



Measuring device for monitoring indoor air quality. Measurement of dust concentrations starting at 150 nm <sup>(\*)</sup> incl. CO<sub>2</sub> and tVOC for calculation of air quality and infection risk index.

## Description



Fig. 1: AQ Guard

AQ Guard, currently the most advanced compact analyzer for determining indoor air quality, continuously and reliably analyses airborne fine dust particles in the range 175 nm – 20 μm <sup>(\*)</sup> IAHP-Package starting from 150 nm). A newly developed mass conversion algorithm calculates PM values based on single particle optical light scattering, taking signal duration and shape into account. Sensor system and algorithms were developed based on the technology of the EN 16450 certified Fidas® 200. The "Ambient" version (with heated aerosol inlet) achieves precision comparable to type approved analyzers, which makes AQ Guard stand out compared to similar devices.

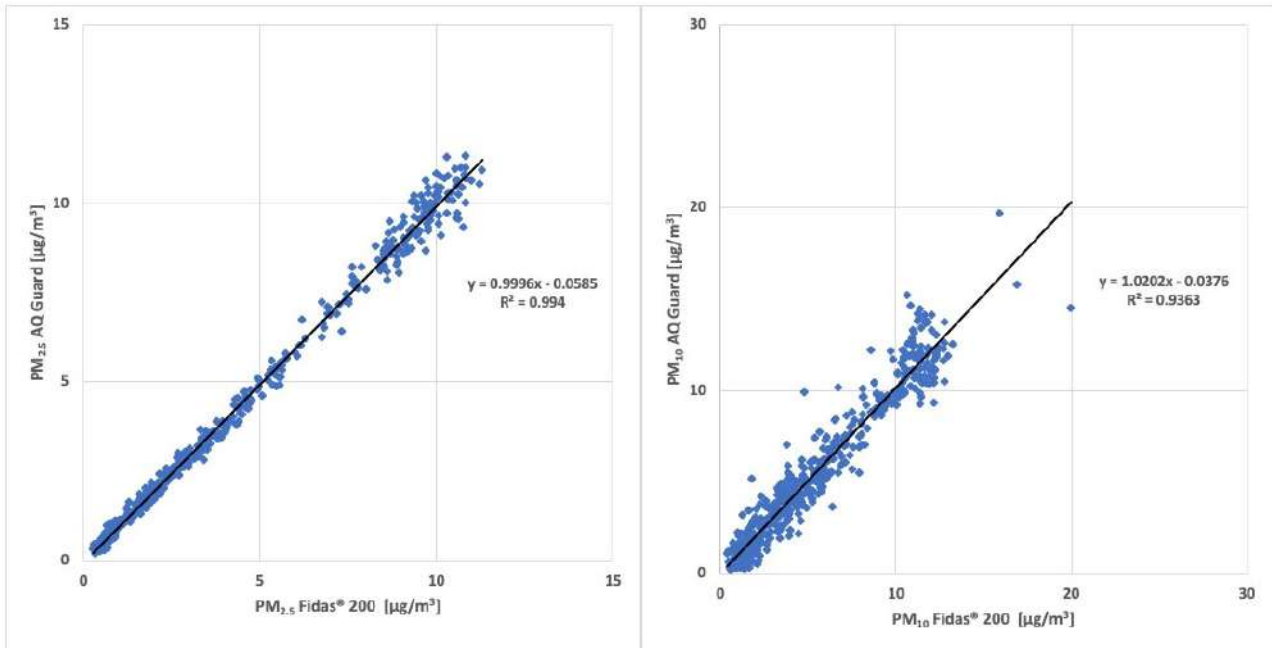


Fig. 2: Comparison of data recorded by AQ Guard ambient and Fidas® 200 S

Besides the PM<sub>10</sub> und PM<sub>2.5</sub> fine dust fractions, relevant for regulatory immission control, AQ Guard simultaneously calculates and records PM<sub>1</sub>, PM<sub>4</sub>, the total dust load, the particle number concentration C<sub>n</sub> as well as the particle size distribution. AQ Guard thus provides precise and comprehensive information about particulates as only a single particle counting and sizing device can.

AQ Guard is designed for unattended, continuous operation and features an extraordinarily durable sampling gas blower. Aerosol sampling as well as optical sensor system resist staining but can be cleaned, if necessary, by the user.

Exceptional long term stability of the measuring system is achieved by automatic calibration tracking and allows up to two years of operation without recalibration. Calibration status can be checked, using a test powder calibrated by Palas®. This makes Palas® aerosol spectrometers the only optical fine dust monitors which can be user calibrated with a traceable standard on site.



Fig. 3: AQ Guard screen view

Auxiliary sensors for CO<sub>2</sub> and volatile organic carbohydrates (VOC) built into AQ Guard provide data for calculating an indoor air quality index (AQI) according to the European model. AQ Guard also records air temperature, pressure and relative humidity.

Since CO<sub>2</sub> is a tracer for human breath the combined measurement of CO<sub>2</sub> content and particle size distribution can be used to indicate air contamination by germs and particles emitted by humans. Indoors it is thus possible to determine the fraction of the air that has been exhaled by persons present and contains potentially infectious particles. This kind of data evaluation is a new dimension for assessing indoor air quality, and is available as an "infection risk indicator" (pat. pending) in the AQ Guard. An assessment of air pollution with respect to human aerosols is more specific and meaningful than a general air quality index (AQI).

To achieve better resolution and calculation of aerosol concentration in the particle size range of typical airborne viruses, the resolution of nanoscale particles is increased and lowered to 150 nm instead of the usual 175 nm.

The resulting improved imaging performance enables a more accurate measurement of particle concentration and concentration progression over time, which is particularly necessary to determine the effectiveness of measures to reduce the particle number concentration (\*<sup>1</sup>)IAHP extension).

AQ Guard features fast data interfaces and allows real time access over Ethernet, Wi-Fi or cellular network. Since all results are calculated and recorded within the analyzer it requires no external data processing by, e.g., cloud computing. Users retain full control over their data and decide over information access. AQ Guard can provide numerical data, using various communication protocols, as well as visualize information on any type of device using a modern web interface. Compact design and optional power supply on the Ethernet port (PoE) simplifies installation in buildings and integration in an existing infrastructure.

AQ Guard is available in different expansion stages:

**Basic version:**

The basic version of the AQ Guard provides measured values of the fine dust fractions PM<sub>10</sub> and PM<sub>2.5</sub>.

**"Fine Dust Professional" Package:**

For applications that require more detailed information on the particles, we offer the "Fine Dust Professional" add-on package. Here, further PM fractions, the number concentration as well as the particle size distribution data are available.

**"Healthy Rooms" Package:**

For applications in the field of indoor air quality and hygiene we offer the additional package "Healthy Rooms". This provides measured values for CO<sub>2</sub> and tVOC concentration in the air, air quality index and infection risk index.

**"Indoor Air Hygiene Professional" Package:**

Compared to the above packages, this version has the measurement limit for small particles extended downwards to 150 nm to meet the specific requirements of detecting airborne viruses.

The "Indoor Air Hygiene Professional" package is designed to meet the requirements of expert users in the field of indoor air and air hygiene. It includes all the features of the "Fine Dust Professional" and "Healthy Rooms" packages.

In addition, it enables the evaluation of the air hygiene quality of a room based on measured values recorded over a defined test period or, in conjunction with an aerosol generator, the investigation of the spread of aerosols and the effectiveness of measures to reduce the aerosol concentration.

## Benefits

- Technology based on the type approved Fidas® 200 series (EN16450 and MCERTS); simultaneous measurement of C<sub>n</sub>, PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>4</sub>, PM<sub>10</sub>
- With "Indoor Air Hygiene Professional" extension: increased counting efficiency for nano-scaled particles from 150 nm
- Computation of air quality index based on measurements of particulates, CO<sub>2</sub>, and VOC
- Estimation of infection risk based on measurements of CO<sub>2</sub> and particulate matter
- High accuracy due to advanced algorithms
- Long term stable due to self calibration for measurement of flow rate, particulates, and gaseous pollutants
- 2 years operation without calibration
- Operates on AC, DC, or power-over-Ethernet

## Datasheet

<i>Parameter</i>	<i>Description</i>
<b>Interfaces</b>	USB, Ethernet (LAN), Wi-Fi, optional: 4G
<b>Measurement range (size)</b>	0.175 – 20 $\mu\text{m}$ (with IAHP-Package installed, starting from 0.150 $\mu\text{m}$ )
<b>Size channels</b>	64 (32/decade)
<b>Measuring principle</b>	Optical light scattering of single particles
<b>Measurement range (number <math>C_N</math>)</b>	0 – 20,000 particles/ $\text{cm}^3$
<b>Volume flow</b>	1.0 l/min $\hat{=}$ 0.06 $\text{m}^3/\text{h}$
<b>Data acquisition</b>	Digital, 22 MHz processor, 256 raw data channels
<b>Light source</b>	Long term stable LED
<b>Power consumption</b>	< 20 W
<b>User interface</b>	Touchscreen 800 • 480 pixel, 5" (12.7 cm)
<b>Dimensions</b>	175 • 280 • 140 mm ( H • W • D )
<b>Weight</b>	2.4 kg
<b>Operating system</b>	Windows 10 IoT Enterprise
<b>Data logger storage</b>	10 GB
<b>Software</b>	PDAnalyze
<b>Response time</b>	1 s, moving average configurable
<b>Aerosol conditioning</b>	Optional: thermal with compact IADS
<b>Measurement range (mass)</b>	0 – 20,000 $\mu\text{g}/\text{m}^3$
<b>Reported data</b>	PM <sub>1</sub> , PM <sub>2.5</sub> , PM <sub>4</sub> , PM <sub>10</sub> , TSP, C <sub>N</sub> , particle size distribution, pressure, temperature, relative humidity, CO <sub>2</sub> , TVOC, Infection Risk Index, Air Quality Index
<b>Installation conditions</b>	-20 – +50 °C
<b>Linearity</b>	0.95 – 1.05 (measured against EN16450 certified Fidas® 200)
<b>Accuracy</b>	R <sub>2</sub> > 0.98 for PM <sub>2.5</sub> and R <sub>2</sub> > 0.94 for PM <sub>10</sub> versus EN16450-certified Fidas® 200 (15 min average, each)

## Applications

- Industry:
  - Production processes
  - Bulk material handling (mixing, discharge, storage, packaging etc.)
  - Fenceline Monitoring
- Construction sites: Roads, railroads, demolition sites
- Buildings: Schools, kindergartens, hospitals, hotels, offices, public service buildings
- Residential buildings near construction sites or other polluted areas
- Public transportation: Airports, train stations, tramway underground stations, cruise ships, passenger cabin, e.g. in tram, train

**Palas GmbH**  
Partikel- und Lasermesstechnik  
Greschbachstrasse 3 b  
**76229 Karlsruhe**  
Germany

**Managing Partner:**  
Dr.-Ing. Maximilian Weiß, Udo Fuchslocher  
**Commercial Register:**  
register court: Mannheim  
company registration number: HRB 103813  
USt-Id: DE143585902



**Contact:** E-Mail: [mail@palas.de](mailto:mail@palas.de) Internet: [www.palas.de](http://www.palas.de) Tel: +49 (0)721 96213-0 Fax: +49 (0)721 96213-33