TOPAS®
Technologie-orientierte Partikel-, Analysen- und Sensortechnik

Laser Aerosol Spectrometer

LAP 324

Laser Aerosol Spectrometer LAP 324.

The Laser Aerosol Spectrometer LAP 324 is an analytical instrument for high-resolution characterisation of both number concentration and size distribution of airborne particles.

In accordance with ISO 21501-1, the spectrometer is based on the measuring principle of single particle light scattering using either monochromatic or polychromatic light. Therefore, the LAP 324 is equipped with two different laser diodes (red, blue) that can be operated in parallel (i.e. Dual Wavelength® technology) or individually.

The touch screen can be used for adjusting as well as operating the instrument and provides visualisation of the measured concentration course respectively the particle size distribution.

Applications

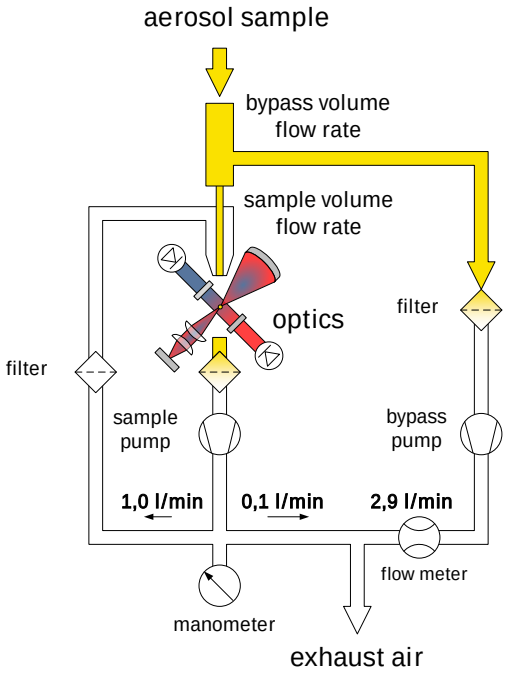
- high resolution analysis of aerosols
- filter testing and filter characterisation
- indoor aerosol analyses
- basic aerosol research
- toxicology testing

Features

- stand-alone or computer-assisted operation
- high particle classification accuracy
- wide particle number concentration range
- operation with two or one light sources

Principle of operation

Within the aerosol spectrometer, the sampled aerosol flow rate is firstly divided into an effective detection flow rate and a bypass flow rate. The unmodified effective detection flow rate goes straight forward into the measurement cell. To avoid analytical artifacts, the effective detection flow rate is sheathed (aerodynamic focusing) by the afore filtered bypass flow rate.



Schematic description of the operating principle of the LAP 324.

Topas GmbH
Technologie-orientierte
Partikel-, Analysen- und Sensortechnik
Gasanstaltstraße 47 · D-01237 Dresden

Telefon +49 (351) 21 66 43 - 0
Fax +49 (351) 21 66 43 55
E-Mail office@topas-gmbh.de
Internet www.topas-gmbh.de

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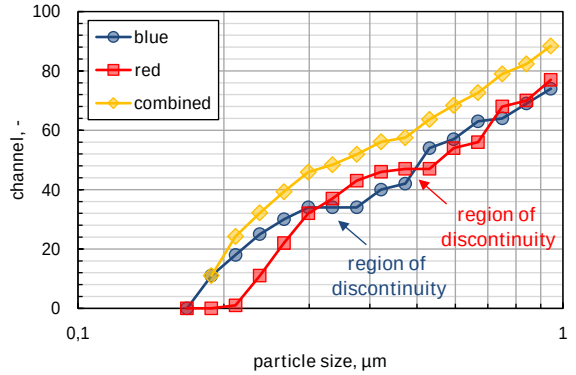
Specifications

Two long-life laser diodes of different wavelengths in the measurement cell illuminate particles passing through. The scattered light is collected by a photo detector. These signals are converted into electrical signals and processed.

Details

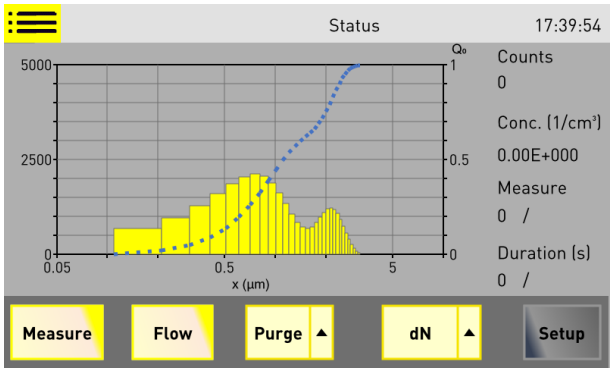
In the following figure, the advantage of using two different wavelengths is shown for DEHS droplets.



Assignment of channel position to particle size depending on the wavelength used (blue 450 nm, red 660 nm, combined).

If monochromatic light (one wavelength) is used for droplet aerosols, there is a discontinuity in the signal course in dependence of particle size. Typically, this leads to measurement artefacts. The use of polychromatic light compensates this discontinuity and improves thus the sizing accuracy.

The aerosol spectrometer can be adjusted and operated via the touch screen.



User interface of the LAP324: in-situ visualisation of measurement results.

References

Oeser et al. (2023) Artificial neural network based coincidence correction for optical aerosol spectrometers. J. Aerosol Sci. 171, 106177. doi:10.1016/j.jaerosci.2023.106177

Oeser et al. (2022) Minimizing the coincidence error in particle size spectrometers with digital signal processing techniques. J. Aerosol Sci., 165, 106039. doi:10.1016/j.jaerosci.2022.106039

Accessories

- Sample Switching Unit SYS 520
- software PASWin (included in delivery)
- static (DIL) and Dynamic Dilution System (DDS)
- antistatic hose lines

Technical specifications

particle size	0,15 – 40 µm
particle concentration	< 2 × 10^4 cm^{-3}
size resolution	max. 128 (64) size channels or user defined
flow rate	3,0 l/min (sample flow) 0,1 l/min (detection flow)
light source	laser diode - red: 660 nm, 30 mW - blue: 450 nm, 60 mW
communication interface	Ethernet, USB-C, RS232
power supply	110 - 230 VAC, 50-60 Hz; 12 VDC, 4,2 A
dimensions (w × h × d)	220 × 380 × 200 mm
weight	9,4 kg
normative references	VDI 3867-4:2023 (E) ISO 21501-1:2009

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