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Product data sheet

Palas® Condensation particle counter UF-CPC 100

Applications

- Aerosol research
- Testing of filters and air purifiers
- Environmental measurements
- Workplace exposure and occupational safety studies
- Studies concerning inhalation and health impacts
- Process control
- Printer emission studies

Benefits

- This novel and patented working fluid delivery system provides the user with the option to quickly switch between butanol and isopropanol, for example, or even water.
- The UF-CPC is able to count up to 2.000.000 particles/cm^3 in single count mode, depending on the sensor in use (able to be switched out by the user).
- Integrated computer with 7'' touch screen
- Intuitive user interface with sophisticated software for data analysis
- Integrated data logger
- Unlimited network compatibility that supports remote control and data storage on the Internet
- Integrated interface for process control applications

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Description

The Palas® UF-CPC condensation particle counter is suitable for medium concentrations (e.g. environmental measurements).

The UF-CPC measures the total particle concentration of ultrafine particles and nanoparticles suspended in air or other carrier gases. These particles are enlarged by a condensation process in order to enable the precise determination of their number with an optical light scattering detector. The working fluid, e.g. butanol or water, is vaporized as a condensation agent. The nanoparticles to be measured are directed through the vapor atmosphere, during which the vapor condenses on the nanoparticles in a cooling zone. The condensation process is influenced by the nanoparticles themselves, as well as the working fluid, the operating temperatures, and the volume flow.

In addition to their number, the UF-CPC 100 also measures the size of the droplets and provides the user with additional information concerning the condensation process. This novel and patented (German patent no.: DE 10 2005 001 992 A1) working fluid delivery system provides greater flexibility. The user is no longer limited to butanol or water, but may also opt for more environmentally friendly or better suited working liquids for special applications.

In addition, the modularity of the components enables the user to perform most maintenance tasks (e.g. cleaning, pump replacement).

In research mode, the user is able to easily adjust most parameters, e.g. temperature settings on the saturator, using the 7" touch screen.

For process control applications, the UF-CPC supports a standardized interface with various protocol options, e.g. Modbus, and provides features, such as remote access and data storage on the Internet or internal networks.

Figure 1 presents the principle of operation of the UF-CPC [1]. The aerosol with nanoparticles enters the UF-CPC at the bottom and reaches the heated evaporation chamber – the saturator first.

Within the saturator, the working fluid is moved helically around the flow area of the aerosol, resulting in a more homogeneous contact area compared to designs where only one or two walls of the saturator are lined with a porous material that is soaked with the working fluid.

In addition, the working fluid is circulated continuously from the reservoir to the constantly heated helical and U-shaped channel and back to the reservoir at a flow rate that can be adjusted to accommodate different working fluids.

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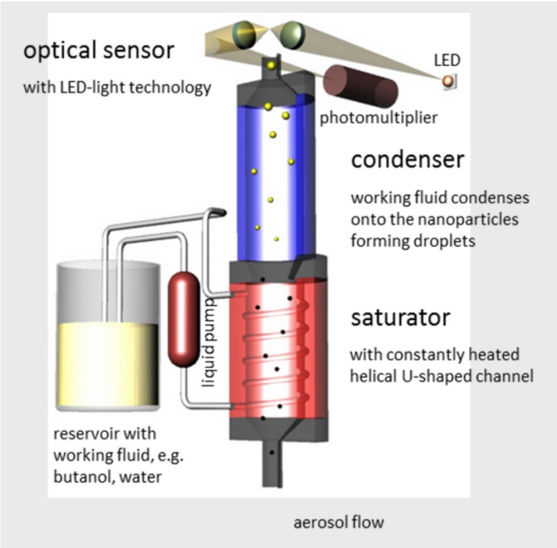

Fig. 1: Principle of operation of the condensation particle counter (UF-CPC)

Downstream from the evaporation chamber, the aerosol and the saturated carrier gas enter a cooled area, the condenser, in which the working fluid condenses onto the nanoparticles, forming droplets in the µm size range.

Downstream from the condenser, the droplets enter the optical sensor. Here, the size of the droplets is analyzed and their concentration is measured by counting them. Unlike other CPCs, the sensor on the UF-CPC uses a patented technology to count particles at concentrations of up to 10^7 P/cm^3 without diluting the aerosol.

Figure 2 presents the counting efficiency of the UF-CPC 100, as measured by a distinguished German laboratory. A higher saturator temperature with unchanged condenser temperature results in a shift of d_{50} to smaller particle sizes, thus increasing the sensitivity of the UF-CPC.

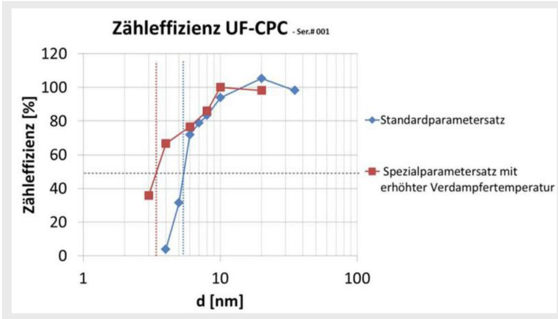

Fig. 2: Counting efficiency of the UF-CPC 100 operated with butanol

Software

Based on continuous customer feedback, the user interface and software have been designed for intuitive operation and real-time control of measurement data and parameters (Fig. 3) In addition, the software provides data management with the integrated data logger, sophisticated export capabilities, and network support. The measured data are able to be displayed and evaluated with many available options. If a specific display is desired, we can implement it for you.

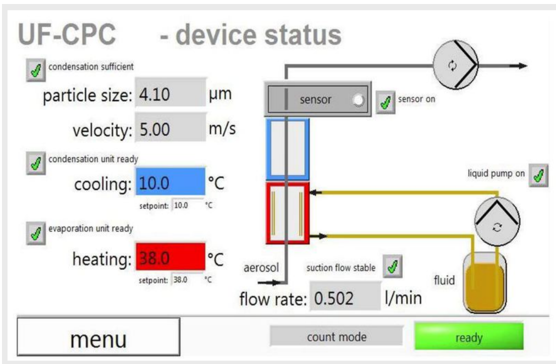

Fig. 3: Touch screen user interface showing the device status

References

[1] Patent: DE 10 2005 001 992 A1

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Specifications

Measurement range (size)	4 - 10000 nm
Measurement range (number concentration)	70 • 103 particles/cm³ (single count mode), 70 • 103 - 107 particles/cm³ (nephelometric mode)
Volume flow	0,9 l/min (Butanol); 0,3 l/min (Wasser)
Data acquisition	Digital, 20 MHz processor, 256 raw data channels
Light source	LED
User interface	Touch screen, 800 • 480 pixels, 7"
Dimensions	29 • 24 • 35 mm (H • W • D)
Data logger storage	4 GB
Software	PDAnalyze
Accuracy	5 % (single count mode); 10 % (nephelometric mode)
Response time	t90 = 2.8 s, t90-10 = 2.0 s
Operation liquid	Butanol, isopropanol, water (count mode only) or different