Charme®

High Quality Reference Aerosol Electrometer

The charge aerosol measurement system Charme® developed by Palas® is a high-capacity Faraday cup aerosol electrometer which measures the electrical charges that exist on aerosol particles.

For years, aerosol electrometers have been used in research to measure the mean charge of an aerosol. If the charge state of particles for monodisperse aerosols is known, the number concentration of particles having a size from approx. 2 nm can be determined fast and easily with these devices.
For polydisperse aerosols often a neutralizer is used to generate a defined charge distribution. If then a particle size is set via an upstream classifier (e.g. Palas® DEMC), the number concentration of the particles can be determined indirectly via a current measurement (charge/time).

Often an aerosol electrometer is also used for the calibration of condensation particle counters (e.g. Palas® UF-CPC). Since there is no absolute particle number standard and a current measurement is directly traceable to SI units, a calibration of the condensation particle counter is achieved by a counting comparison of a condensation particle counter with an aerosol electrometer.

The reference aerosol electrometer Charme® for concentration measurements within the size range from 2 nm to 100 µm* is characterized by reliable function, highest quality of the used components and easy operation via touchscreen. The extremely fast measurement (10 Hz) of the particle concentration and of the electrometer current are displayed graphically in real time.

By means of the gravimetric filter, which can be replaced by the user, an on-site correlation of the measured current (particle charges) to the mass concentration can be determined. Thus, the Palas® aerosol electrometer Charme® is particularly suitable for the verification of high particle loads in the environment and in the workplace as well as for the calibration of condensation particle counters (CPCs).

Charme® achieved very good measurement results during the comparison with established electrometers at the Federal Office for Metrology METAS in Switzerland.

** The upper limit for the particle size depends on the aerosol transport of bigger particles, i.e. it depends primarily on the aerosol sampling.*

Particular advantages:

- reliable current measurement (charge/time) for aerosols
- fast measurement (10 Hz) of particle concentration
- intuitive operation via touchscreen
- graphical measured value display of particle concentration and of electrometer current
- replaceable gravimetric filter for the on-site correlation of the measured current to the mass concentration
- integrated pump
- integrated data logger
- low maintenance
- easy handling
- reduces your operating costs

Application examples:

- aerosol research
- environmental measurements (high concentrations)
- workplace measurements
- emission studies
- process monitoring
- calibration of condensation particle counters (CPC)

Technical parameters:

• measuring range:	± 1 fA up to 24,000 fA
• concentration range (size related):	e.g. at 3 nm 1.6 x 10^7/cm^3
• particle size range:	2 nm – 100 µm*
• volume flow (internal pump):	1 – 4 l/min
• volume flow (external pump):	1 – 10 l/min
• operating interface:	3.5‘‘ touch screen 320 x 240 pixels 312 MHz Intel processor 2 GB Compact Flash
• interfaces:	USB, LAN, RS-232 analog out 0 – 10 V (more on request)
• power supply:	115/230 V; 50/60 Hz
• dimensions (HxWxD):	265 x 180 x 65 mm
• weight:	3.2 kg

Accessories:

- transport case

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Charme®
Quality in Detail

Function:

Figure 1 shows the functional principle of the reference aerosol electrometer Charme®. A removable gravimetric and electro-conductive filter is installed in a Faraday cage. The electrically charged particles are collected on the filter. The charges carried by the particles are discharged via a very high resistance. The voltage drop over this resistance is a measure for the effluent current.
By knowing the number of charges per particle, this measured current is converted afterwards into a concentration. Both the measured current and the calculated concentration are shown on the display.

$$C_n = \frac{I}{n \cdot e} \cdot \frac{1}{\dot{V}}$$

C_n = number concentration
I = effluent current
n = mean charge on the particles
e = 1.602176487 * 10^{-19} C elementary charge
$\dot{V}$ = volume flow

The measurement accuracy of the aerosol electrometer Charme®:
1 fA = 0.000000000000001 A = 10^{-15} A = 6240 elementary charges/s

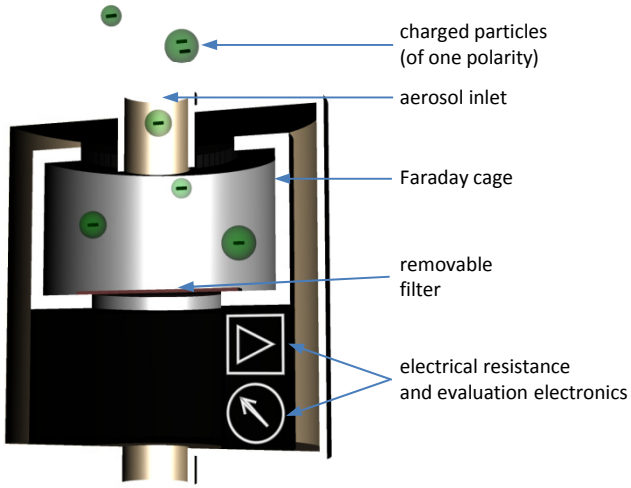

Fig. 1: Working principle of the aerosol electrometer Charme®

Due to intrinsic electronic noise, a certain minimum concentration of charges (particles) always has to exist for a meaningful measurement with an aerosol electrometer.

Thus, an aerosol electrometer is not suitable for measurements at low concentrations, as for example in operating rooms of hospitals.

Operating Interface:

The aerosol electrometer Charme® is operated through an intuitive graphical user interface with touch screen.
The measured values – electrometer current and particle concentration – are displayed graphically during the measurement (see example in figure 2).

Several interfaces ensure the easy export and further use of the obtained data.

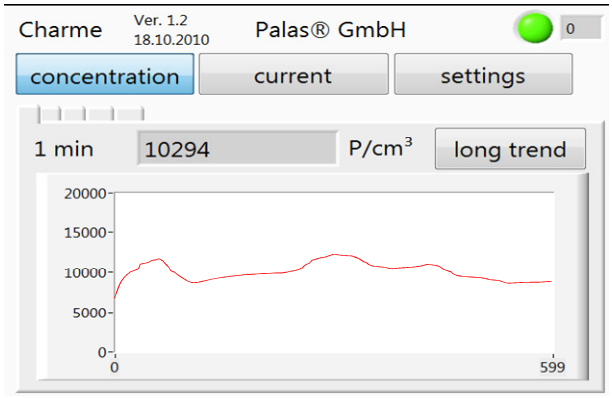

Fig. 2: 1-minute run (600 data points at 10 Hz) of the particle number concentration

Palas® is continuously setting standards in aerosol technology with more than 50 patents filed since 1983. Our innovations result in products of superior quality and long durability, which lead to unique technical and economic advantages for our customers.

On this account, Palas® could established itself as a world-wide market leader in aerosol generation, aerosol dilution and aerosol particle measurement.

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