

AVL UltraFine Particle Monitor™ for Ambient Air Quality

Count on decades of experience in high-quality particle measurement

New Benchmark in Air Quality Monitoring



The AVL UltraFine Particle Monitor™ measures the ultrafine particle number concentration in ambient air, compliant with EN 16976.

Given the growing evidence of the health impacts of ultrafine particles (UFPs), global guidelines advocate for the expansion of air quality monitoring networks to include UFP measurements.

Quantifying these particles and understanding their sources is challenging, making robust and accurate measurement tools essential.

Developed based on decades of experience in particle emission measurement, the AVL UltraFine Particle Monitor™ (UFPM) enables continuous measurement of UFPs, utilizing the condensation particle counting AVL UFPM (CPC) method. It provides environmental agencies and researchers with precise ultrafine particle data for defining pollution reduction plans.



Proven Reliability at Its Best

Originally built for the automotive industry, the instrument is designed to withstand even the harshest conditions. Its robust optical components are optimized for durability and performance.

Highest Data Quality—Highest Precision

Our automated drift detection technology continuously monitors for any deviations in system performance, ensuring reliable data quality and high calibration stability.

Straight-Forward Serviceability

The unique wick design and user-friendly layout simplify operation and maintenance of the device. All parts are easily accessible, and the wick is exchanged in a minute without any tools.

Consistent Data Flow

The device intelligence continuously evaluates the instrument status and key parameters. Regardless of the cause, be it power failure or butanol depletion, the UFPM restarts operation autonomously.

Low Butanol Consumption

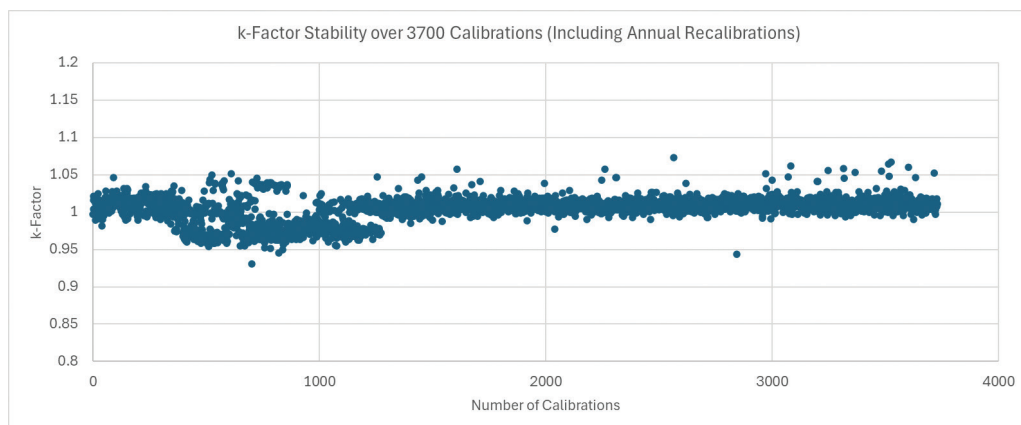
The working fluid system, featuring integrated ventilation and high-quality components, minimizes butanol consumption and is hermetically sealed to prevent environmental exposure.

Seamless Integration

The state-of-the-art software is optimized for remote error handling and supports different interface protocols such as AK, Bayern-Hessen, and Modbus.

Calibration Excellence Meets Superior Design

The k-factor data across more than 3700 calibrations includes initial factory calibrations, as well as annual and post service recalibrations. The data exhibits remarkable long-term stability within a narrow $\pm 3\%$ band around unity. The lack of drift indicates that the sensor, signal processing, and mechanical design retain exceptional calibration accuracy over time. Tight clustering further confirms the robustness and precision of the thermal and electronic system architecture.

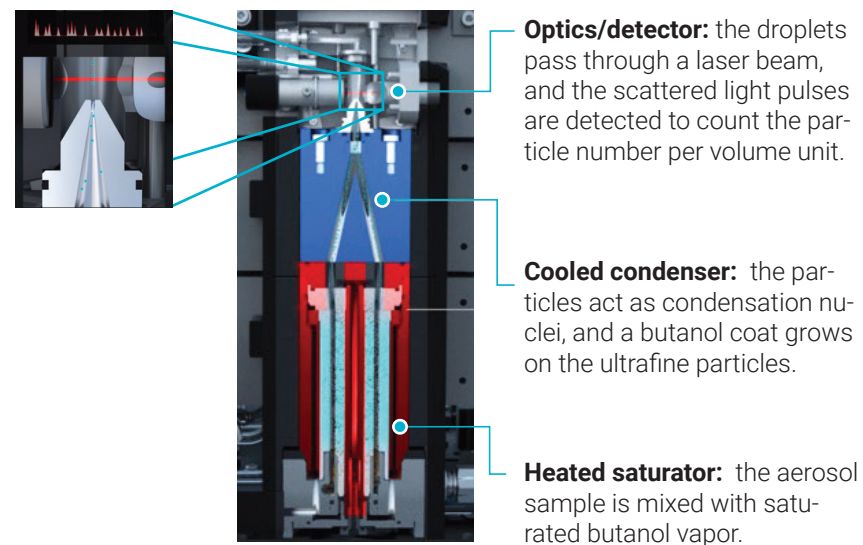


KEY FEATURES

- EN 16976 compliant; ACTRIS-compatible
- Robust optical components
- Unique wick design
- Automated drift detection
- Fully closed working fluid system
- Automatic reboot function

Condensation Particle Counting (CPC)

CPC detects aerosol particles down to nanometer scale by enlarging them for optical detection. The aerosol is saturated with butanol vapor, and particles act as condensation nuclei as the vapor condenses onto them. The resulting droplets, now large enough to scatter light, are individually detected using a focused laser beam and photodetector system.



AVL ULTRAFINE PARTICLE MONITOR™

Counting efficiencies	d ₅₀	10 ± 1 nm
	d ₉₀	< 20 nm
Measurement range	0 ... 100,000 #/cm³	
Measurement accuracy	± 5 %	
Response time (t ₉₀)	≤ 1s	
Aerosol -		
flow rate	~ 1000 cm³/min	
inlet pressure	-50 ... 150 mbar rel.	
Dimensions (W × H × D)	360 × 315 × 280 mm	

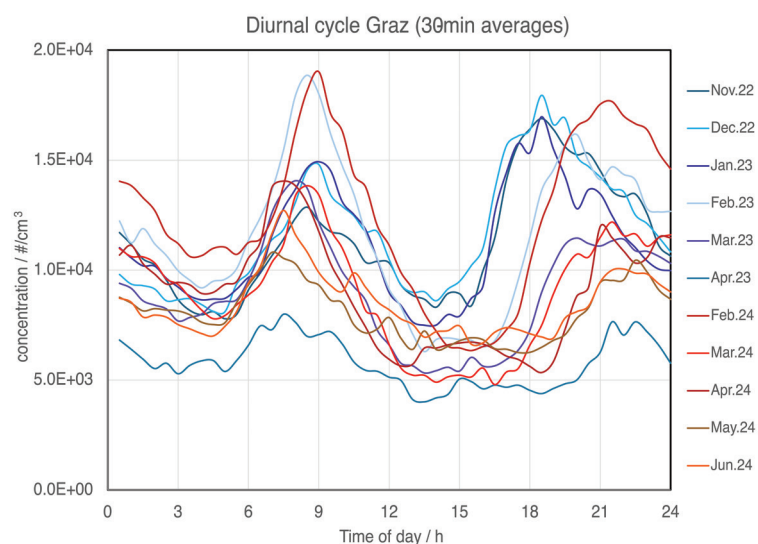
Ready for Any Challenge

The AVL UltraFine Particle Monitor is an EN 16976-compliant, ACTRIS-compatible instrument that supports air quality networks with reliable performance, fast response, and minimal maintenance.

Whether in urban traffic corridors or remote mountaintop observatories, it consistently delivers traceable, high-quality ultrafine particle (UFP) data.

Urban Air Quality Monitoring

Diurnal cycles in particle number concentrations with distinct morning and evening peaks indicated commuter traffic.



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With two years of operation, the AVL instrument maintained consistent results. It has proven to be a reliable, easy to maintain solution that integrates reliably with our existing protocols.

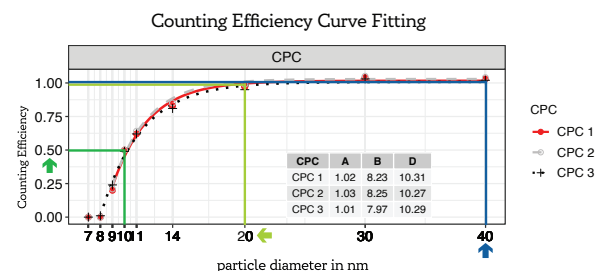
Benedikt Tschofenig,
Office of the Styrian Provincial Government, Austria

Performance Evaluation for ACTRIS Compatibility at World Calibration Center for Aerosol Physics (WCCAP)

Instrument Model: AVL Ultrafine Particle Monitor
Evaluating Unit: WCCAP, Leipzig, Germany

Performance Evaluation Results:

Performance Characteristics	Criteria	CPC1	CPC2	CPC3	Unit
Detection efficiency at 40 ± 10 nm	$\geq 95\%$	102	103	101	%
Particle diameter where efficiency is $\geq 50\%$	$D50 = 10 \pm 1$ nm	10.31	10.27	10.29	nm
Detection efficiency at < 20 nm	$\geq 90\%$	97	99	95	%
Concentration response (linearity)	$100\% \pm 5\%$	101	101	100	%



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We have included the AVL instrument to our suite of high quality instruments in the WCCAP laboratory due to its compliance to the EN standard.

Kay Weinhold,
TROPOS Institute, Leipzig, Germany

Sonnblick Observatory at 3,106 m - an ACTRIS key site

The AVL UFPM and a reference CPC showed excellent agreement, even

- at low background concentrations
- during distinct nucleation episodes
- under extreme ambient conditions.



AVL UFP Sampling System

Collecting representative ambient air samples is challenging due to fluctuating humidity, changing wind conditions, and potential diffusion losses. The AVL UFP Sampling System ensures representative ambient air sampling in compliance with EN 16976, essential for precise air quality monitoring.

The system allows for tailored installation by connecting main components with flexible tubing rather than rigid connectors and offers the following features.

1. The 360-degree **PM10 sampling head** removes biological material and large particles above 10 µm.
2. The **PM2.5 cyclonic separator** restricts the sample to particles smaller than 2.5 µm.
3. The **Nafion® dryer** ensures a relative humidity of the sample below 40%, as required by EN16976.



AVL AT A GLANCE

- Founded in 1948
- 12,200 employees worldwide (67% engineers)
- Global sales and service network
- 11% of turnover invested in R&D
- 2,300 granted patents in force
- ISO-certified quality management system

Decades of Expertise

- 60 years of measuring the particle emission of aerosols
- 20 years using AVL's proprietary Condensation Particle Counting (CPC) technology
- More than 1600+ CPC units installed worldwide, at large OEM accounts, legal authorities, as well as universities
- In-house design and production of all key components for maximum quality



Reimagining Motion

For a greener, safer, better world of mobility.

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