



OUTDOOR AIR QUALITY MONITORING

Ensure good air quality by measuring pollution accurately

The most advanced and reliable solution

kunak[®]
SENSING ANYWHERE



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



GLENCORE





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



Multiple pollutants



MCERTS certified
CSA MC230418/00



Traceable back to reference standards



Remote calibration



Additional probes

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:





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 ₂ S, NH ₃ , CH ₄ , VOC, HCl
PM sensor	PM ₁ , PM _{2.5} , PM ₄ , PM ₁₀ TSP and 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



2 gases and particles



Proven accuracy



Traceable to reference standards



Autonomous operation



Additional probes

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:





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 ₂ S, NH ₃ , CH ₄ , VOC, HCl
PM sensor	PM ₁ , PM _{2.5} and 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

Accurate real-time pollutant value without the need for external instruments or reference data



Traceable QC & QA

Each cartridge is calibrated and validated individually in lab against traceable reference standards.



Low intra-variability

Consistent readings across all equipment and locations, correcting implicit sensor variability.



Endless combinations

Combine your cartridges according to your needs in just 2 minutes.

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.



Say hello to a revolutionary air quality sensor that fits in the palm of your hand.



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.

Type	Electrochemical	Limit of Detection (LOD) ⁽⁷⁾	10 ppb ^(A) 0.02 ppm ^(B)
Unit of measurement	$\mu\text{g}/\text{m}^3$, ppb ^(A) mg/m^3 , ppm ^(B)	Repeatability ⁽⁸⁾	20 ppb ^(A) 0.05 ppm ^(B)
Measurement range ⁽¹⁾	0 - 12,000 ppb ^(A) 0 - 500 ppm ^(B)	Response time ⁽⁹⁾	< 30 sec ^(A) < 180 sec ^(B)
Resolution ⁽²⁾	1 ppb ^(A) 0.01 ppm ^(B)	Typical accuracy ^{(11) (12)}	± 80 ppb ^(A) ± 0.1 ppm ^(B)
Operating temp. range ⁽³⁾	-30 to 50 °C	Typical precision R^2 ⁽¹⁰⁾	> 0.85
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⁾	-50 ppb $\leq a \leq$ +50 ppb ^(A) -0.1 ppm $\leq a \leq$ +0.1 ppm ^(B)
Operating life ⁽⁵⁾	> 24 months	DQO - Typical U(exp) ⁽¹³⁾	< 20%
Guarantee range ⁽⁶⁾	1,000 ppm	Typical Intra-model variability ⁽¹⁴⁾	< 3 ppb ^(A) < 0.05 ppm ^(B)

* See notes on page 24

Carbon dioxide



Where is it found?

Carbon dioxide (CO₂) 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 CO₂ 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 (O₂) and nitrogen (N₂). CO₂ is removed from the atmosphere when it is absorbed by plants and algae as part of the biological carbon cycle.

CO₂ 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.

Type	NDIR
Unit of measurement	mg/m ³ , 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

* See notes on page 24

Nitric oxide



Where is it found?

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 (NO₂) and tropospheric ozone (O₃), 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.

Type	Electrochemical	Limit of Detection (LOD) ⁽⁷⁾	2 ppb
Unit of measurement	µg/m ³ , ppb	Repeatability ⁽⁸⁾	4 ppb
Measurement range ⁽¹⁾	0 - 5,000 ppb	Response time ⁽⁹⁾	< 30 sec
Resolution ⁽²⁾	1 ppb	Typical accuracy ^{(11) (12)}	± 4 ppb
Operating temp. range ⁽³⁾	-30 to 45°C	Typical precision R ² ⁽¹⁰⁾	> 0.9
Operating RH range ⁽⁴⁾	0 to 99 %RH	Typical slope ⁽¹⁰⁾	0.9 - 1.12
Recommended RH range ⁽⁴⁾	15 to 85 %RH	Typical intercept (a) ⁽¹⁰⁾	-2 ppb ≤ a ≤ +2 ppb
Operating life ⁽⁵⁾	> 24 months	DQO - Typical U(exp) ⁽¹³⁾	< 20%
Guarantee range ⁽⁶⁾	20 ppm	Typical Intra-model variability ⁽¹⁴⁾	< 1 ppb

* See notes on page 24

Nitrogen dioxide



Where is it found?

The major source of nitrogen dioxide (NO₂) is combustion of fossil fuels: coal, oil and gas. Most of the NO₂ in cities is derived from motor vehicle's exhausts.

Other sources of NO₂ are petrol and metal refining, electricity generation from coal-fired power stations, other manufacturing industries and food processing.

Why is it harmful?

NO₂ is a pollutant criterion that contributes to the formation of photochemical smog, which has significant impact on human health and the environment.

Inhalation of NO₂ 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 NO₂ cartridge contains an electrochemical sensor with an embedded O₃ 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.

Type	Electrochemical	Limit of Detection (LOD) ⁽⁷⁾	2 ppb
Unit of measurement	µg/m ³ , ppb	Repeatability ⁽⁸⁾	4 ppb
Measurement range ⁽¹⁾	0 - 5,000 ppb	Response time ⁽⁹⁾	< 60 sec
Resolution ⁽²⁾	1 ppb	Typical accuracy ^{(11) (12)}	± 5 ppb
Operating temp. range ⁽³⁾	-30 to 45°C	Typical precision R ² ⁽¹⁰⁾	> 0.85
Operating RH range ⁽⁴⁾	0 to 99 %RH	Typical slope ⁽¹⁰⁾	0.78 - 1.29
Recommended RH range ⁽⁴⁾	15 to 85 %RH	Typical intercept (a) ⁽¹⁰⁾	-4 ppb ≤ a ≤ +4 ppb
Operating life ⁽⁵⁾	> 24 months	DQO - Typical U(exp) ⁽¹³⁾	< 25%
Guarantee range ⁽⁶⁾	20 ppm	Typical Intra-model variability ⁽¹⁴⁾	< 1 ppb

* See notes on page 24

Ozone



Where is it found?

Ozone (O₃) 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?

O₃ 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 O₃ cartridge has a built-in electrochemical sensor responsive to NO₂ and O₃ concentrations. Hence, in order to measure accurately the O₃ concentration, it is required to install in the same device the NO₂ cartridge.

The Kunak algorithm considers both concentrations allowing for accurate O₃ measurements with no NO₂ influence, even at high temperatures which are related to higher O₃ concentration due to the solar radiation.

Type	Electrochemical	Limit of Detection (LOD) ⁽⁷⁾	3 ppb
Unit of measurement	µg/m ³ , ppb	Repeatability ⁽⁸⁾	4 ppb
Measurement range ⁽¹⁾	0 - 2,000 ppb	Response time ⁽⁹⁾	< 70 sec
Resolution ⁽²⁾	1 ppb	Typical accuracy ^{(11) (12)}	± 8 ppb
Operating temp. range ⁽³⁾	-30 to 45°C	Typical precision R ² ⁽¹⁰⁾	> 0.9
Operating RH range ⁽⁴⁾	10 to 99 %RH	Typical slope ⁽¹⁰⁾	0.85 - 1.18
Recommended RH range ⁽⁴⁾	15 to 85 %RH	Typical intercept (a) ⁽¹⁰⁾	-3 ppb ≤ a ≤ +3 ppb
Operating life ⁽⁵⁾	> 24 months	DQO - Typical U(exp) ⁽¹³⁾	< 20%
Guarantee range ⁽⁶⁾	20 ppm	Typical Intra-model variability ⁽¹⁴⁾	< 1 ppb

Hydrogen sulphide



Where is it found?

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?

H_2S is highly toxic to humans and other living organisms, even at low concentrations and affects mainly 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.

H_2S cartridge

The H_2S cartridge has a built-in electrochemical sensor very sensitive to its target pollutant allowing to detect small changes in H_2S concentration. This cartridge also responds to **methyl mercaptan (CH_3S)** 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.

Type	Electrochemical	Limit of Detection (LOD) ⁽⁷⁾	2 ppb ^(A) 0.01 ppm ^(B)
Unit of measurement	$\mu g/m^3$, ppb ^(A) mg/m ³ , ppm ^(B)	Repeatability ⁽⁸⁾	4 ppb ^(A) 0.01 ppm ^(B)
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 ppb $\leq a \leq$ +5 ppb ^(A) -0.05 ppm $\leq a \leq$ +0.05 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



Where is it found?

Sulphur dioxide (SO₂) 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 SO₂ 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?

SO₂ 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.

SO₂ cartridge

The SO₂ cartridge has a built-in electrochemical sensor which presents high cross-sensitivities with O₃, NO₂ and CO. When used together with the NO₂, O₃ 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).

Type	Electrochemical
Unit of measurement	µg/m ³ , 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 ppb ≤ a ≤ +5 ppb
DQO - Typical U(exp) ⁽¹³⁾	< 25%
Typical Intra-model variability ⁽¹⁴⁾	< 3 ppb

* See notes on page 24

Ammonia



Where is it found?

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?

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. NH_3 also contributes to the formation of particulate aerosols in the atmosphere as a secondary particulate precursor.

NH_3 cartridge

The NH_3 cartridges contain electrochemical sensors capable of accurately measuring NH_3 in different ranges. There are 3 types of NH_3 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 H_2S when present at high concentrations (ppm level), which is relevant since the two substances can coexist in the same environment. Therefore, to accurately measure NH_3 , it is necessary to have the H_2S cartridge installed in the same device (in case of high H_2S concentrations, ppm level). Thus, thanks to Kunak's algorithm which considers both concentrations, it is possible to correct the interference of H_2S and obtain precise measurements of NH_3 .
- **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 NH_3 concentrations (i.e. livestock).
- **Type C:** cartridge is able to measure continuous (background) concentrations of NH_3 , with a range up to 50 ppm. It is responsive to H_2S , which is why it is recommended to install an H_2S cartridge in the same device to correct this interference when H_2S is present at high concentrations (ppm level). This cartridge is recommended for continuous NH_3 monitoring applications such as farms and livestock.

Type	Electrochemical	Limit of Detection (LOD) ⁽⁷⁾	0.02 ppm ^(A-C) 0.15 ppm ^(B)
Unit of measurement	mg/m ³ , ppm	Repeatability ⁽⁸⁾	0.03 ppm ^(A) 0.5 ppm ^(B) 0.1 ppm ^(C)
Measurement range ⁽¹⁾	0 - 50 ppm ^(A-C) 0 - 1,500 ppm ^(B)	Response time ⁽⁹⁾	< 45 sec ^(A) < 90 sec ^(B-C)
Resolution ⁽²⁾	0.01 ppm	Typical accuracy ^{(11) (12)}	± 0.3 ppm ^(A) ± 1.5 ppm ^(B) ± 0.5 ppm ^(C)
Operating temp. range ⁽³⁾	-10 to 50°C ^(A) -20 to 43°C ^(B) -20 to 40°C ^(C)	Typical precision R ² ⁽¹⁰⁾	-
Operating RH range ⁽⁴⁾	0 to 99 %RH	Typical slope ⁽¹⁰⁾	-
Recommended RH range ⁽⁴⁾	15 to 90 %RH	Typical intercept (a) ⁽¹⁰⁾	-
Operating life ⁽⁵⁾	> 24 months	DQO - Typical U(exp) ⁽¹³⁾	-
Guarantee range ⁽⁶⁾	100 ppm ^(A) 5,000 ppm ^(B) 200 ppm ^(C)	Typical Intra-model variability ⁽¹⁴⁾	< 0.1 ppm ^(A-C) < 0.2 ppm ^(B)

* See notes on page 24

Volatile Organic Compounds



Where is it found?

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.

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.

Type	Photoionization detector	Limit of Detection (LOD) ⁽⁷⁾	1 ppb ^(A) 0.01 ppm ^(B)
Unit of measurement	$\mu\text{g}/\text{m}^3$, ppb ^(A) mg/m^3 , ppm ^(B)	Repeatability ⁽⁸⁾	5 ppb ^(A) < 0.02 ppm ^(B)
Measurement range ⁽¹⁾	0 - 3,000 ppb ^(A) 0 - 40 ppm ^(B)	Response time ⁽⁹⁾	< 12 sec ^(A) < 10 sec ^(B)
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) < 0.1 ppm ^(B)

* See notes on page 24

Methane



Where is it found?

Methane (CH_4) 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. CH_4 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 CH_4 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. CH_4 contributes to the formation of tropospheric ozone and particulate pollution.

Moreover, methane is a much more potent greenhouse gas than CO_2 contributing significantly to global warming and climate change.

CH_4 sensors

Various options are available for methane monitoring, each designed for different applications and measurement ranges:

- **Cartridge (Type A):** is a non-dispersive infrared (NDIR) sensor specific for the detection of CH_4 leaks in industrial processes. This sensor has a detection limit of 1,000 ppm and can measure concentrations up to 50,000 ppm. This cartridge includes an automatic baseline correction (ABC) algorithm to background levels to maintain long-term stability.

NEW • Cartridge (Type C): a new state-of-the-art sensor designed for applications that demand reliable and affordable methane monitoring. This high-sensitivity sensor provides accurate measurements from low concentrations (2 ppm) to 300 ppm. Its compact design, cost-effectiveness and cutting-edge performance make it an ideal solution for continuous monitoring and leak detection.

NEW • Methane Laser Module (Type D): Leveraging Tunable Diode Laser Absorption Spectroscopy (TDLAS) technology, this module (320 x 150 x 120 mm) provides exceptional accuracy for methane measurements, with a range spanning from sub-ppm levels to 1,000 ppm. Its unique selectivity for methane, free from interference by other gases, water vapor, or dust particles, makes it an advanced solution for industries demanding the highest accuracy.

Type	NDIR ^(A) N.A. ^(C) TDLAS ^(D)	Limit of Detection (LOD) ⁽⁷⁾	1,000 ppm ^(A) < 0.05 ppm ^(C-D)
Unit of measurement	mg/m ³ , ppm	Repeatability ⁽⁸⁾	500 ppm ^(A) < 0.35 ppm ^(C) < 0.30 ppm ^(D)
Measurement range ⁽¹⁾	1,000 - 50,000 ppm (5% vol) ^(A) 2 - 300 ppm ^(C) 0 - 1,000 ppm ^(D)	Response time ⁽⁹⁾	< 90 sec ^(A) < 120 sec ^(C) < 20 sec ^(D)
Resolution ⁽²⁾	100 ppm ^(A) 0.01 ppm ^(C-D)	Typical accuracy ^{(11) (12)}	±3 % of F.S. ^(A) ±1 ppm + 10% of reading ^(C) ±0.5 ppm + 1% of reading ^(D)
Operating temp. range ⁽³⁾	-20 to 50°C ^(A) -30 to 60°C ^(C-D)	Typical precision R ² ⁽¹⁰⁾	> 0.85 ^(C) > 0.90 ^(D)
Operating RH range ⁽⁴⁾	0 to 99 %RH ^(A) 10 to 99 %RH ^(C) 0 to 98 %RH ^(D)	Typical slope ⁽¹⁰⁾	-
Recommended RH range ⁽⁴⁾	15 to 95 %RH ^(A) 15 to 90 %RH ^(C)	Typical intercept (a) ⁽¹⁰⁾	-
Operating life ⁽⁵⁾	> 4 years ^(A) > 24 months ^(C) > 5 years ^(D)	DQO - Typical U(exp) ⁽¹³⁾	-
Guarantee range ⁽⁶⁾	100% vol ^(A) 10,000 ppm ^(C-D)	Typical Intra-model variability ⁽¹⁴⁾	< 500 ppm ^(A)

Hydrogen chloride



Where is it found?

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.

HCl 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 H_2S , it is therefore recommended to use an H_2S cartridge together with the HCl cartridge, when high H_2S 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.

Type	Electrochemical	Limit of Detection (LOD) ⁽⁷⁾	0.01 ppm
Unit of measurement	mg/m ³ , ppm	Repeatability ⁽⁸⁾	0.02 ppm
Measurement range ⁽¹⁾	0 - 20 ppm	Response time ⁽⁹⁾	< 45 sec
Resolution ⁽²⁾	0.01 ppm	Typical accuracy ^{(11) (12)}	± 0.1 ppm
Operating temp. range ⁽³⁾	-20 to 50°C	Typical precision R ² ⁽¹⁰⁾	-
Operating RH range ⁽⁴⁾	0 to 99 %RH	Typical slope ⁽¹⁰⁾	-
Recommended RH range ⁽⁴⁾	15 to 90 %RH	Typical intercept (a) ⁽¹⁰⁾	-
Operating life ⁽⁵⁾	> 24 months	DQO - Typical U(exp) ⁽¹³⁾	-
Guarantee range ⁽⁶⁾	200 ppm	Typical Intra-model variability ⁽¹⁴⁾	< 0.1 ppm

* See notes on page 24

Particulate Matter



Where is it found?

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 ($<0.1 \mu m$ 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 $0.3 \mu m$ up to $40 \mu m$ thanks to 24 bin channels. The PM_1 , $PM_{2.5}$, PM_4 , PM_{10} , 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 $0.3 \mu m$ up to $10 \mu m$. The sensor monitors accurately PM_1 and $PM_{2.5}$ concentration, while the expected error for PM_{10} 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

CSA MC230418/00



Type A (only for Kunak AIR Pro)

Type	Optical particle counter		0.5 µg/m ³ (PM1) 0.5 µg/m ³ (PM2.5) 0.5 µg/m ³ (PM4) 1 µg/m ³ (PM10) 1 µg/m ³ (TSP)
Unit of measurement	µg/m ³	Limit of Detection (LOD) ⁽⁷⁾	
Measurement range ⁽¹⁾	0 - 1,000 µg/m ³ (PM1) 0 - 2,000 µg/m ³ (PM2.5) 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⁾	± 2 µg/m ³ (PM1) ± 3 µg/m ³ (PM2.5) ± 3 µg/m ³ (PM4) ± 4 µg/m ³ (PM10) ± 6 µg/m ³ (TSP)
Resolution ⁽²⁾	1 µg/m ³ 1 count/cm ³ (TPC)	Typical precision R ² ⁽¹⁰⁾	> 0.9 (PM1) > 0.8 (PM2.5) > 0.8 (PM4) > 0.7 (PM10) > 0.7 (TSP) > 0.8 (TPC)
Operating temperature range ⁽³⁾	-10 to 50 °C	Typical slope ⁽¹⁰⁾	0.85 - 1.18
Operating RH range ⁽⁴⁾	0 to 99 %RH	Typical intercept (a) ⁽¹⁰⁾	-1.8 µg/m ³ ≤ a ≤ +1.8 µg/m ³ (PM1) -2 µg/m ³ ≤ a ≤ +2 µg/m ³ (PM2.5) -2 µg/m ³ ≤ a ≤ +2 µg/m ³ (PM4) -3 µg/m ³ ≤ a ≤ +3 µg/m ³ (PM10) -4 µg/m ³ ≤ a ≤ +4 µg/m ³ (TSP)
Recommended RH range ⁽⁴⁾	0 to 95 %RH	DQO - Typical U(exp) ⁽¹¹⁾	< 50%
Operating life ⁽⁵⁾	> 24 months	Typical intra-model variability ⁽¹²⁾	< 2 µg/m ³
Repeatability ⁽⁸⁾	2 µg/m ³ (PM1) 3 µg/m ³ (PM2.5) 3 µg/m ³ (PM4) 5 µg/m ³ (PM10) 6 µg/m ³ (TSP)		
Response time ⁽⁹⁾	< 10 sec		

Type B (only for Kunak AIR Lite)

Type	Optical particle counter		0.5 µg/m ³ (PM1) 0.5 µg/m ³ (PM2.5) 0.5 µg/m ³ (PM10)
Unit of measurement	µg/m ³	Limit of Detection (LOD) ⁽⁷⁾	
Measurement range ⁽¹⁾	0 - 1,000 µg/m ³	Typical accuracy (MAE) ⁽¹⁰⁾	± 3 µg/m ³ (PM1) ± 3 µg/m ³ (PM2.5) ± 6 µg/m ³ (PM10) *
Resolution ⁽²⁾	1 µg/m ³	Typical precision R ² ⁽¹⁰⁾	> 0.85 (PM1) > 0.8 (PM2.5) > 0.5 (PM10) *
Operating temperature range ⁽³⁾	-10 to 60 °C	Typical slope ⁽¹⁰⁾	0.80-1.25 (PM1) 0.83-1.20 (PM2.5) 0.75-1.35 (PM10) *
Operating RH range ⁽⁴⁾	0 to 99 %RH	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) *
Operating life ⁽⁵⁾	> 24 months	DQO - Typical U(exp) ⁽¹¹⁾	< 50% (PM1 - PM2.5) < 75% (PM10) *
Repeatability ⁽⁸⁾	3 µg/m ³ (PM1) 3 µg/m ³ (PM2.5) 6 µg/m ³ (PM10)	Typical intra-model variability ⁽¹²⁾	< 2 µg/m ³
Response time ⁽⁹⁾	< 10 sec		

* See notes on page 25

Environmental data

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
Type	Solid state	Solid state	Solid state	Solid state
Unit of measurement	°C	%	hPa	°C
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	± 2 hPa	-
Typical precision R ² ⁽¹⁰⁾	> 0.95	> 0.95	> 0.95	> 0.95

	CO	CO ₂	NO	NO ₂	O ₃	H ₂ S	SO ₂	NH ₃	VOCs	CH ₄	HCl
Type	Electrochemical	Non-dispersive infrared (NDIR)	Electrochemical	Electrochemical	Electrochemical	Electrochemical	Electrochemical	Electrochemical	Photo-ionization detector	NDIR ^(A) N.A. ^(C) TDLAS ^(D)	Electrochemical
Unit of measurement	µg/m ³ , ppb ^(A) mg/m ³ , ppm ^(B)	mg/m ³ , ppm	µg/m ³ , ppb	µg/m ³ , ppb	µg/m ³ , ppb	µg/m ³ , ppb ^(A) mg/m ³ , ppm ^(B)	µg/m ³ , ppb	mg/m ³ , ppm	µg/m ³ , ppb ^(A) mg/m ³ , ppm ^(B)	mg/m ³ , ppm	mg/m ³ , 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) 2-300 ppm ^(C) 0-1,000 ppm ^(D)	0-20 ppm
Resolution ⁽²⁾	1 ppb ^(A) 0.01 ppm ^(B)	0,01 ppm	1 ppb	1 ppb	1 ppb	1 ppb ^(A) 0.01 ppm ^(B)	1 ppb	0.01 ppm	1 ppb ^(A) 0.01 ppm ^(B)	100 ppm ^(A) 0.01 ppm ^(C-D)	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) -30 to 60 °C ^(C-D)	-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 ^(A) 10 to 99 %RH ^(C) 0 to 98 %RH ^(D)	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 95 %RH ^(A) 15 to 90 %RH ^(C)	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 ^(A) > 24 months ^(C) > 5 years ^(D)	> 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 ^(A) 10,000 ppm ^(C-D)	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 ppb ^(A) 0.01 ppm ^(B)	1,000 ppm ^(A) < 0.05 ppm ^(C-D)	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) < 0.35 ppm ^(C) < 0.30 ppm ^(D)	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) < 120 sec ^(C) < 20 sec ^(D)	< 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) ±1 ppm + 10% of reading ^(C) ±0.5 ppm + 1% of reading ^(D)	±0.1 ppm
Typical precision - R ² ⁽¹⁰⁾	> 0.85	> 0,8	> 0.9	> 0.85	> 0.9	> 0.75	> 0.7	-	-	> 0.85 ^(C) > 0.90 ^(D)	-
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 ≤ a ≤ +50 ppb ^(A) -0.1 ppm ≤ a ≤ +0.1 ppm ^(B)	-170 ppm ≤ a ≤ 170 ppm	-2 ppb ≤ a ≤ +2 ppb	-4 ppb ≤ a ≤ +4 ppb	-3 ppb ≤ a ≤ +3 ppb	-5 ppb ≤ a ≤ +5 ppb ^(A) -0.05 ppm ≤ a ≤ +0.05 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	< 1 ppb	< 1 ppb	< 1 ppb	< 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

	PM ₁	PM _{2.5}	PM ₄	PM ₁₀	TSP	TPC
Type	Optical particle counter	Optical particle counter	Optical particle counter	Optical particle counter	Optical particle counter	Optical particle counter
Unit of measurement	µg/m ³	µg/m ³	µg/m ³ (A)	µg/m ³ (A)	µg/m ³ (A)	counts/cm ³ (A)
Measurement range ⁽¹⁾	0 - 1,000 µg/m ³	0 - 2,000 µg/m ³ (A) 0 - 1,000 µg/m ³ (B)	0 - 2,000 µg/m ³ (A)	0 - 10,000 µg/m ³ (A) 0 - 1,000 µg/m ³ (B)	0 - 15,000 µg/m ³ (A)	0 - 8,000 counts/cm ³ (A)
Resolution ⁽²⁾	1 µg/m ³	1 µg/m ³	1 µg/m ³ (A)	1 µg/m ³	1 µg/m ³ (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/m ³ (A) 0.5 µg/m ³ (B)	0.5 µg/m ³ (A) 0.5 µg/m ³ (B)	0.5 µg/m ³ (A)	0.5 µg/m ³ (A) 0.5 µg/m ³ (B)	1 µg/m ³ (A)	-
Repeatability ⁽⁸⁾	2 µg/m ³ (A) 3 µg/m ³ (B)	3 µg/m ³	3 µg/m ³ (A)	5 µg/m ³ (A) 6 µg/m ³ (B)	6 µg/m ³ (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/m ³ (A) ±3 µg/m ³ (B)	±3 µg/m ³	±3 µg/m ³ (A)	±4 µg/m ³ (A) ±6 µg/m ³ (B) *	±6 µg/m ³ (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 µg/m ³ ≤ a ≤ +1.8 µg/m ³ (A) -2 µg/m ³ ≤ a ≤ +2 µg/m ³ (B)	-2 µg/m ³ ≤ a ≤ +2 µg/m ³ (A) -3 µg/m ³ ≤ a ≤ +3 µg/m ³ (B)	-2 µg/m ³ ≤ a ≤ +2 µg/m ³ (A)	-3 µg/m ³ ≤ a ≤ +3 µg/m ³ (A) -9 µg/m ³ ≤ a ≤ +9 µg/m ³ (B) *	-4 µg/m ³ ≤ a ≤ +4 µg/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/m ³ (A)	< 2 µg/m ³ (A)	< 2 µg/m ³ (A)	< 2 µg/m ³ (A)	< 2 µg/m ³ (A)	-

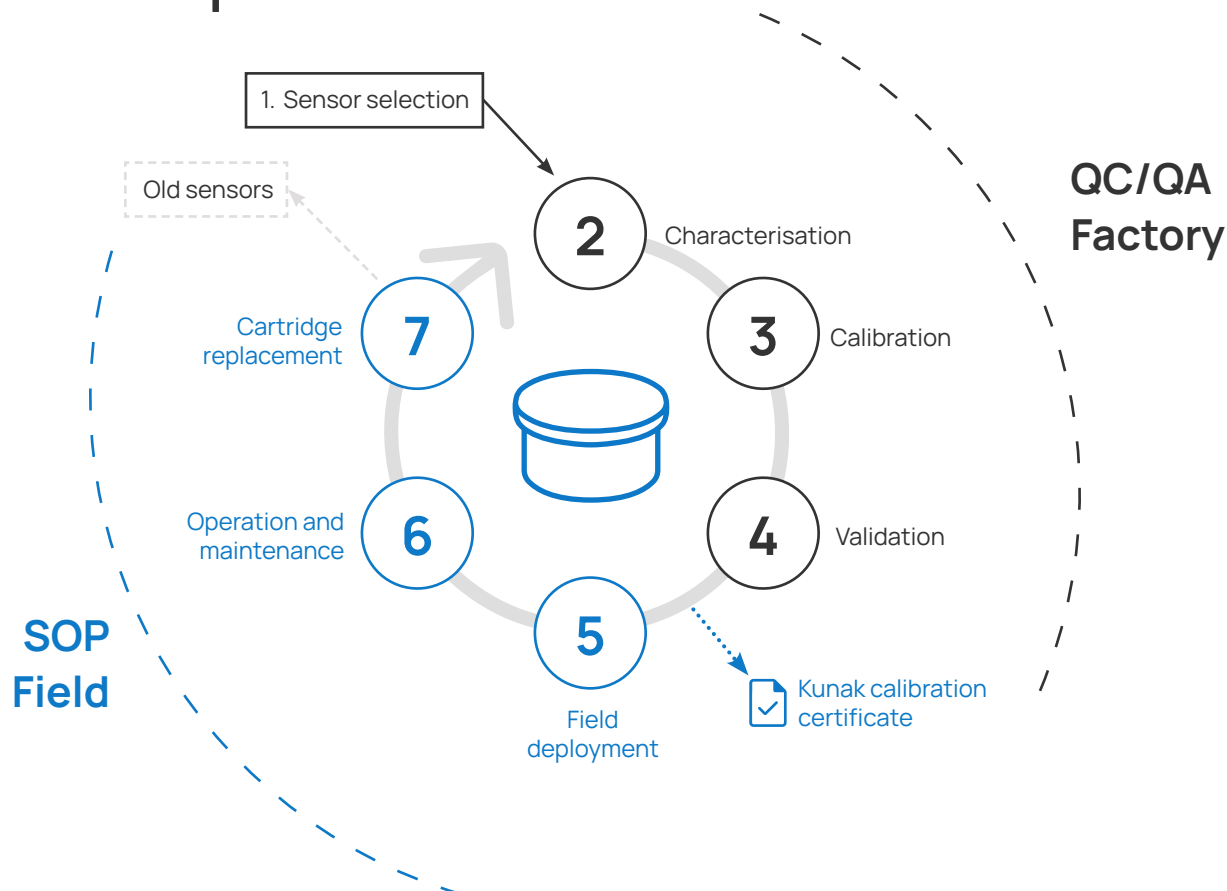
Table notes for gases and particulate matter:

- Measurement range: concentration range measured by the sensor.
- Resolution: smallest unit of measurement that can be indicated by the sensor.
- Operating temperature range: temperature interval at which the sensor is rated to operate safely and provide measurements.
- Operating RH range (Recommended RH range): humidity interval at which the sensor is rated to operate safely and provide measurements.
- Operating life: time period during which the sensor can operate effectively and accurately under normal conditions.
- Guarantee range: concentration range covered by Kunak's guarantee.
- 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.
- 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.
- Response time: time needed by the sensor to reach 90% of the final stable value.
- 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.
- 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.
- Error: it is the error of the sensor at reading measurement or full scale.
- DQO-Typical U(exp): Data Quality Objective expressed as the Expanded Uncertainty 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 PM₁₀ is higher in presence of coarse particles.
- 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 and Standard Operation Procedure



QC/QA manufacturing process (Factory)

- ① **Sensor selection:** Best-in-class sensor selection among all OEM sensors.
- ② **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.
↳ **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)
- ⑦ **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 $\mu\text{g}/\text{m}^3$ 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 $\mu\text{g}/\text{m}^3$ 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 uncertainty 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 without 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 uncertainty.

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 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
CO	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
HCl	A1, A2, B1	●	●	◆	24 months
PM	A1, B3	●		Check and clean	24 months

◆ Compulsory ● Highly recommended for optimal performance

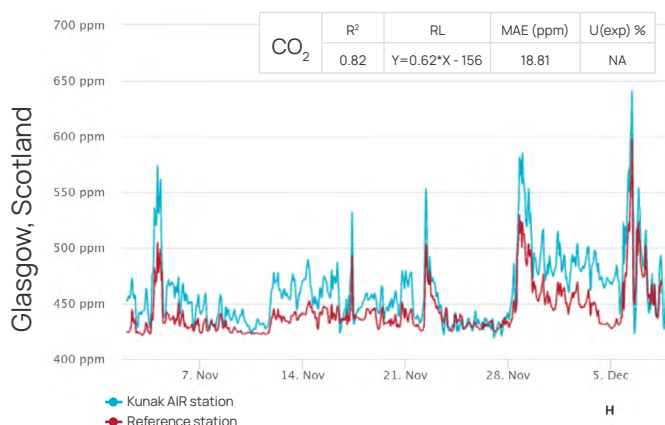
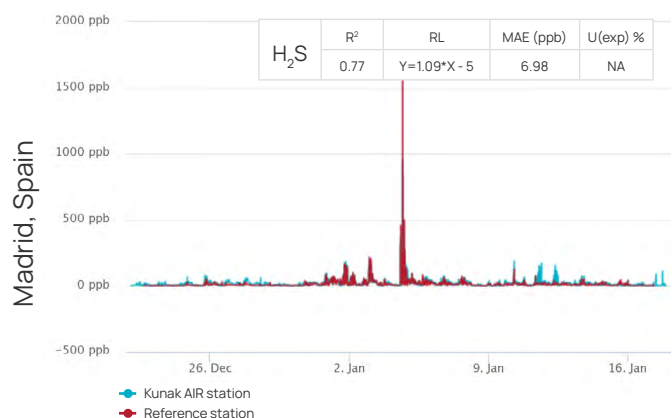
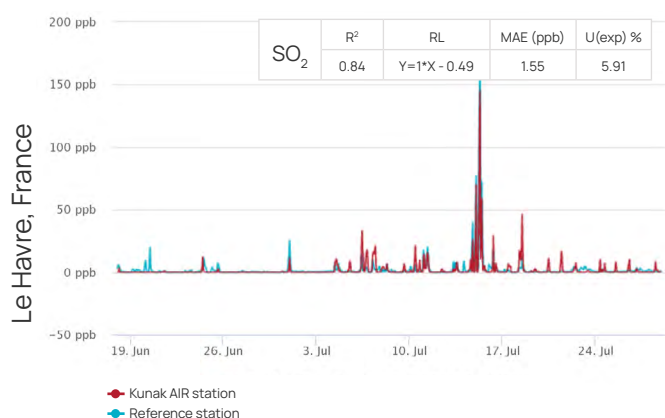
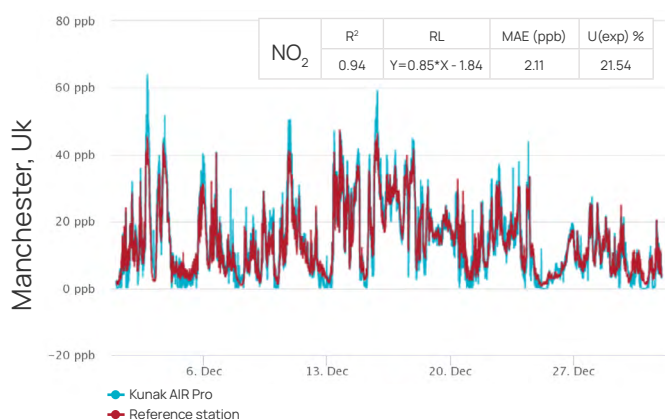
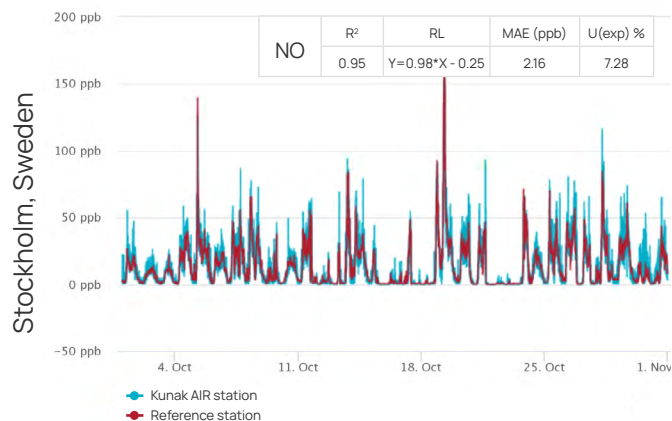
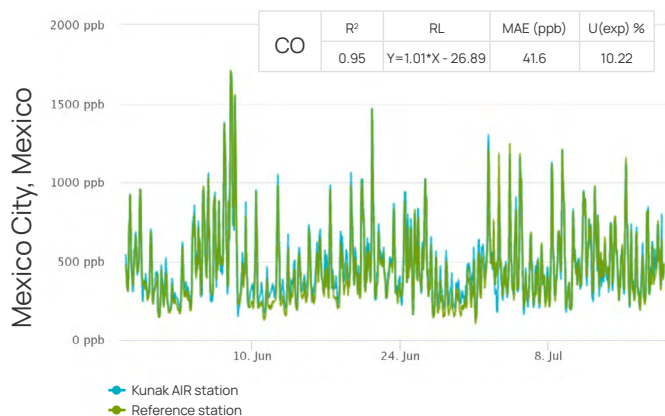
Type of calibration / correction:

- 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



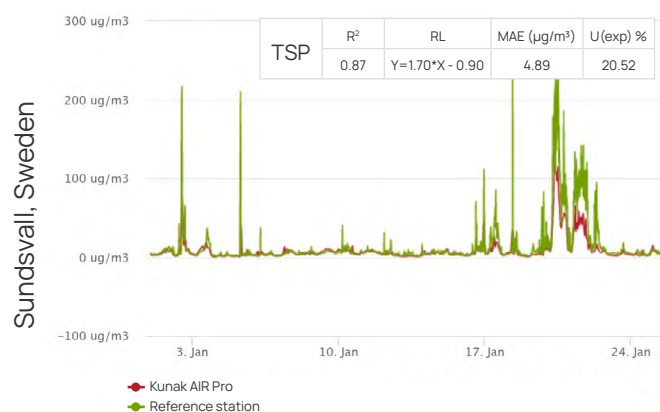
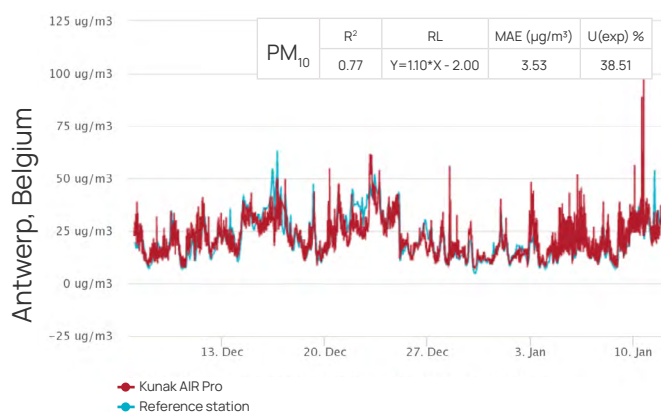
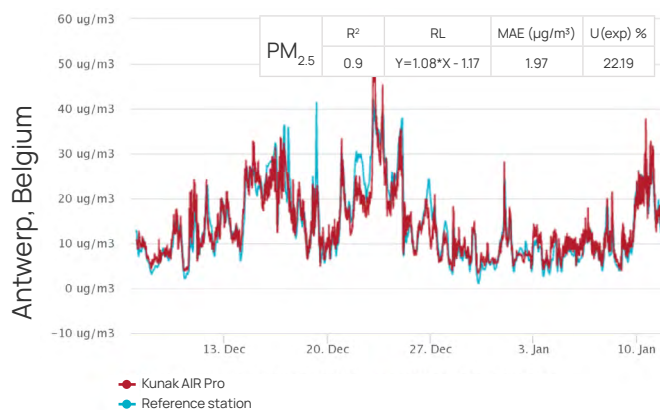
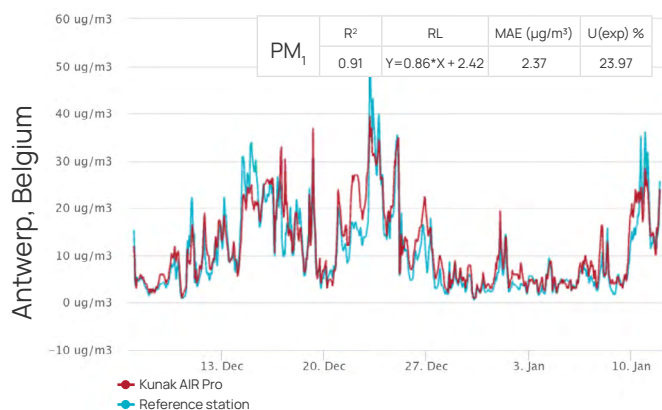
Evidence of accuracy

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

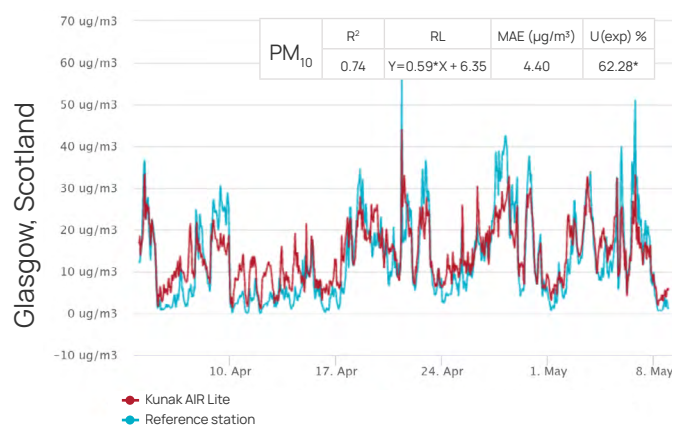
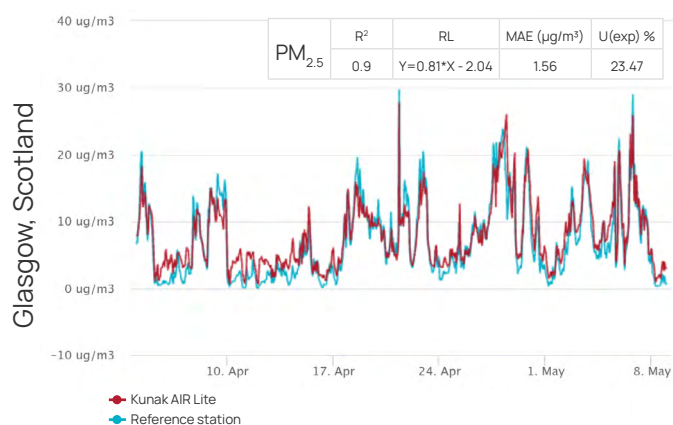




Kunak AIR Pro



Kunak AIR Lite



*The expected error for PM₁₀ is higher in presence of coarse particles (see notes in p. 21)

High-value information
for decision making.





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	± 1 m/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 cm²
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
Operating temp.	-10 to 50 °C	Typical accuracy	±1 dB(A)
Weight	2.5 kg	Dimensions	191 x 296 x 168 mm





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.



Range	0 to 1,600 W/m ² 285 to 3,000 nm	Resolution	0.2 W/m ²
Typical accuracy	± 0.2 W/m ²	Operating temp.	-40 to 80 °C
Weight	0.5 kg	Dimensions	Ø56 x 70 mm
Protocol	Modbus RTU (RS-485)		

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	0 to 200 W/m ² 280 ~ 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 & Confidential

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



Free continuous updates

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



Air Quality reports

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



Automatic supervision

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



Reliable data guaranteed

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



Pollution sources & Hot spots

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



Remote troubleshooting

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



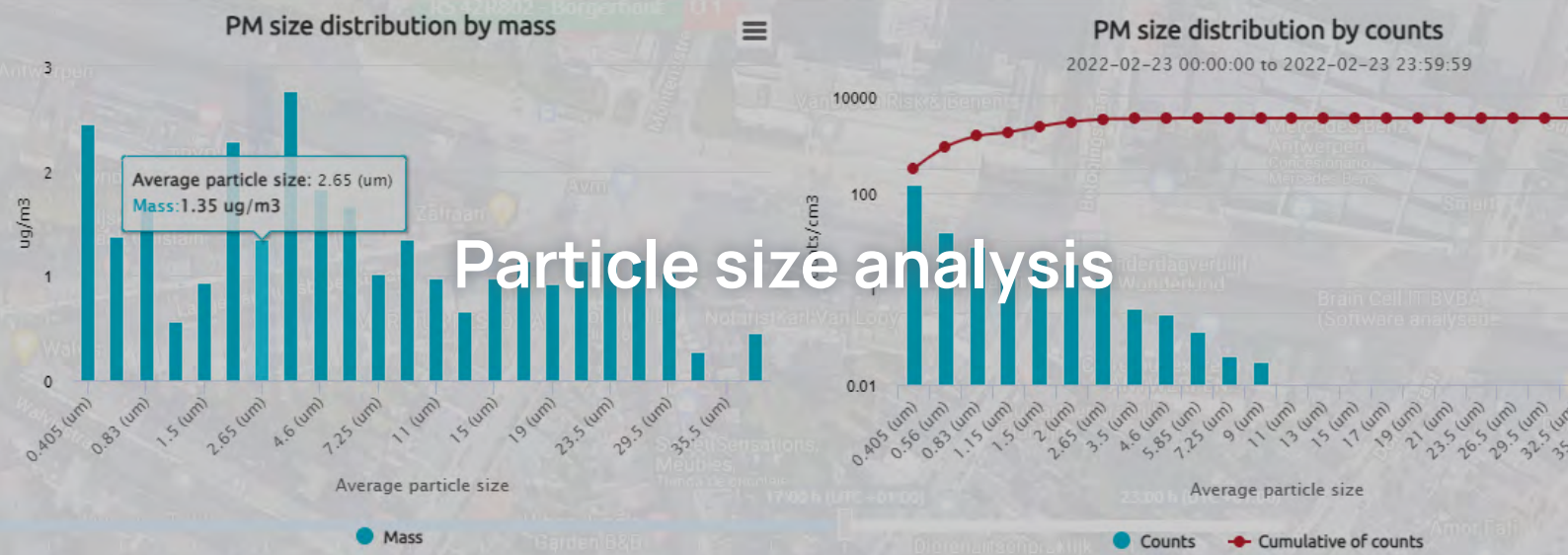
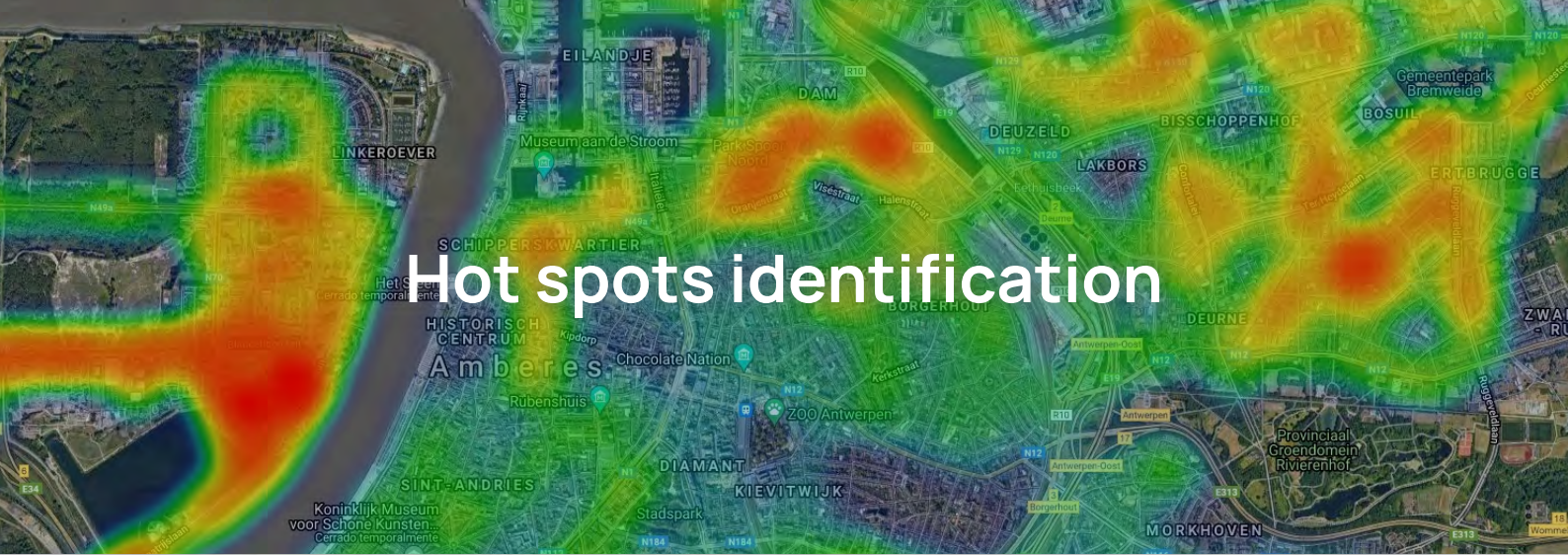
Data sharing & Integration

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



Public Air Quality Data

Create public web portals and widgets to share air quality data with stakeholders.

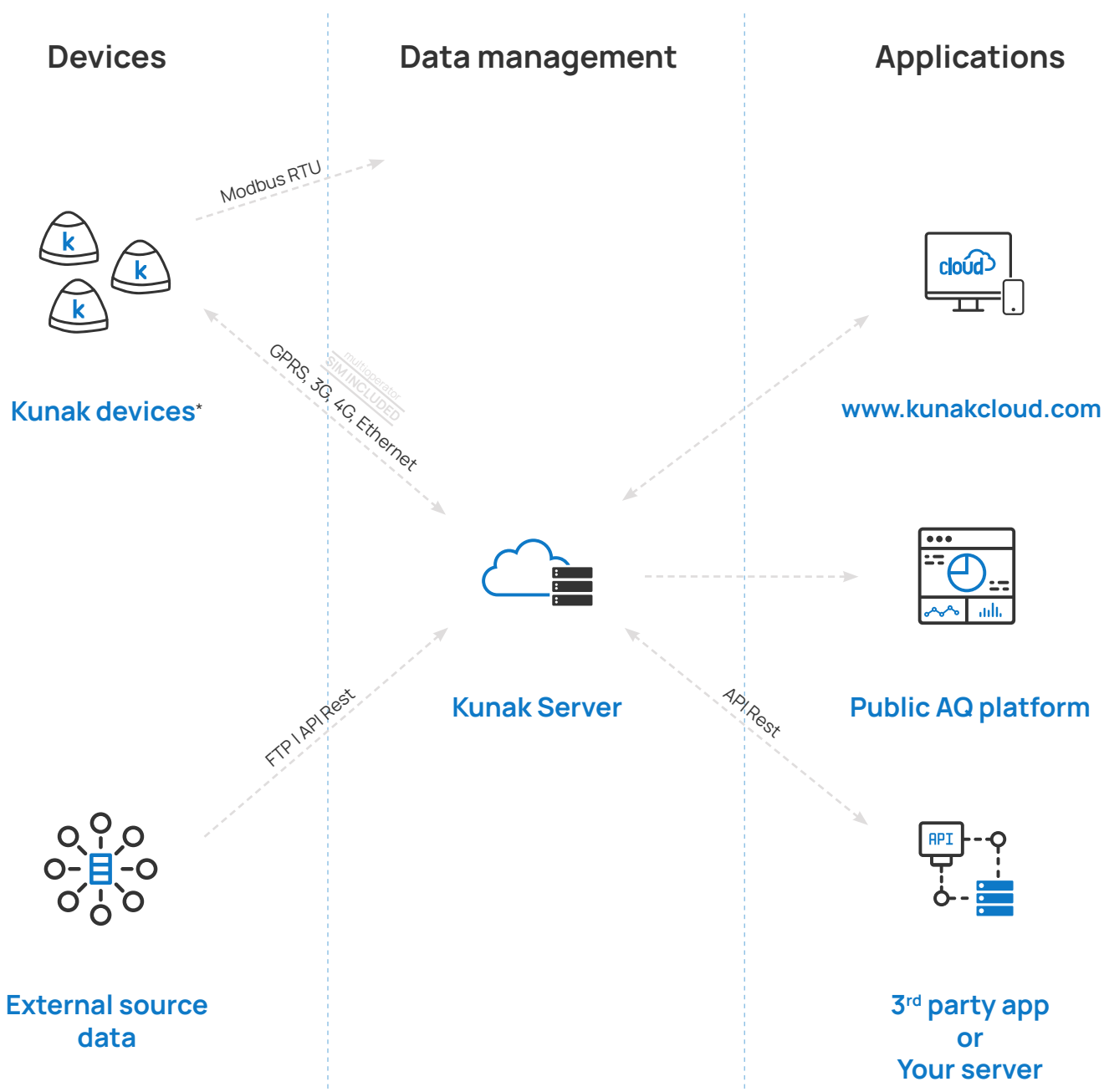




Data architecture

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.

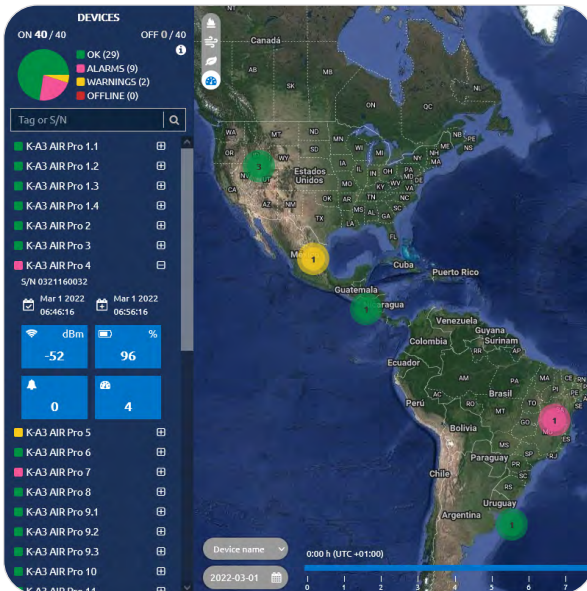
The communication protocols are designed for low power and low data consumption.



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



Control panel



Multiparametric analysis



Alarms & Log traceability

Warnings Configuration Operation Tools

Parameters (99) Period: All

Alarm type: ☒ Active ☒ Unconfirmed ☒ Confirmed

Notifications Settings

100 entries per page Confirm selected alarms: Confirm Help

Status	Device	Periodicity	Parameter	Description
☐ Unconfirmed	K-A3 RENT 1	Hourly	Battery (%)	Device close to run out of battery
☐ Unconfirmed	K-A3 RENT 1	Instantaneous	Heartbeat	Heartbeat: Lost of connexion probably due to battery discharge. Persistence: 5, last connection: 2022-02-16 02:58:30 UTC
☐ Unconfirmed	K-A3 RENT 1	Hourly	Battery (%)	Device close to 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 run out of battery
☐ Unconfirmed	K-A3 RENT 1	Hourly	Battery (%)	Device close to run out of battery
☒ Confirmed	K-A3 RENT 1	Instantaneous	Geolocation	The device could NOT be geolocated correctly
☒ Confirmed	K-A3 RENT 1	Instantaneous	Heartbeat	Heartbeat: Connection has been lost. Persistence: 2, last connection: 2022-01-19 11:33:37 UTC

CMMS

Warnings Configuration Operation Tools

Event info

Category: Installation / Relocation Device: K-A3 AIR Pro 1.3

Time zone: UTC Coordinated Universal Time Created by: kunak auto (Kunak)

Date: 2022-01-19 10:23

Latitude (°): 36.521656 Longitude (°): -6.244758

☐ Update device position

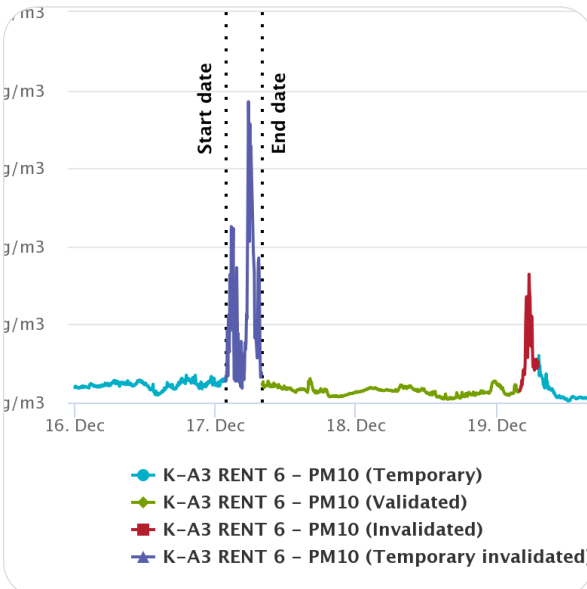
* Se puede cambiar la posición del marcador arrastrándolo en el mapa a la nueva localización.

Description: Kunak auto: Latitude = 36.521656, Longitude = -6.244758, by GPS

Observation:

Attached Files:

Data validation



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.

2 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**



**Starter +
Analytics**



Full

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



Viewer

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



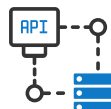
Expert

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

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



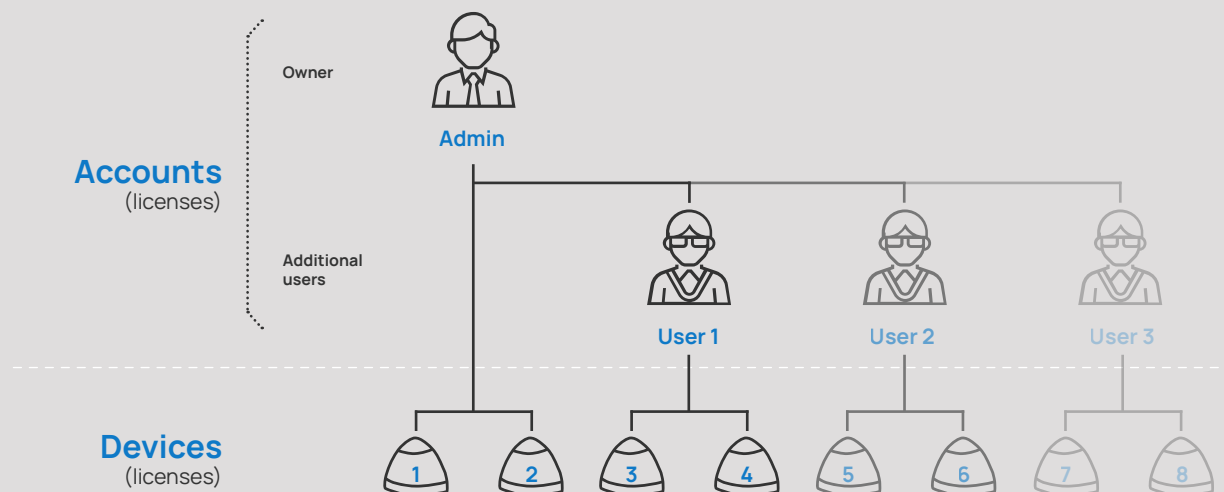
Give access to your data through open web tools (widget / website).



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

5 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		✓	✓	✓
Basic diagnostic information		✓	✓	✓
Follow the actions taking place in your devices (O&M logbook)		✓	✓	✓
Access to traceability info and receive notifications when the cartridges end the lifespan		✓	✓	✓
Automatic data-flagging		✓	✓	✓
Dashboard & Map View		✓	✓	✓
Multiparametric and Multidevice Charts & Tables, and download the data (.csv, .txt)		✓	✓	✓
Automatic averages calculations according to AQ standards		✓	✓	✓
Access to interactive AQI tool (EU and EPA. Others under request)		✓	✓	✓
Configure your devices (sampling and sendig periods, specific features...)		✓	✓	✗
Set alerts, thresholds and receive notifications by email		✓	✓	✗
Data Storage time limit		1 year		
OPERATION PACKAGE				
Gas & Particle Calibration Tool: calibrate your devices remotely		✓	✓	✗
Automatic health supervision alarms (broken sensor, out of battery, lack of data...)		✓	✓	✗
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		✓	✓	✓
Time-varying heatmaps to know evolution of hotspots over time		✓	✓	✓
Particulate size analysis tool (particle size distribution by counts and by mass)		✓	✓	✓
OpenAir Suite for advanced analytics		✓	✓	✗
Data Validation Tool for manual data flagging		✓	✓	✗
Create automatic AQ reports		✓	✓	✗

DEVICES



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.



We value the scalability and reliability of the Kunak solution: we manage over 100 stations in Africa, Europe and Asia. The data is accurate, we have a 0-defect rate for the hardware and the performance of the Kunak Cloud analytics is excellent, even with big data volumes.



Jérôme De Waele
Managing director - Airscan



I greatly value the innovative Kunak solutions, together with their cloud analytics and calibration tools as they build important evidence on the trustworthiness of air quality sensor data.



Jelle Hofman
R&D Air Quality - VITO



Kunak's sensor network has improved our monitoring and assessment of the impact of port activity on air quality. It also helped us to identify in more detail the source of the emission sources, making the mitigation measures implemented more effective.



Ibai Uria Gaztelu-Iturri
Prevention and Environment Manager - Bilbao Port



Kunak's sensor network allows us to accurately monitor airborne dust and gaseous pollutants in the mine and activate mechanisms to minimise their dispersion, thereby improving air quality and protecting our workers and the surrounding communities.



Cristobal Hernández
Environmental Monitoring Professional - FQML



Kunak air quality monitors make our environment portfolio instruments the most complete in the market, providing us with near-reference data quality in a flexible and easy-to-deploy system.



Bachir Kerkache
Managing Director - CleanAir Europe

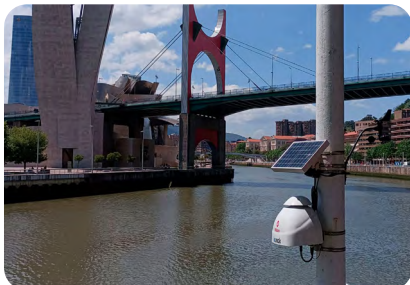




References



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)



Industry & Odours



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

PROJECTS

- CEMEX (Mexico, Colombia) - Cement
- AOPIIL (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



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)



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.

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