# kunak air PRO LITE
## DATASHEET




Preliminary version

www.kunak.es/en

# The air quality monitoring station for professionals

SENSOR BASED | BEST AVAILABLE ACCURACY

After 7 years designing and deploying small air quality stations all over the world, we have created the new Kunak AIR Pro, a huge evolution of our previous sensor based air quality monitoring station, designed to solve all the lifecycle challenges of a sensor-based air quality product, its operation and maintenance, as well as the need of every environmental project.

Its multipollutant cutting-edge design includes environmental sensors as well as connectors for external weather sensors or probes which, together with its solar panel operation and real-time wireless data transmission, makes the Kunak AIR Pro the most advanced air quality monitoring station on the market.




## Easy & Fast installation

Set up in less than 10 minutes with visual diagnosis in a built-in display.

## Cartridges system

Replace and combine pollutant sensors with a plug & play system.

## Proven accuracy

Proven as the best-in-class system by independent organizations.

## Easy calibration

Adjust the baseline and span remotely.

## Air quality platform

Visualize, analyse and manage your data in the cloud.

## Multi pollutant

Measure up to 5 gases and particulate matter at once.

## Fully autonomous

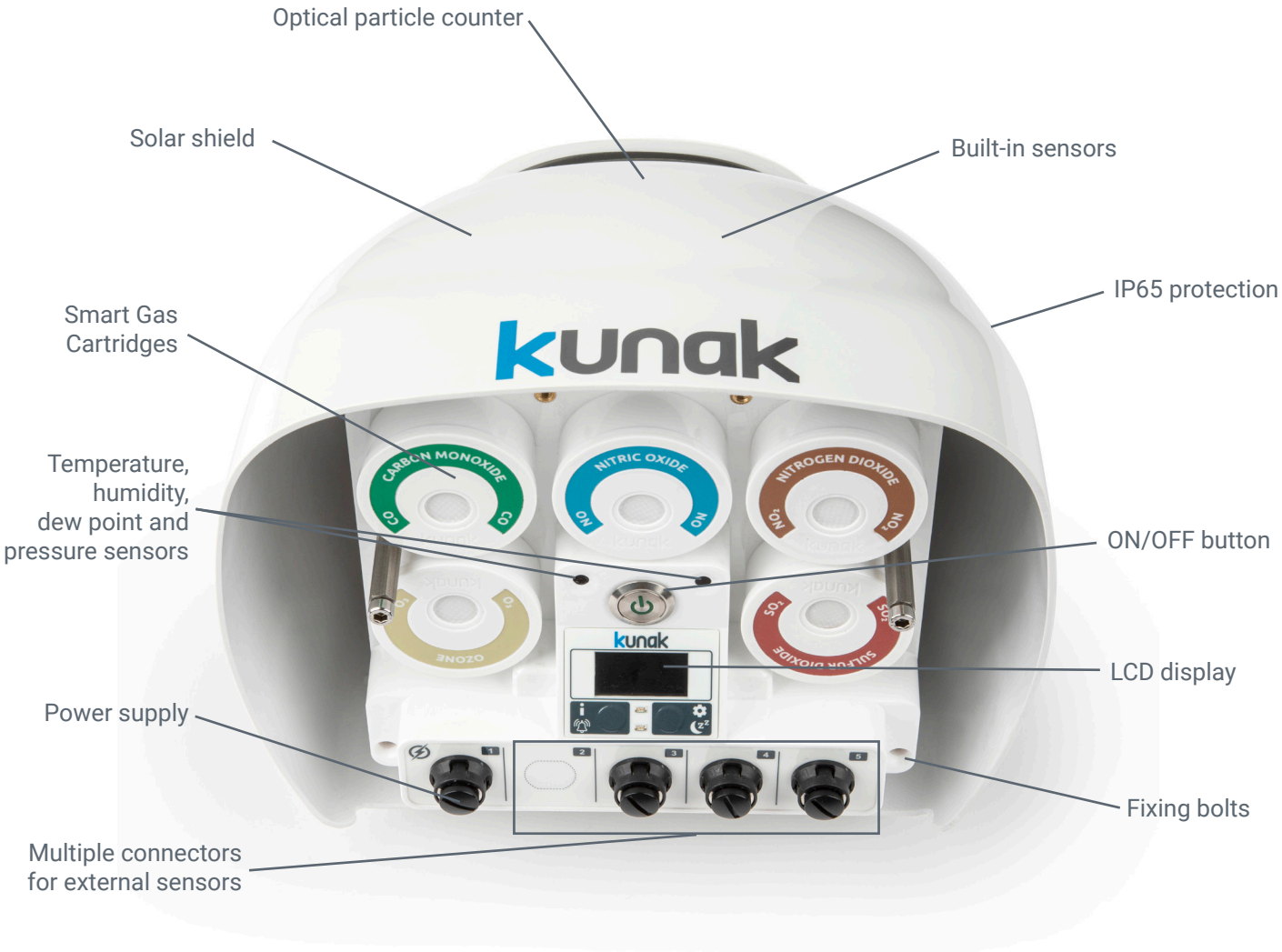
Autonomous operation with its built-in battery and solar panel.

## Real-time data

Access to your data and alarms in real-time.

## Add environmental sensors

Connect wind, rain, noise, and other sensors.




# Specifications

| | |
|---|---|
| **Dimensions** | 257 x 270 x 225 mm |
| **Weight** | <3.5 kg |
| **Enclosure** | PMMA & Polycarbonate & Stainless steel |
| **Operating temp** | -20 ºC to 60ºC |
| **Operating RH** | 0 to 99 %RH |
| **IP rating** | IP65 |
| **Battery** | Lithium 2.9Ah or 26 Ah |
| **External supply** | 7 - 12 Vdc. charger or solar panel |
| **Autonomy** | 24/7 with charger or solar panel |
| **Power consumption** | 0.08 - 1.2W (depending on configuration) |
| **Communications** | Multi-Band 2G/3G/4G \| Ethernet \| Modbus RTU Slave |
| **GNSS** | GPS and GLONASS |

| | |
|---|---|
| **Gas sensors** | CO, $CO_2$, NO, $NO_2$, $O_3$, $SO_2$, $H_2S$, $NH_3$ & VOCs |
| **PM sensor** | $PM_1$, $PM_{2.5}$, $PM_4$, $PM_{10}$ TSP and TPC |
| **Internal status** | Temperature \| Battery \| Charging voltage & current \| Signal |
| **Built-in sensors** | Temperature \| Humidity \| Atmospheric pressure \| Dew point |
| **Connectors** | #1: Power 7V to 12V or Ethernet<br>#2: Modbus RTU Slave<br>#3: Sound meter, UV<br>#4: WBGT, Pyranometer, Modbus RTU Master<br>#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<br>Remote configuration and calibration |
| **SIM** | Embedded eSIM and SIM holder |

# Communications

GSM GPRS 2G 3G 4G Lte Ethernet Modbus RTU SLAVE

kunak air LITE

# The compact air quality station for hyperlocal monitoring

INDUSTRY GRADE DESIGN | HIGH ACCURACY




An increasing demand of a compact and cost-effective air quality solution was perceived for industrial applications and massive deployments in cities. Thus, based on the same principles as Kunak AIR Pro solution and making use of the same Smart Gas sensor technology, the Kunak AIR Lite is designed to complete Kunak AIR solutions, targeting a maximum of 2 gases and particles. In addition, probes for wind, rain, noise... can be connected to the device to meet all the necessities of your air quality project.

This industrial air quality solution is designed for harsh environments with an easy integration of real-time data into wired industrial systems and maintaining wireless data transmission to the Kunak Cloud software.

**Main applications:**

- Industrial fenceline monitoring
- Massive city deployments
- Leakage detection
- Wastewater management
- Landfill monitoring
- Environmental Health & Safety (EHS)
- Building Automation

## Application based design

Select your targeted pollutants for industrial monitoring or massive deployments in cities.

## Built-in display

Easy installation and on field diagnosis thanks to its embedded display.

## Best accuracy

Get the most reliable and accurate data without the need of additional external instruments.

## Cost effective

Get the most accurate technology at a fair cost.

## Cartridges system

Replace and combine gas cartridges and PM sensor with a plug & play system.

## Easy data integration

Local wired integration through slave MODBUS RTU or via API through the cloud.

## Rugged & Compact design

The smallest air quality solution designed for harsh environments (IP65 & IK08)

## Targeted pollutants

Measure up to 2 gases and particulate matter at once.

## Fully autonomous

Autonomous operation with its built-in battery and solar panel.




# Specifications

| | |
|---|---|
| **Dimensions** | 200 x 153 x 185 mm |
| **Weight** | <2.3 kg |
| **Enclosure** | PMMA & Polycarbonate & Stainless steel |
| **Operating temp** | -20 ºC to 60ºC |
| **Operating RH** | 0 to 99 %RH |
| **IP rating** | IP65 |
| **Battery** | Lithium 2.9Ah or 20 Ah |
| **External supply** | 7 - 12 Vdc. charger or 6 Vdc. solar panel |
| **Autonomy** | 24/7 with charger or solar panel |
| **Power consumption** | 0.08 - 0.55W (depending on configuration) |
| **Communications** | Multi-Band 2G/3G/4G \| Ethernet \| Modbus RTU Slave |
| **GNSS** | GPS and GLONASS |

| | |
|---|---|
| **Gas sensors** | CO, $CO_2$, NO, $NO_2$, $O_3$, $SO_2$, $H_2S$, $NH_3$ & VOCs |
| **PM sensor** | $PM_1$, $PM_{2.5}$ & $PM_{10}$* |
| **Internal status** | Temperature \| Battery \| Charging voltage & current \| Signal |
| **Built-in sensors** | Temperature \| Humidity \| Atmospheric pressure \| Dew point |
| **Connectors** | #1: Power 7V to 12V<br>#2: Several options to choose from:<br>• Option 1: Anemometer & Rain Gauge<br>• Option 2: Modbus RTU Master<br>• Option 3: Sound meter<br>• Option 4: Modbus RTU Slave<br>• 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<br>Remote configuration and calibration |
| **SIM** | Embedded eSIM and SIM holder |

# Communications

GSM GPRS 2G 3G 4G Lte Ethernet Modbus RTU SLAVE

* Go to pages 24 and 25 for more information.

# Evidence

## OF ACCURACY

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

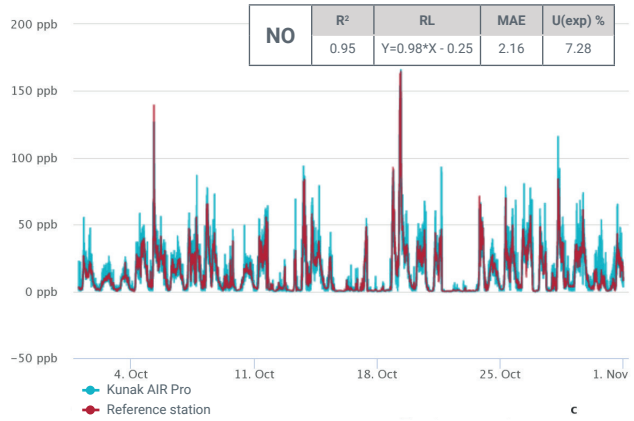
MEXICO CITY, MEXICO

| CO | $R^2$ | RL | MAE | U(exp) % |
|---|---|---|---|---|
| | 0.95 | Y=1.01*X - 26.89 | 41.6 | 10.22 |



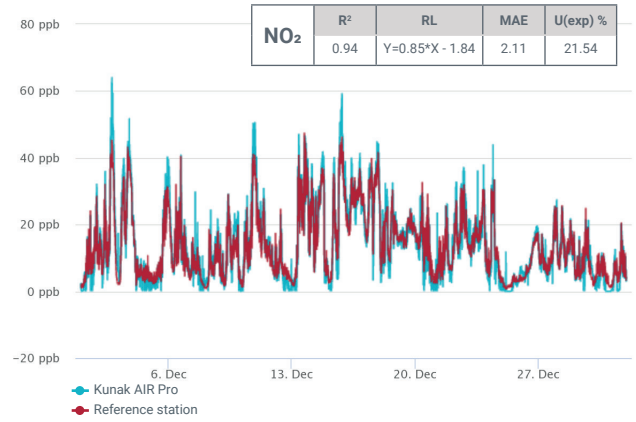

STOCKHOLM, SWEDEN

| NO | $R^2$ | RL | MAE | U(exp) % |
|---|---|---|---|---|
| | 0.95 | Y=0.98*X - 0.25 | 2.16 | 7.28 |




MANCHESTER, UK

| $NO_2$ | $R^2$ | RL | MAE | U(exp) % |
|---|---|---|---|---|
| | 0.94 | Y=0.85*X - 1.84 | 2.11 | 21.54 |



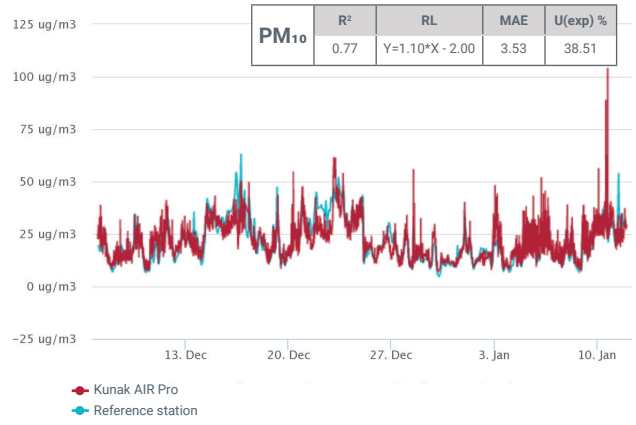

BARCELONA, SPAIN

| $O_3$ | $R^2$ | RL | MAE | U(exp) % |
|---|---|---|---|---|
| | 0.95 | Y=1.02*X - 1.11 | 1.99 | 17.42 |



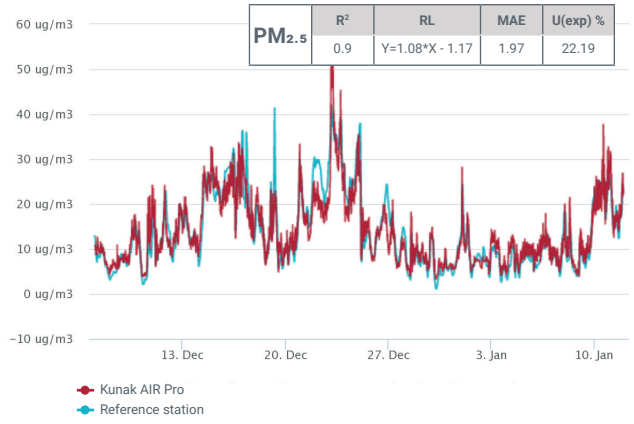

ANTWERP, BELGIUM

| $PM_{10}$ | $R^2$ | RL | MAE | U(exp) % |
|---|---|---|---|---|
| | 0.77 | Y=1.10*X - 2.00 | 3.53 | 38.51 |




ANTWERP, BELGIUM

| $PM_{2.5}$ | $R^2$ | RL | MAE | U(exp) % |
|---|---|---|---|---|
| | 0.9 | Y=1.08*X - 1.17 | 1.97 | 22.19 |




*THE MOST ACCURATE MULTI-POLLUTANT SENSOR*

AIRLAB
The International Microsensors Challenge

*"It provides excellent quality for $PM_1$, very good quality for $PM_{2.5}$, $PM_{10}$, and $O_3$, and good quality for $NO_2$ and NO, being the best performing sensor for this latter pollutant."*

EPA
United States Environmental Protection Agency

*"Sensor nodes have very small form factor and weight that are practical for response field deployments."*

AQ-SPEC
Air Quality Sensor Performance Evaluation Center

*"The three sensors showed an absolute intra-model variability of 0.32 ppb, 0.33 ppb and 0.002 ppm for $O_3$, $NO_2$ and CO measurements, respectively."*

# Smart gas cartridges

## Description

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

Kunak's Smart Gas Cartridges ensure measurement control throughout the life cycle of each sensor, making the Kunak AIR stations more sustainable and our customers' lifes easier.

### Traceable QC & QA

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

### Endless combinations

Combine the parameters freely. Reuse and scale your basestations at your own pace.

### Plug & Play

Simply take the old one out and replace easily with the new one, on field. Be back online in 2'.

### More sustainable

The electronic and mechanical parts can be reused, making it the most sustainable AQ sensor-based station in the market.

## *GasPlug*™ technology (patent pending)

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



# Technical specs

| | CO | $CO_2$ | NO | $NO_2$ | $O_3$ | $H_2S$ | $SO_2$ | $NH_3$ | VOCs |
|---|---|---|---|---|---|---|---|---|---|
| **Type** | Electro-chemical | Non-dispersive infrared (NDIR) | Electro-chemical | Electro-chemical | Electro-chemical | Electro-chemical | Electro-chemical | Electro-chemical | Photo-ionization detector |
| **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] |
| **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 | 0 - 3,000 ppb [A] 0 - 40 ppm [B] |
| **Resolution** [2] | 1 ppb [A] 0.01 ppm [B] | 1 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] |
| **Operating temp. range** [3] | -30 to 50 °C | -20 to 50 °C | -30 to 40 °C | -30 to 40 °C | -30 to 40 °C | -30 to 50 °C | -30 to 40 °C | -10 to 50 °C | -40 to 60 °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 |
| **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 |
| **Operating life** [5] | > 24 months | > 7 years | > 24 months | > 24 months | > 24 months | > 24 months | > 24 months | > 24 months | 10,000 hours |
| **Guarantee range** [6] | 1,000 ppm | - | 20 ppm | 20 ppm | 20 ppm | 100 ppm | 100 ppm | 100 ppm | 50 ppm [A] 60 ppm [B] |
| **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 | 0.1 ppm | 1 ppb [A] 0.01 ppm [B] |
| **Repeatability** [8] | 20 ppb [A] 0.05 ppm [B] | - | 4 ppb | 4 ppb | 4 ppb | 4 ppb [A] 0.01 ppm [B] | 5 ppb | - | 5 ppb [A] 0.02 ppm [B] |
| **Response Time** [9] | < 30 sec [A] < 180 sec [B] | < 30 sec | < 30 sec | < 60 sec | < 70 sec | < 60 sec | < 60 sec | < 45 sec | < 12 sec [A] < 10 sec [B] |
| **Typical Accuracy - MAE** [10] | ± 80 ppb [A] ± 0.1 ppm [B] | ±30 ppm | ±4 ppb | ±5 ppb | ±8 ppb | ± 10 ppb [A] ± 0.05 ppm [B] | ±15 ppb | ±0.3 ppm | ± 10 ppb [A] ± 0.1 ppm [B] |
| **Typical precision - $R^2$** [10] | > 0.85 | - | > 0.9 | > 0.85 | > 0.9 | > 0.8 | > 0.7 | - | > 0.99 |
| **Typical Slope** [10] | 0.78 - 1.29 | - | 0.9 - 1.12 | 0.78 - 1.29 | 0.85 - 1.18 | 0.78 - 1.29 | 0.78 - 1.29 | - | 0.99 - 1.002 |
| **Typical Intercept (a)** [10] | -50 ppb ≤ a ≤ +50 ppb [A] -0.1 ppm ≤ a ≤ +0.1 ppm [B] | - | -2 ppb ≤ a ≤ +2 ppb | -4 ppb ≤ a ≤ +4 ppb | -3 ppb ≤ a ≤ +3 ppb | -2 ppb ≤ a ≤ +2 ppb [A] -0.02 ppm ≤ a ≤ +0.02 ppm [B] | -5 ppb ≤ a ≤ +5 ppb | - | -9 ppb ≤ a ≤ +9 ppb [A] -0.08 ppm ≤ a ≤ +0.08 ppm [B] |
| **DQO - Typical U(exp)** [11] | < 20% | - | < 20% | < 25% | < 20% | NA | < 25% | NA | NA |
| **Typical intra-model variability** [12] | < 3 ppb [A] < 0.05 ppm [B] | - | < 1 ppb | < 1 ppb | < 1 ppb | < 2 ppb [A] < 0.02 ppm [B] | < 3 ppb | < 0.1 ppm | < 3 ppb [A] < 0.1 ppm [B] |

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. Recommended RH range of the sensor for continuous exposure.
5. Operating life: lifetime of the sensor at normal conditions.
6. Guarantee range: limit covered by the guarantee.
7. LOD (Limit Of Detection): measured at laboratory conditions at 20ºC and 50% RH. The limit of detection is the minimum concentration that can be detected as significantly different at zero gas concentration, based on the metric from the Technical Specification CEN/TS 17660-1:2022.
8. Repeatability (measured at laboratory conditions at 20ºC 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 hourly measurements of the device and the reference instruments for 1 to 8 months field test between -10 to +30 °C in different countries.
11. 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 +30ºC 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.
12. Typical intra-model variability: calculated as the standard deviation of the three sensor means in 1 to 8 months field test between -10 to +30ºC in different countries.

| | $PM_1$ | $PM_{2.5}$ | $PM_4$ | $PM_{10}$ | 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/m³ | µg/m³ | µg/m³ (A) | µg/m³ (A) | µg/m³ (A) | counts/cm³ (A) |
| **Measurement range** (1) | 0 - 1,000 µg/m³ | 0 - 1,500 µg/m³ (A)<br>0 - 1,000 µg/m³ (B) | 0 - 1,500 µg/m³ (A) | 0 - 2,500 µg/m³ (A)<br>0 - 1,000 µg/m³ (B) | 0 - 3,000 µg/m³ (A) | 0 - 10,000 counts/cm³ (A) |
| **Resolution** (2) | 1 µg/m³ | 1 µg/m³ | 1 µg/m³ (A) | 1 µg/m³ | 1 µg/m³ (A) | 1 counts /cm³ (A) |
| **Operating temp. range** (3) | -10 to 50 °C (A)<br>-10 to 60 °C (B) | -10 to 50 °C (A)<br>-10 to 60 °C (B) | -10 to 50 °C (A) | -10 to 50 °C (A)<br>-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 (A) | 0.5 µg/m³ (A) | 1 µg/m³ (A) | 1 µg/m³ (A) | - |
| **Repeatability** (8) | 2 µg/m³ (A) | 3 µg/m³ (A) | 3 µg/m³ (A) | 5 µg/m³ (A) | 6 µg/m³ (A) | - |
| **Response Time** (9) | < 10 sec | < 10 sec | < 10 sec (A) | < 10 sec (A) | < 10 sec (A) | < 10 sec (A) |
| **Typical Accuracy - MAE** (10) | ±2 µg/m³ (A) | ±3 µg/m³ (A) | ±3 µg/m³ (A) | ±4 µg/m³ (A) | ±6 µg/m³ (A) | - |
| **Typical precision - $R^2$** (10) | > 0.9 (A) | > 0.8 (A) | > 0.8 (A) | > 0.7 (A) | > 0.7 (A) | > 0.8 (A) |
| **Typical Slope** (10) | 0.85 - 1.18 (A) | 0.85 - 1.18 (A) | 0.85 - 1.18 (A) | 0.85 - 1.18 (A) | 0.85 - 1.18 (A) | - |
| **Typical Intercept (a)** (10) | -1.8 µg/m³ ≤ a ≤ +1.8 µg/m³ (A) | -2 µg/m³ ≤ a ≤ +2 µg/m³ (A) | -2 µg/m³ ≤ a ≤ +2 µg/m³ (A) | -3 µg/m³ ≤ a ≤ +3 µg/m³ (A) | -4 µg/m³ ≤ a ≤ +4 µg/m³ (A) | - |
| **DQO - Typical U(exp)** (11) | < 50% (A) | < 50% (A) | < 50% (A) | < 50% (A) | < 50% (A) | - |
| **Typical intra-model variability** (12) | < 2 µg/m³ (A) | < 2 µg/m³ (A) | < 2 µg/m³ (A) | < 2 µg/m³ (A) | < 2 µg/m³ (A) | - |

***Large data is the goal***
***but accurate data is the key***

kunak®
SENSING ANYWHERE

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