /

' See notes on page 24



Hydrogen chloride (HCl) is a colourless to slightly yellow gas with a pungent odour. On contact with air, it forms dense, white, corrosive vapours. It is produced in the digestive system of most mammals or as a by-product of numerous industrial processes and is mainly used to synthesise inorganic and organic chemicals, such as chlorine, ethylene dichloride and methyl chloride. It is used for fumigation, electroplating, mining, chemical synthesis and the manufacture of synthetic fibres, plastics, dyes and pesticides.

Why is it harmful?

Hydrogen chloride is irritating and corrosive to any tissue it comes into contact with. Brief exposure at low levels can irritate the skin, nose, eyes, throat and larynx, as well as cause burns to the eyes and skin.

Its odour threshold was set at 0.77 ppm, while the irritant concentration has been recorded at 33 ppm.

HCl can react in the atmosphere to form acid aerosols, which can contribute to acid rain. Moreover, this gas can have corrosive effects on metals, building materials and vegetation.

HCI cartridge

The HCl cartridge has a built-in electrochemical sensor capable of monitoring low concentrations (< 1 ppm) as well as high concentrations of HCl, up to 20 ppm, with an accuracy of ± 0.3 ppm. The HCl cartridge has a high cross-sensitivity with H₂S, it is therefore recommended to use an H₂S cartridge together with the HCl cartridge, when high H₂S concentrations are present (at ppm level), allowing the Kunak algorithm to correct this cross-sensitivity to obtain the highest accuracy.

The HCl cartridge is recommended for leak detection in industrial processes, and not for continuous HCl monitoring.

Туре	Electrochemical
Unit of measurement	mg/m³, ppm
Measurement range (1)	0 - 20 ppm
Resolution ⁽²⁾	0.01 ppm
Operating temp. range (3)	-20 to 50°C
Operating RH range (4)	0 to 99 %RH
Recommended RH range (4)	15 to 90 %RH
Operating life (5)	> 24 months
Guarantee range (6)	200 ppm

Limit of Detection (LOD) (7)	0.01 ppm
Repeatability (8)	0.02 ppm
Response time ⁽⁹⁾	< 45 sec
Typical accuracy (11) (12)	± 0.1 ppm
Typical precision R ^{2 (10)}	-
Typical slope (10)	-
Typical intercept (a) (10)	-
DQO - Typical U(exp) ⁽¹³⁾	-
Typical Intra-model variability (14)	< 0.1 ppm

See notes on page 24



Particles, commonly referred to as PM (particulate matter), are emitted from a wide range of anthropogenic sources. The most significant are road transport, non-combustion processes, industrial combustion plants and processes, commercial and residential activities as well as power plants. Natural sources are less important, including volcanoes and sandstorms.

Why is it harmful?

PM may be seen as one of the most critical of all pollutants. Particulate matter is the generic term to classify air pollutants comprising of suspended particles in the air. The size, surface, number and composition of particles play an important role in human health effects. The upper respiratory tract is affected by PM_{10} , $PM_{2.5}$ affect the lower respiratory tract, while PM_1 and ultrafine particles (<0.1 µm diameter) can reach the lung alveoli and the bloodstream, respectively.

Particles can cause premature mortality in patients suffering from lung or heart disease, provoke heart attacks, aggravate asthma, reduce lung functionality, and irritate in airways.

PM sensor

The particle sensor consists of sensors based on laser scattering technology. To cover different applications, two particle sensors are available:

Type A (specific for Kunak AIR Pro stations): an OPC (Optical Particle Counter) capable of measuring particles from 0.3 μm up to 40 μm thanks to 24 bin channels. The PM₁, PM_{2.5}, PM₄, PM₁₀, Total Suspended Particles (TSP) and Total Particle Counter (TPC) are calculated assuming a particle density profile. Field co-location studies have shown similar field performance as equivalence instruments based on the same technology, even in monitoring coarse particles (Certified Product for Indicative Ambient Particulate Monitors).



Type B (specific for Kunak AIR Lite stations): sensor with a range of measurement from 0.3 μm up to 10 μm. The sensor monitors accurately PM₁ and PM_{2.5} concentration, while the expected error for PM₁₀ is higher in presence of coarse particles (see technical specifications in p. 25).

The effect of humidity is perfectly corrected in both sensors with the embedded algorithm achieving high accuracy at any environmental conditions except under foggy days or condensation, where the data is automatically invalidated by the software Kunak Cloud to prevent data noise.

Besides, the remote Kunak calibration tool allows you to adjust the correction factor to the specific location where the device is installed. Additionally, particle size distributions are available in Kunak Cloud.



Technical specifications

iecnnical spec	cifications		CSA MC230418/00
	Type A (only	y for Kunak AIR Pro)	
Туре	Optical particle counter		0.5 µg/m ³ (PM1)
Unit of measurement	µg/m³	Limit of Detection (LOD) ⁽⁷⁾	0.5 µg/m ³ ^(PM4) 1 µg/m ³ ^(PM10)
	$0 - 1,000 \mu g/m^{3} (PM1)$		1 µg/m ³ (TSP)
Measurement range ⁽¹⁾	0 - 2,000 µg/m ³ (^{PM4)} 0 - 10,000 µg/m ³ (^{PM10)} 0 - 15,000 µg/m ³ (^{TSP)} 0 - 8,000 counts/cm ³ (^{TPC)}	Typical accuracy (MAE) ⁽¹⁰⁾	$\pm 2 \mu g/m^{3}$ (PMI) $\pm 3 \mu g/m^{3}$ (PM2.5) $\pm 3 \mu g/m^{3}$ (PMA) $\pm 4 \mu g/m^{3}$ (PMI0) $\pm 6 \mu g/m^{3}$ (PSP)
Resolution ⁽²⁾	1 µg/m³ 1 count/cm³ ^(TPC)		> 0.9 (PM1) > 0.8 (PM2.5)
Operating temperature range ⁽³⁾	-10 to 50 ∘C	Typical precision R ^{2 (10)}	> 0.8 (PM4)
Operating RH range ⁽⁴⁾	0 to 99 %RH		> 0.7 ^(TSP) > 0.8 ^(TPC)
Recommended RH range ⁽⁴⁾	0 to 95 %RH	Typical slope ⁽¹⁰⁾	0.85 - 1.18
Operating life ⁽⁵⁾	> 24 months		$-1.8 \mu\text{g/m}^3 \le a \le +1.8 \mu\text{g/m}^3 ^{(\text{PM1})}$
Repeatability ⁽⁸⁾	2 µg/m ^{3 (PM1)} 3 µg/m ^{3 (PM2.5)} 3 µg/m ^{3 (PM4)}	Typical intercept (a) ⁽¹⁰⁾	$\begin{array}{l} -2\ \mu g' M^3 \leq a \leq +2\ \mu g' M^3 \ ^{(PM2.5)} \\ -2\ \mu g/m^3 \leq a \leq +2\ \mu g/m^3 \ ^{(PM4)} \\ -3\ \mu g/m^3 \leq a \leq +3\ \mu g/m^3 \ ^{(PM10)} \\ -4\ \mu g/m^3 \leq a \leq +4\ \mu g/m^3 \ ^{(TSP)} \end{array}$
	6 µg/m ^{3 (TSP)}	DQO - Typical U(exp) ⁽¹¹⁾	< 50%
Response time ⁽⁹⁾	< 10 sec	Typical intra-model variability ⁽¹²⁾	< 2 µg/m3

Typical intra-model variability⁽¹²⁾ < $2 \,\mu g/m^3$

Type	B (only	for Kunak	AIR Lite)
------	---------	-----------	-----------

Туре	Optical particle counter	Limit of Detection (LOD) ⁽⁷⁾	0.5 µg/m ^{3 (PM1)} 0.5 µg/m ^{3 (PM2.5)}
Unit of measurement	µg/m³		0.5 μg/m ³ ^(PM10)
Measurement range ⁽¹⁾	0 - 1,000 µg/m³	Typical accuracy (MAE) ⁽¹⁰⁾	$\pm 3 \mu g/m^{3} (PM1)$ $\pm 3 \mu g/m^{3} (PM2.5)$ $\pm 6 \mu g/m^{3} (PM10)^{*}$
Resolution ⁽²⁾	1µg/m³		> 0 85 (PM1)
Operating temperature range ⁽³⁾	-10 to 60 °C	Typical precision R ^{2 (10)}	> 0.8 (PM2.5) > 0.5 (PM10)*
Operating RH range ⁽⁴⁾	0 to 99 %RH		0.80-1.25 (PM1)
Operating life ⁽⁵⁾	> 24 months	Typical slope ⁽¹⁰⁾	0.83-1.20 (PM2.5) 0.75-1.35 (PM10) *
Repeatability ⁽⁸⁾	3 µg/m ³ ^(PM1) 3 µg/m ³ ^(PM2.5) 6 µg/m ³ ^(PM10)	Typical intercept (a) ⁽¹⁰⁾	-2 μg/m ³ ≤ a ≤ +2 μg/m ^{3 (PM1)} -3 μg/m ³ ≤ a ≤ +3 μg/m ^{3 (PM2.5)} -9 μg/m ³ ≤ a ≤ +9 μg/m ^{3 (PM10)} *
Response time ⁽⁹⁾	< 10 sec	DQO - Typical U(exp) ⁽¹¹⁾	< 50% (PM1 - PM2.5) < 75% (PM10) *

Typical intra-model variability⁽¹²⁾ < 2 µg/m³



Why are they important?

Air quality is a major environmental health problem affecting everyone wherever they are. Kunak AIR stations include environmental monitoring of a wide range of different parameters that should be considered by the Kunak algorithm to provide accurate pollutant measurements.

Kunak AIR stations are a total solution that includes a continuous monitoring system of ambient temperature, relative humidity and atmospheric pressure.

Why measure them?

These sensors are always supplied with the Kunak AIR stations and the data collected are used by the correction algorithms to achieve the highest accuracy, mitigating the effects of temperature, humidity and cross sensitivities.

Environmental sensors

The Kunak AIR stations are equipped with built-in environmental sensors, including temperature, relative humidity, and atmospheric pressure. These sensors are utilized to correct gas sensor readings and also provide accurate measurements akin to those of a professional weather station.

	Temperature	Relative humidity	Pressure	Dew point
Туре	Solid state	Solid state	Solid state	Solid state
Unit of measurement	٥C	%	hPa	٥C
Measurement range ⁽¹⁾	-40 to 125 °C	0 - 100 %RH	300 - 1,100 hPa	-40 to 125 °C
Resolution ⁽²⁾	0.01 °C	0.04 %RH	0.18 Pa	0.01 °C
Operating temperature range ⁽³⁾	-40 to 125 °C	-40 to 150 °C	-90 to 85 °C	-40 to 125 °C
Operating RH range ⁽⁴⁾	0 to 100 %RH	0 to 100 %RH	0 to 100 %RH	0 to 100 %RH
Operating life ⁽⁵⁾	Device time life	Device time life	Device time life	Device time life
Typical accuracy (MAE) ⁽¹⁰⁾	± 0.9 °C	± 3 %RH	±2hPa	-
Typical precision R ^{2 (10)}	> 0.95	> 0.95	> 0.95	> 0.95

	СО	CO ₂	NO	NO ₂		H_2S	SO ₂	$NH_{\mathfrak{z}}$	VOCs	CH_4	HCI
Туре	Electrochemical	Non-dispersive infrared (NDIR)	Electrochemical	Electrochemical	Electrochemical	Electrochemical	Electrochemical	Electrochemical	Photo- ionization detector	NDIR ^(A) Non-dispersive Infrared MEMS ^(B) Micro-Electro-Mechanical Systems	Electrochemica
Unit of measurement	µg/m³, ppb ^(A) mg/m³, ppm ^(B)	mg/m³, ppm	µg/m³, ppb	µg/m³, ppb	µg/m³, ppb	µg/m³, ppb ^(A) mg/m³, ppm ^(B)	µg/m³, ppb	mg/m³, ppm	µg/m³, ppb ^(A) mg/m³, ppm ^(B)	mg/m³, ppm	mg/m³, ppm
Measurement range (1)	0 - 12,000 ppb ^(A) 0 - 500 ppm ^(B)	0-5,000 ppm	0-5,000 ppb	0-5,000 ppb	0-2,000 ppb	0 - 2,000 ppb ^(A) 0 - 20 ppm ^(B)	0-10,000 ppb	0-50 ppm ^(A-C) 0 - 1,500 ppm ^(B)	0 - 3,000 ppb ^(A) 0 - 40 ppm ^(B)	1,000-50,000 ppm (5% vol) ^(A) 60-300,000 ppm (30% vol) ^(B)	0-20 ppm
Resolution (2)	1 ppb ^(A) 0.01 ppm ^(B)	0,01 ppm	1 ppb	1ppb	1ppb	1 ppb ^(A) 0.01 ppm ^(B)	1ppb	0.01 ppm	1 ppb ^(A) 0.01 ppm ^(B)	100 ppm ^(A) 1 ppm ^(B)	0.01 ppm
Operating temp. range ⁽³⁾	-30 to 50 °C	-20 to 50 ∘C	-30 to 45 °C	-30 to 45 °C	-30 to 45 °C	-30 to 50 °C	-30 to 40 °C	-10 to 50 °C ^(A) -20 to 43 °C ^(B) -20 to 40 °C ^(C)	-40 to 60 °C	-20 to 50 °C ^(A) -35 to 70 °C ^(B)	-20 to 50 °C
Operating RH range ⁽⁴⁾	0 to 99 %RH	0 to 99 %RH	0 to 99 %RH	0 to 99 %RH	0 to 99 %RH	0 to 99 %RH	0 to 99 %RH	0 to 99 %RH	0 to 99% RH	0 to 99 %RH	0 to 99 %RH
Recommended RH range ⁽⁴⁾	15 to 90 %RH	15 to 95 %RH	15 to 85 %RH	15 to 85 %RH	15 to 85 %RH	15 to 90 %RH	15 to 90 %RH	15 to 90 %RH	0 to 99% RH	15 to 90 %RH ^(A) 0 to 99 %RH ^(B)	15 to 90 %RH
Operating life ⁽⁵⁾	> 24 months	> 4 years	> 24 months	> 24 months	> 24 months	> 24 months	> 24 months	> 24 months	10,000 hours	> 4 years	> 24 months
Guarantee range ⁽⁶⁾	1,000 ppm	-	20 ppm	20 ppm	20 ppm	100 ppm	100 ppm	100 ppm ^(A) 5,000 ppm ^(B) 200 ppm ^(C)	50 ppm ^(A) 60 ppm ^(B)	100% vol	200 ppm
LOD - Limit of detection ⁽⁷⁾	10 ppb ^(A) 0.02 ppm ^(B)	-	2 ppb	2 ppb	3 ppb	2 ppb ^(A) 0.01 ppm ^(B)	3 ppb	0.02 ppm ^(A-C) 0.15 ppm ^(B)	1 ррб ^(A) 0.01 ррт ^(B)	1,000 ppm ^(A) 60 ppm ^(B)	0.01 ppm
Repeatability (8)	20 ppb ^(A) 0.05 ppm ^(B)	-	4 ppb	4 ppb	4 ppb	4 ppb ^(A) 0.01 ppm ^(B)	5 ppb	0.03 ppm ^(A) 0.5 ppm ^(B) 0.1 ppm ^(C)	5 ppb ^(A) 0.02 ppm ^(B)	500 ppm ^(A)	0.02 ppm
Response time ⁽⁹⁾	< 30 sec ^(A) < 180 sec ^(B)	< 30 sec	< 30 sec	< 60 sec	< 70 sec	< 60 sec	< 60 sec	< 45 sec ^(A) < 90 sec ^(B-C)	< 12 sec ^(A) < 10 sec ^(B)	< 90 sec ^(A) < 10 sec ^(B)	< 45 sec
Typical accuracy ^{(11) (12)}	± 80 ppb ^(A) ± 0.1 ppm ^(B)	±20 ppm	±4 ppb	±5 ppb	±8 ppb	± 10 ppb ^(A) ± 0.05 ppm ^(B)	±15 ppb	±0.3 ppm ^(A) ±1.5 ppm ^(B) ±0.5 ppm ^(C)	-	±3% of F.S. ^(A) ±30 ppm + 10% of reading ^(B)	±0.1 ppm
Typical precision - R ^{2 (10)}	> 0.85	> 0,8	> 0.9	> 0.85	> 0.9	> 0.75	> 0.7	-	-	-	-
Typical slope ⁽¹⁰⁾	0.78 - 1.29	0.6 - 1.66	0.9 - 1.12	0.78 - 1.29	0.85 - 1.18	0.78 - 1.29	0.78 - 1.29	-	-	-	-
Typical intercept (a) ⁽¹⁰⁾	-50 ppb \leq a \leq +50 ppb ^(A) -0.1 ppm \leq a \leq +0.1 ppm ^(B)	-170 ppm ≤ a ≤ 170 ppm	$-2 \text{ ppb} \le a \le +2 \text{ ppb}$	-4 ppb ≤ a ≤ +4 ppb	-3 ppb ≤ a ≤ +3 ppb	$-5 \text{ ppb} \le a \le +5 \text{ ppb}^{(A)}$ -0.05 ppm $\le a \le +0.05 \text{ ppm}^{(B)}$	-5 ppb ≤ a ≤ +5 ppb	-	-	-	-
DQO - Typical U (exp) ⁽¹³⁾	< 20%	-	< 20%	< 25%	< 20%	-	< 25%	-	-	-	-
Typical intra-model variability (14)	< 3 ppb ^(A) < 0.05 ppm ^(B)	< 0,5 ppm	<1ppb	<1ppb	<1ppb	< 2 ppb ^(A) < 0.02 ppm ^(B)	< 3 ppb	< 0.1 ppm (A-C) < 0.2 ppm ^(B)	< 3 ppb ^(A) < 0.1 ppm ^(B)	< 500 ppm (A)	< 0.1 ppm

	Operating temp. range ⁽³⁾	
	Operating RH range ⁽⁴⁾	
	Recommended RH range ⁽⁴⁾	
	Operating life ⁽⁵⁾	
	LOD - Limit of Detection ⁽⁷⁾	
	Repeatability ⁽⁸⁾	
	Response Time ⁽⁹⁾	
	Typical accuracy ^{(11) (12)}	
	Typical precision - R ^{2 (10)}	
ş	Typical slope ⁽¹⁰⁾	
/ww.k	Typical intercept (a) ⁽¹⁰⁾	-1
unaka	DQO - Typical U(exp) ⁽¹³⁾	
ir.com	Typical intra-model variability ⁽¹⁴⁾	
_		
25		

Туре	Optical particle counter	Optical particle counter	Optical particle counter	Optical particle counter	Optical particle counter	Optical particle counter
Unit of measurement	µg/m³	µg/m³	hð\w _{2 (Y)}	hā, (v)	hð\w _{3 (v)}	counts/cm ^{3 (A)}
Measurement range ⁽¹⁾	0 - 1,000 µg/m³	0 - 2,000 µg/m³ (A) 0 - 1,000 µg/m³ (B)	0 - 2,000 µg/m³ (A)	0 - 10,000 µg/m³ (A) 0 - 1,000 µg/m³ (B)	0 - 15,000 µg/m³ (A)	0 - 8,000 counts/cm ^{3 (A)}
Resolution (2)	1µg/m³	1µg/m³	1 µg/m³ (^)	1 µg/m³	1 µg/m³ (A)	1 counts /cm ^{3 (A)}
Operating temp. range ⁽³⁾	-10 to 50 °C ^(A) -10 to 60 °C ^(B)	-10 to 50 °C ^(A) -10 to 60 °C ^(B)	-10 to 50 °C (A)	-10 to 50 °C ^(A) -10 to 60 °C ^(B)	-10 to 50 °C (A)	-10 to 50 °C (A)
Operating RH range ⁽⁴⁾	0 to 99 %RH	0 to 99 %RH	0 to 99 %RH (A)	0 to 99 %RH	0 to 99 %RH (A)	0 to 99 %RH ^(A)
Recommended RH range ⁽⁴⁾	0 to 95 %RH ^(A)	0 to 95 %RH ^(A)	0 to 95 %RH (A)	0 to 95 %RH	0 to 95 %RH ^(A)	0 to 95 %RH (A)
Operating life ⁽⁵⁾	> 24 months	> 24 months	> 24 months ^(A)	> 24 months	> 24 months ^(A)	> 24 months ^(A)
LOD - Limit of Detection ⁽⁷⁾	0.5 μg/m³ ^(A) 0.5 μg/m³ ^(B)	0.5 µg/m³ ^(A) 0.5 µg/m³ ^(B)	0.5 µg/m³ (A)	0.5 μg/m³ ^(A) 0.5 μg/m³ ^(B)	1 µg/m³ (A)	-
Repeatability ⁽⁸⁾	2 µg/m³ (A) 3 µg/m³ (B)	3 µg/m³	3 µg/m ^{3 (A)}	5 µg/m³ (a) 6 µg/m³ (b)	6 µg/m³ (A)	-
Response Time ⁽⁹⁾	< 10 sec	< 10 sec	< 10 sec (A)	< 10 sec	< 10 sec (A)	< 10 sec (A)
Typical accuracy ^{(11) (12)}	±2 μg/m³ ^(A) ±3 μg/m³ ^(B)	±3 µg/m³	±3 µg/m³ (A)	±4 µg/m ^{3 (A)} ±6 µg/m ^{3 (B)} *	±6 µg/m³ (A)	-
Typical precision - R ^{2 (10)}	> 0.9 ^(A) > 0.85 ^(B)	> 0.8 ^(A) > 0.8 ^(B)	> 0.8 ^(A)	> 0.7 ^(A) > 0.5 ^{(B)*}	> 0.7 ^(A)	> 0.8 ^(A)
Typical slope ⁽¹⁰⁾	0.85 - 1.18 ^(A) 0.80 - 1.25 ^(B)	0.85 - 1.18 ^(A) 0.83 - 1.20 ^(B)	0.85 - 1.18 ^(A)	0.85 - 1.18 ^(A) 0.75 - 1.35 ^{(B)*}	0.85 - 1.18 ^(A)	-
Typical intercept (a) ⁽¹⁰⁾	-1.8 μ g/m ³ \leq a \leq +1.8 μ g/m ³ (^{A)} -2 μ g/m ³ \leq a \leq +2 μ g/m ³ (^{B)}	$-2 \mu g/m^3 \le a \le +2 \mu g/m^{3} ^{(A)}$ $-3 \mu g/m^3 \le a \le +3 \mu g/m^{3} ^{(B)}$	$-2\mu g/m^3 \le a \le +2\mu g/m^{3}$ (A)	$-3 \mu g/m^3 \le a \le +3 \mu g/m^3 {}^{(A)}$	$-4 \mu g/m^3 \le a \le +4 \mu g/m^3$ ^(A)	-
DQO - Typical U (exp) ⁽¹³⁾	< 50%	< 50%	< 50% ^(A)	< 50% ^(A) < 75% ^{(B)+}	< 50% ^(A)	-
Typical intra-model variability ⁽¹⁴⁾	< 2 µg/m³ (A)	< 2 µg/m³ (A)	< 2 µg/m³ (A)	< 2 µg/m³ (A)	< 2 µg/m³ (A)	-

PM,

 PM_{10}

TSP

TPC

 $PM_{2.5}$

PM,

Table notes for gases and particulate matter:

- 1. Measurement range: concentration range measured by the sensor.
- 2. Resolution: smallest unit of measurement that can be indicated by the sensor.
- 3. Operating temperature range: temperature interval at which the sensor is rated to operate safely and provide measurements.
- 4. Operating RH range (Recommended RH range): humidity interval at which the sensor is rated to operate safely and provide measurements.
- 5. Operating life: time period during which the sensor can operate effectively and accurately under normal conditions.
- 6. Guarantee range: concentration range covered by Kunak's guarantee.
- 7. LOD (Limit Of Detection): measured at laboratory conditions at 20°C and 50% RH. The limit of detection is the minimum concentration that can be detected as significantly different from zero gas concentration, based on the metric from the Technical Specification CEN/TS 17660-1:2022.
- 8. Repeatability (measured at laboratory conditions at 20°C and 50% RH): closeness of the agreement between the results of successive measurements of the same measure carried out under the same conditions of measurement, based on the metric from the Technical Specification CEN/TS 17660-1:2022.
- 9. Response time: time needed by the sensor to reach 90% of the final stable value.
- 10. Statistical metric: statistics obtained between the device hourly measurements and reference instruments for 1 to 8 months field test between -10 to +30°C in different countries. (*) The expected error for PM₁₀ is higher in presence of coarse particles.
- 11. Mean Absolute Error: it is the average mean absolute error (MAE) obtained between the device hourly measurements and reference instruments for 1 to 8 months field test between -10 to +30°C in different countries.
- 12. Error: it is the error of the sensor at reading measurement or full scale.
- 13. DQO-Typical U(exp): Data Quality Objetive expressed as the Expanded Uncertainity in the Limit Value obtained between hourly measurements of the device and the reference instruments for 1 to 8 months field test between -10 to +30°C in different countries, based on the metric from the European Air Quality Directive 2008/50/EC and from the Technical Specification CEN/TS 17660-1:2022. (*) The expected error for PM, is higher in presence of coarse particles.
- 14. Typical intra-model variability: calculated as the standard deviation of the three sensor means in 1 to 8 months field test between -10 to +30°C in different countries.

A. B. C superindex: the super indexes refer to different types of cartridges related to the same target pollutant but with different technical specifications.



QC/QA manufacturing process (Factory)

- Sensor selection: Best-in-class sensor selection among all OEM sensors.
- Characterisation: Each sensor is characterized across the full range of temperature and humidity in the laboratory. Once characterized, specific Kunak onboard algorithm is applied to each sensor independently to correct the influence of environmental conditions.
- 3 Calibration: Kunak calibration against reference standards
- (4) Validation: Field sensor validation.
 - \hookrightarrow Kunak calibration certificate

Standard Operation Procedure (Field)

- 5 Field deployment: initial verification and/or calibration/ correction if required.
- 6 Operation and maintenance: Kunak Cloud allows to perform remote network operation & maintenance. A calibration tool is available to calibrate or correct the cartridges remotely following the Kunak SOP guidelines (p. 27)
- Cartridge replacement: once the sensor reaches its end of life, cartridges are returned to Kunak and the electronics are recycled to build new cartridges.

Kunak onboard algorithm

<>

Kunak embedded algorithm calculates the concentrations in ppb or µg/m³ locally and in real-time, not requiring any external reference data to calculate gas or particle concentrations.

Kunak algorithm corrects the interferences and artifacts typically found in raw data, compensating environmental effects like temperature, humidity, and pressure (depending on the cartridge), as well as cross-sensitivities using onboard data. Hence, **Kunak algorithm compensates and mitigates all the effects derived from the different ambient conditions** that the sensors will be exposed to.

Processing Level (*) of Kunak AIR stations 2A: gas concentration in μg/m³ or ppb, derived from onboard sensors, corrected for interferences based on the measurement principle and/or T/RH effects using onboard data.

(*) Schneider, et al., (2019). Toward a unified terminology of processing levels for low-cost air-quality sensors.

Standard Operation Procedure (SOP) guidelines

How Kunak AIR stations can be calibrated or corrected?

Due to the high complexity and variability among different applications, Kunak offers the possibility to either **calibrate** or **correct** the sensor drift and even combine both options to get the most reliable data with the highest accuracy.

Below are defined the processes to maintain maximum sensor accuracy:

- **A. Calibration:** The calibration consists of adjusting the sensor response based on the relation between a reference concentration value and the concentration measured by the sensor itself, obtaining an exact uncertainity of the sensors. Kunak AIR stations offer performance levels close to reference standards, providing reliable, accurate data according to Class 1 of the European CEN/TS 17660 and traceable data to international recognised standards (European Directive 2008/50/EC and USEPA 40 CFR Part 53).
- **B. Correction:** The correction consists of adjusting the sensor response withouth using any external reference data. The correction reduces the error, mitigating the drift of the sensor, however, it does not allow to calculate the exact measurement uncertainity.

Kunak Calibration & Verification

There are two types of calibration for cartridges, which can be used as verification steps as well:



- **A1. Calibration through co-location with reference station:** calibrate the Kunak AIR station against data provided by reference instruments.
 - **Gas cartridges:** only two points are required, baseline and span (sensitivity) calibration.
 - Particle sensor: apply a calibration factor calculated using reference data.



A2. Certified calibration gas cylinder (ISO 6141, NIST) connected through gashood (only in gas cartridges): calibration using a gas cylinder and a gashood (see p. 34) connected to the Kunak AIR station similar as calibration protocol for reference instruments. Only two points are required: baseline and span (sensitivity).

Kunak Correction

If reference data is not available, Kunak offers the possibility to mitigate the drift in the cartridges by conducting:

- **B1.** Baseline correction without reference (only in gas cartridges): select a background level to correct the baseline based on historical data.
- **B2.** Automatic Baseline Correction (ABC): only in CO₂ and CH₄ cartridges. When the cartridge detects a difference between the environmental gas background and the known CH₄ and CO₂ actual background, a self correction is is initiated, adjusting the cartridge parameters to align the known background concentration.
- **B3.** MCERTS certification (only particulate matter sensor): the Kunak AIR Pro PM sensor got the MCERTS certification for Indicative Ambient Particulate Monitors. All PM sensors are delivered with the PM factors obtained in the MCERTS certification.

Scheduled calibration / correction maintenance

At Kunak we share your concern about collecting the highest quality of data. Our stations have been designed **to ensure their optimal operation** during a long period of time.

Our sensors offer a **long service lifetime between 2-5 years** depending on the sensor. Their performance is degraded by the natural loss of the capabilities of the sensors; thus, it is recommended to carry out a remote correction or a baseline and span calibration every time the average temperature changes in 10°C or every 3 to 12 months.

Cartridge	Type of calibration / correction	After deployment on the field	Every 3 months	Every 12 months	Recommended replacement
СО	A1, A2, B1	•	•	•	24 months
CO ₂	B2		Automatic		4 years
NO	A1, A2, B1	•	•	♦	24 months
NO ₂	A1, A2, B1	•	•	♦	24 months
O ₃	A1, A2, B1	•	•	♦	24 months
H ₂ S	A1, A2, B1	•	•	♦	24 months
SO ₂	A1, A2, B1	•	•	♦	24 months
NH ₃	A1, A2, B1	•	•	•	24 months
VOCs	A2		●	•	10,000 hours
CH ₄	B2		Automatic		4 years
HCI	A1, A2, B1	•	•	♦	24 months
PM	A1, B3	•		Check and clean	24 months

Compulsory
 Highly recommended for optimal performance

Type of calibration / correction:

- A1. Calibration through co-location with reference station
 - Gas cartridges: baseline and span calibration
 - PM sensor: PM calibration factor
- A2. Certified calibration gas cylinder (ISO 6141, NIST) connected through gashood
- B1. Baseline correction without reference
- B2. Automatic Baseline Correction (ABC)
- B3. MCERTS certification

Reference station

Evidence of accuracy

We continuously conduct intercomparative studies with reference stations in different locations and laboratories to guarantee the highest quality results.



Kunak AIR Pro









Kunak AIR Lite





*The expected error for $\ensuremath{\mathsf{PM}_{10}}$ is higher in presence of coarse particles (see notes in p. 21)

High-value information for decision making.

EMCA - OP4

Chargers

Kunak AIR stations are equipped with a rechargeable lithium battery which prevents the equipment from shutting down due to a power cut. In this way, they can continue working for long periods of time until the power is restored.

Different charger options are available to power the devices.

Solar panel

The high-efficiency monocrystalline solar panel is robust, waterproof (IP67) and has been designed for prolonged outdoor use in any environment. The photovoltaic panel makes the device autonomous from the power grid, allowing the installation anywhere without civil works or in remote locations. All solar panel models include a mounting kit.



Power	Dimensions	Weight	Installation notes
6W	320 x 190 x 110 mm	1.250 kg	Air Lite: between 0-50°N/S parallels
12 W	340 x 220 x 110 mm	2.350 kg	AIR Pro: between the 0-50°N/S parallels AIR Lite: above the 50°N/S parallels
26 W	450 x 350 x 110 mm	3.150 kg	Above the 50°N/S parallels

Dimensions without box. Each solar panel ensures sufficient power supply depending on the application and project location.

Outdoor charger

An outdoor charger must be used when the Kunak AIR station is going to be installed outdoors. It is small, lightweight, waterproof (IP67) and has been designed for prolonged outdoor use in any environment. AC cable not included.



Dimensions	Weight	Input voltage	Output voltage
200 x 85 x 95 mm	750 g	100-240V AC 50-60 Hz	12V DC

Indoor charger

An indoor charger with global plugs is available for testing and verification.

Not for outdoor use. Only available with the purchase of a power pack.



Dimensions	Weight	Input voltage	Output voltage
75 x 35.8 x 65.6 mm	170 g	100-240V AC 50-60 Hz	9V DC

Meteo sensors

Mechanical anemometer

It includes both wind speed and wind direction sensors. Rugged components stand up to hurricane-force winds yet are sensitive to a light breeze. It includes sealed bearings for long life.

Wind speed range	1 to 89 m/s	Direction resolution	1° on compass rose
Wind speed resolution	0.1 m/s	Direction accuracy	± 3°
Wind speed accuracy	±1m/s or ±5%	Operating temp.	-40 to 65 °C
Weight	1.3 kg	Dimensions	381 x 38 x 457 mm



Ultrasonic anemometer

It includes both wind speed and wind direction sensors. It is an ultrasonic self-powered anemometer. The power requirement is fairly small and is met by means of a small solar panel sitting on top of the unit along with a rechargeable lithium battery in the wider part of the stem of the unit, immediately below the ultrasonic platform.



Wind speed range	0.12 to 40 m/s	Direction resolution	1°
Wind speed resolution	0.05 m/s	Direction accuracy	± 1.5°
Wind speed accuracy	0.12 m/s	Operating temp.	-15 to 55 °C
Weight	0.2 kg	Dimensions	300 x Ø16 mm

Rain gauge

It is highly reliable, simple to maintain and simple to clean. It has proved good performance in all climates and conditions. Proven self-emptying bucket technology to ensure uninterrupted measurement of precipitation regardless of amount and intensity. It measures rain by means of a standardized orifice funnel which collects water into a self-emptying bucket mechanism.

Typical accuracy	±0.2 mm	Operating temp.	0 °C to 60 °C
Resolution	0.2 mm	Orifice area	Ø200 cm ²
Weight	0.5 kg	Dimensions	255 x Ø165 mm



Sound level meter

Low-cost wireless system for the monitoring of urban and industrial noise. Type 2 sound level meter that captures data in real-time and sends it wirelessly to Kunak Cloud. It monitors the noise level in critical points of different areas, provides data 24/7 and allows the configuration of alerts. Small, lightweight and easy to install.

Measuring range	35-130 dB(A) 20 - 12,500 Hz	Resolution	0.1 dB	
Oprating temp.	-10 to 50 ∘C	Typical accuracy	±1 dB(A)	
Weight	2.5 kg	Dimensions	191 x 296 x 168 mm	



Range

Weight

Protocol

Typical accuracy

Pyranometer

The pyranometer measures solar radiation with a high-quality blackened thermopile protected by a dome. The blackened thermopile provides a flat spectral response for the full solar spectrum range, which enables to be used under plant canopies or lamps, when the sky is cloudy, and for reflected radiation measurements.

Resolution

Dimensions

Operating temp.

0.2 W/m²

-40 to 80 °C

Ø56 x 70 mm

0 to 1,600 W/m²

285 to 3,000 nm ± 0.2 W/m²

0.5 kg

Modbus RTU (RS-485)

 $0 \pm 0.200 W/m^2$

Radiation sensor

The radiation sensor detect UV radiation from 280 to 400 nm and are calibrated in energy flux density units of watts per square meter. Typical applications of UV sensors include incoming UV radiation measurement in outdoor environments.

Range	280 ~ 400 nm	Response time	≤1s
Accuracy	±5% rdg	Operating temp.	-40 to 85 °C
Weight	150 g	Dimensions	Ø64 x 33.5 mm
Protocol	Modbus RTU (RS-485)		

Wet Bulb Globe Thermometer (WBGT)

The wet-bulb globe temperature (WBGT) is a measure of the heat stress in direct sunlight, which takes into account the temperature, humidity, wind speed (wind chill) and solar radiation. It is used in OHSAS, in sporting events and by military agencies to determine appropriate exposure levels to high temperatures.

Range	-40 to 80 °C	Resolution	0.05 °C
Accuracy (0°C to 60°C)	± 0.2 K	Operating temp.	-40 to 60 °C
Weight	0.78 kg	Dimensions	15 x 15 x 25.9 cm
Protocol	Modbus RTU (RS-485)		

Gashood

To perform an accurate calibration of the gas cartridges, a gashood can be used to connect a certified calibration gas cylinder (ISO 6141, NIST) to the Kunak AIR station. This type of calibration is similar to the calibration protocol for reference instruments and requires only two points: baseline and span (sensitivity). More about calibration methods on p. 27.









You cannot improve what you can't measure.



Kunak AIR Cloud

Air quality software



Simplify data analysis and get actionable insights for decision-making

REAL-TIME DATA | ALWAYS UPDATED

Our web-based air quality monitoring software helps environmental professionals to use and understand air quality data and delivers operational environmental intelligence to make better decisions.

Thanks to our bidirectional software, Kunak Cloud offers professionals a new way to handle remote settings configuration, alarms management, calibration and field operations, as well as a complete suite for air quality data analysis.

Kunak Cloud is a flexible modular software designed for user-friendly account management, simple network operation, intuitive data validation, and simple analysis and reporting.

The Kunak Cloud web platform is the powerful air quality software that completes the comprehensive Kunak AIR solution.

www.kunakcloud.com

Secure & Confiden

HTTPS/SSL protocols. Confidentiality and ownership of data guaranteed by EULA.

% =	Automatic
	supervision

Monitor the health of your stations & sensors remotely and troubleshoot with automatic tips.



Remote troubleshooting

Service, diagnose and troubleshoot your stations remotely. Get remote support from our team.

G 5 Free continuous updates

Be always updated. Enjoy any new tool or functionality immediately without additional cost.



Advanced algorithms for automatic data flagging. High quality and validated data.



Share the collected data via API or export in different formats. Insert data from third party devices. Air Quality reports

Create customized reports to show AQ data in required formats to share with your clients or external agencies.



Powerful air quality tools and advanced data visualization over the map.



Create public web portals and widgets to share air quality data with stakeholders. PM10 (ug/m3) 0.0 - 10.0 10.0 - 20.0 20.0 - 30.0 30.0 - 40.0 40.0

Mercado Central Cádiz EL PÓPU Pollution sources characterization

ente de la estitución de 1812

Playa de Santa María del Mar (Cádiz) Occidental Cádiz

Punta de San Felipe

numento a la ción de 1812

SCENTRO

Castillo de Santa Catalina Ver Senator Cádiz Spa



100 150 > 200 50

Hot spots identification

KIEVITWIJK

AMANT

PM size distribution by mass

KEROEVER

PM size distribution by counts 2022-02-23 00:00:00 to 2022-02-23 23:59:59

LAKBORS



Amberes: Choco

Average particle size

+ Cumulative of counts

3.

00 10 3

Counts

Data architecture

Thanks to the secured encryption and direct communication protocols it allows bi-directional communications, and facilitates remote configuration, firmware updates and sensor calibration of the devices.

The communication protocols are designed for low power and low data consumption.



*Data is calculated in each node independently, transparently and in real-time. Post-processing is not done in the cloud.

Control panel



Alarms & Log traceability

Parameter	rs (69)			•	Period: All	
Alarm type	e					
🖌 Act	ive 🗹	Unconfirmed	Confirmed	0		
Notificatio	ons Settings					
and the second	los por pag					
100 V end	ies per pagi	Confirm select	ed alarms: Co	nfirm	Help	
Status	Device	Periodicity	Parameter	Description	Check the correct connection of the power suppl	
Unconfirmed	K-A3 RENT 1	Hourly	Battery (%)	Device close to	o run out of battery	
Unconfirmed	K-A3 RENT 1	Instantaneous	Heartbeat	Heartbeat: Los discharge. Per: 02:58:30 UTC	t of connexion probably due to battery sistence: 5, last connection: 2022-02-16	
□ Unconfirmed	K-A3 RENT 1	Hourly	Battery (%)	Device close to	o run out of battery	
Unconfirmed	K-A3 RENT 1	Instantaneous	Heartbeat	Heartbeat: Lost of connexion probably due to battery discharge. Persistence: 5, last connection: 2022-02-15 01:51:18 UTC		
Unconfirmed	K-A3 RENT 1	Hourly	Battery (%)	Device close to run out of battery		
Unconfirmed	K-A3 RENT 1	Hourly	Battery (%)	Device close to	o run out of battery	
Confirmed	K-A3 RENT 1	Instantaneous	Geolocation	The device cou	ld NOT be geolocated correctly	



Multiparametric analysis



CMMS



Customized reports



Software plans

(1)

Get your Admin account (only required per customer, billed annually)

Manage users and accounts, and easily operate the network; configure, operate, calibrate and maintain the stations, as well as validate, analyse data and create reports.



Choose the device's package (1 package per device is required, billed annually)

Select the licence package that best suits your needs and allows you to get the most of the data provided by the sensor network. Choose between:



Starter



Starter +

Operation







Add additional users according to your needs (optional, billed annually)



Always keep on track with diagnosis, operation and maintenance works; and have access to consult validated data, custom analytics and reports.



Easily manage the network; configure, operate, calibrate and maintain the stations as well as validate and analyse data and create reports.



Provide public data or integrate external info into or from third-party platforms.



Give access to your data through open web tools (widget / website).



Integrate external data from your air quality systems into a single platform (Kunak Cloud).



Log in to Kunak Cloud (and start operating your network)

Got to www.kunakcloud.com



Features of each software package

	USER ACCOUNTS	Admin	Expert	Viewer				
	Choose your units, e.g. gas concentration in ppb or µg/m³	✓	~	~				
	Confidentiality and Ownership of data guaranteed by EULA agreement (consult)	✓	~	~				
	ISO 27001 approved cloud data centers (AWS)	✓	~	~				
	Infrastructure monitored and protected 24/7	✓	~	~				
	FAQs, knowledge base, e-mail support with replying asap.	✓	~	~				
	Admin tools (manage users, billing, link devices)	<	×	×				
	API call limit / month		10,000 calls					
	STARTER PACKAGE							
	Check the status of your devices	 Image: A set of the set of the	✓	 Image: A set of the set of the				
	Basic diagnostic information	<	✓	~				
	Follow the actions taking place in your devices (O&M logbook)	<	✓	 Image: A set of the set of the				
	Access to traceability info and receive notifications when the cartridges end the lifespan	<	✓	 Image: A set of the set of the				
	Automatic data-flagging	v	~	 Image: A second s				
	Dashboard & Map View	~	¥	~				
	Multiparametric and Multidevice Charts & Tables, and download the data (.csv, .txt)	 Image: A second s	×	-				
	Automatic averages calculations according to AQ standards	 	· · · ·	~				
	Access to interactive AQI tool (EU and EPA. Others under request)	 Image: A second s	~	× .				
	Configure your devices (sampling and sendig periods, specific features)	 Image: A second s	~	×				
	Set alerts, thres <mark>holds and receive notifications by email</mark>	 Image: A second s	~	×				
S	Data Storage time limit		1 year					
Ю	OPERATION PACKAGE							
)EV	Gas & Particle Calibration Tool: calibrate your devices remotely	~	~ / 3	×				
	Automatic health supervision alarms (broken sensor, out of battery, lack of data)	See.		×				
	Register manually every intervention on the device (upload photos, pdf, documents)			×				
	Computerized Maintenance Management System (CMMS)			×				
	Activate the automatic invalidation of data during interventions & maintenance	~	~	×				
	Manage your AQ data by locations assigning devices to specific spots	~		×				
	ANALYTICS PACKAGE							
	Pollution roses and polar plots over the map		~	~				
	Heatmap to detect hotspots over an area	~	~	v				
	Time-varying heatmaps to know evolution of hotspots over time	~	~	¥				
	Particulate size analysis tool (particle size distribution by counts and by mass)	~	~	v				
	OpenAir Suite for advanced analytics	¥	~	×				
	Data Validation Tool for manual data flagging	~	~	×				
	Create automatic AQ reports			×				

Testimonials

In this section, we share the experiences and opinions of our valued customers that inspire us and motivate us to continue providing exceptional service.

Each testimonial is a statement to the trust placed in our services and the satisfaction derived from them.



References



Urban air quality



Obtain actionable insights into city sustainable development by monitoring your city's air quality.

PROJECTS

- Brussels (Belgium)
- United Nations Addis Ababa (Ethiopia)
- Puebla (Mexico)
- Port-au-Prince (Haiti)
- Mumbai (India)
- Antwerp (Belgium)
- Porto Novo (Benin)
- Madrid (Spain)
- Valencia (Spain)



Works & Demolitions



Comply with requirements by keeping track of the emissions and the ambient in works and demolitions.

PROJECTS

- Solideo (France)
- Modena (Italy)
- Barcelos (Portugal)
- Coke factory (Spain)
- Iberia Barajas (Spain)
- Vicente Calderón Stadium (Spain)
- Santiago Bernabeu Stadium (Spain)



Infrastructures, Ports & Airports



Improve your operations with real time intelligence by monitoring your environmental impact.

PROJECTS

- Dunkirk (France) Port
- Antwerp-Bruges (Belgium) Port
- Neom (KSA) Port & airport
- Basel (Switzerland) Airport
- Brisbane (Australia) Port
- Genoa (Italy) Port
- Balearic Islands (Spain) Port
- Bilbao (Spain) Port
- EFE Valparaiso (Chile) Metro
- RATP (France) Metro



Mines & Quarries



Control air quality in mine and quarries with the high-precision system for resources extraction operations.

PROJECTS

- BHP (Chile)
- Teck (Canada)
- Glencore (South Africa)
- Barrick (Dominican Republic)
- SQM (Chile)
- Cerrejón (Colombia)
- Capstone copper (Australia)
- Rio Tinto (Chile)
- First Quantum Minerals
- (Panama)
- Marcobre (Perú)
- Yamana Gold (Brazil)
- Panamerican Silver (Guatemala)



Industry



Control your processes with real time monitoring of diffuse and perimetral industrial emissions.

PROJECTS

- CEMEX (Mexico, Colombia) Cement
- AOPIL (Oman) Metallurgy
- Jabel Ali (UAE) Cement
- Inerco (Chile) Petrochemical
- Helpe (Greece) Oil & Gas
- Arcelor Mittal (Spain, Brazil, France)
- Ternium (Mexico) Metallurgy
- Shafdan (Israel) WWTP
- Galvani (Brazil) Fertilizer
- ENCE (Spain) Paper



Research & Consulting



Carry out useful and accurate measurements for your studies with the best available technology.

PROJECTS

- US EPA (USA)
- AQMD Los Ángeles (USA)
- VITO (Belgium)
- Helmholtz-Zentrum Hereon (Germany)
- IMEC (Belgium)
- Polytech Orleans (France)
- Universiti Brunei Darussalam (Brunei)
- University of Milan (Italy)
- Universidad Nacional (Costa Rica)
- University of Montenegro (Montenegro)
- UPM Madrid (Spain)

Protect your health. Protect the environment.



P.E. La Muga 9, 4° Oficina 1 31160 Orcoyen (Navarra) - Spain +34 848 470 055 www.kunakair.com

This material is subject to copyright protection, with all copyrights retained by Kunak and its individual partners. All rights reserved, any logos and/or product names are trademarks of Kunak or its individual partners. The reproduction, transfer, distribution or storage of information contained in this brochure in any form without the prior written consent of Kunak is strictly prohibited. All specifications - technical included - are subject to change without notic.