

## AEROSOL INSTRUMENTATION



- NANO- AND MICROPARTICLE CONCENTRATION AND SIZE
- AEROSOL MONITORING
- DILUTION AND DISCHARGE SYSTEM
- GENERATION OF TEST AEROSOLS
- MEASUREMENT SERVICES

ParteQ offers a broad array of instruments for aerosol characterization, fine dust monitoring but also for the generation of test aerosols and filter testing. ParteQ can rely on extensive knowledge in the application and the development of aerosol instrumentation. This enables us to deliver a high level of competence in product selection and support. Additionally, we offer particle and aerosol measurements as a service.

## Nanoparticle measurement



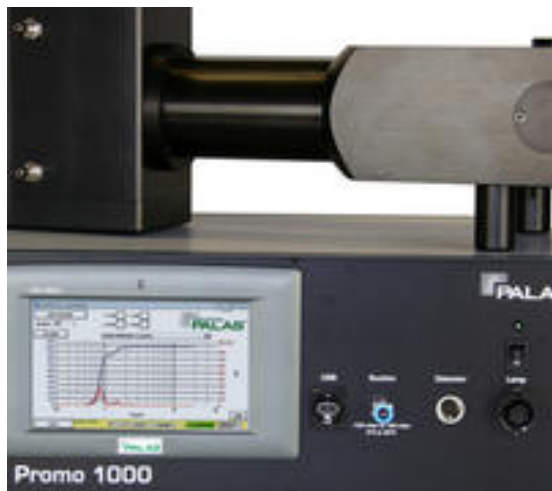
In addition to particle size and particle concentration determination in gases, our partner Palas® has also been engaged for decades now in measurability, i.e. the enlargement of ultrafine particles through condensation. At the same time, Palas® GmbH has remained involved with the discharge and/or measurement of electrically charged aerosols.

Based on this knowledge, Palas has succeeded in developing new measurement systems for determining the particle concentration and particle size of nanoscale particles within the

size range of approx. 2 to 1000 nm. These new measuring devices provide special advantages with respect to accuracy, use, and handling. The U-SMPS series comprises a DEMC particle classifier, with which a monodisperse particle fraction is obtained from a polydisperse aerosol, depending on the applied voltage. The number concentration is determined with a particle counter. Prof. Wiedensohler (IfT Leipzig, Germany) developed the algorithm used by Palas® for inversion of the measured data to yield the particle size distribution.

The U-SMPS can measure concentrations of up to  $10^8$  particles/cm<sup>3</sup>. It is equipped with a continuous and fast-scanning principle of measurement and scans both up and down. Palas® is the first manufacturer in the world to develop and incorporate this up-and-down scan mode. The U-SMPS universally supports DMAs, CPCs, and aerosol electrometers from other manufacturers. It can be connected to other computers or networks using various interfaces (USB, LAN, WLAN, RS-232/485).

## Aerosol spectrometers



The success of the Palas® aerosol spectrometers is based on the development of a measurement method with white light source, 90° scattered-light detections and a measurement volume that was defined optically by the University of Karlsruhe, KIT.

To this day it is the world's only optical measurement method that ensures precise particle and concentration determination over a wide measuring range up to  $10^6$  particles/cm<sup>3</sup>.

Since 2000 the development led to the welas® digital system (White Light Aerosol Spectrometer System) with patented T-aperture technology. The patented optical fiber technology allows reliable quasi-simultaneous measurement at two measurement points with one device and in chemically aggressive waste gases.

With the model groups welas® digital, Inas®, Promo® and Fidas® we offer the most modern, reliable and

scientifically most thoroughly investigated optical aerosol spectrometers in the world.

## Fine dust monitoring

As Palas® is the market-leading manufacturer of optical aerosol spectrometers, it was the obvious step in 2010 to develop and build an optical fine dust measuring device that would be capable not only of supplying the PM values PM<sub>total</sub>, PM<sub>10</sub>, PM<sub>4.0</sub>, PM<sub>2.5</sub> and PM<sub>1</sub>. The Fidas® systems also supply the corresponding particle size distribution in the measurement range from 0.18 to 18 µm for every interesting point in time.

The new Fidas® fine dust monitoring systems can be calibrated on site or via Ethernet. Thanks to their outstanding advantages, these devices are now used successfully all around the world.

The comparison of the generated dust content, e.g. during the filling of powders, can be performed clearly, reproducibly and particularly cost-effectively with the new DustView II.

## Aerosol monitors



Portable systems are required in the assessment of workplace safety, for environmental and personal

monitoring. We offer the naneos Partector and devices from Palas®, covering sizes from a few nanometers into the micron range.

The naneos Partector is the world's smallest nanoparticle detector, designed it to be as simple to use as possible. It is based on a novel non-contact electrical detection principle which requires almost no maintenance. The Partector measures the lung-deposited nanoparticle surface area, which has been identified the most important physical particle metric when it comes to health effects.



The Palas Fidas® Frog allows for a fast, reliable and quality-assured determination of fine dust, e.g. monitoring within the scope of health, safety and environment (HSE) management at workplaces (exposure assessment) or in the range of indoor air quality measurements.

It measures simultaneously the environmentally relevant mass fractions PM1, PM2,5, PM4, PM10, TSP as well as the particle number and the particle size distribution within the

particle size range of 0,18 - 40 µm. By providing fine dust values with high temporal resolution, the operator receives comprehensive information for evaluation and assessment of the fine dust pollution. The very compact and light design of the Fidas® Frog enables portable, hand-held monitoring with up to 8 hours operation time per battery charge.

### Dilution systems

Frequently, the aerosols to be characterized must be first rendered measurable in terms of particle concentration by dilution. The ejector principle is the classic among the dilution systems and is described in VDI 3491-15. It is particularly characterized by the combination (cascading) of the individual dilution steps, whereby dilution factors of 10, 100, 1,000, 100,000 and 1,000,000 can be set.



Depending on the model, the dilution steps can be configured for isothermal dilution of hot aerosols up to 200°C. Diluters made of stainless steel for operation up to 10 bar pressure are available and are used successfully

worldwide for measuring chemically aggressive aerosols. The "partial flow dilution system" VDD is recommended for diluting large droplets (approx. > 5 µm).

### **Discharge systems**

Aerosols frequently are electrically charged which can falsify measurements. The Palas® discharger systems (corona discharge) have been used successfully for many years to neutralize charged aerosols, i.e. a balanced charge distribution is established in the aerosol. Palas® offers various discharger systems for different applications. The CD 2000 systems work according to the principle of a bipolar corona discharge and are used universally for filter testing and aerosol research. In Kr-85 neutralizers the emitted β-radiation generates both positive and negative ions.

### **Test aerosols**

Well-specified test aerosols based on solid particles are required e.g. for particle measurement devices or filter testing. Depending on the type of aerosol generator, the test particles can be produced from solutions (e.g. NaCl, KCl), suspensions (e.g. biological aerosols), powders and dusts (e.g. pollen, A1 to A4 dusts), from monolithic solids (e.g. chalk) or based on condensation and combustion processes.

The test aerosols can be generated with mass flows ranging from a few µg/h to more than 6 kg/h and particle size distributions from around 1 nm to 100 µm. Monodisperse or polydisperse size distributions can be obtained, based on the model and aerosol substance.