Laser Aerosol Particle Size Spectrometer LAP Series

Laser Aerosol Particle Size Spectrometer- LAP 322

Special Advantages

- high size resolution – up to 128 channels
- excellent classification accuracy
- wide size range (0,2..40 µm)
- wide concentration range (up to 10^4 part./cm³ / *28.3 x 10^7 part./ft³)*
- no border zone – no border zone error
- high sensitivity and long service life by using laser diode (>20.000 h)
- user-friendly software PASWin
- sensor and electronic in one compact housing - ideally suited for mobile use

Product Description

The aerosol particle size analyzer of series LAP 322 are designed to measure, characterize and monitor both test aerosols and ambient aerosol particulate by concentration and size distribution.
A particle size spectrometer produces a particle size distribution with very high resolution generated by the analysis of signals extracted from each individual particle detected within the instruments measurement range (VDI guideline 3867, sheet 4 and ISO 21501-1).

Measuring Method

Optical particle counters are single particle measuring instruments which classify and count the number and size of particles dependent on the intensity of the light scattered by them. This method classifies the physical measurable sizes (the particle features). It provides high sensitivity and accuracy combined with fast quantity assessment.
The LAP 322 series allows the simultaneous determination of particle size (represented by the scattered light equivalent diameter) and the number of particles within a concentrated aerosol. Instruments in this series are characterised by high classification accuracy and excellent resolution.

Applications

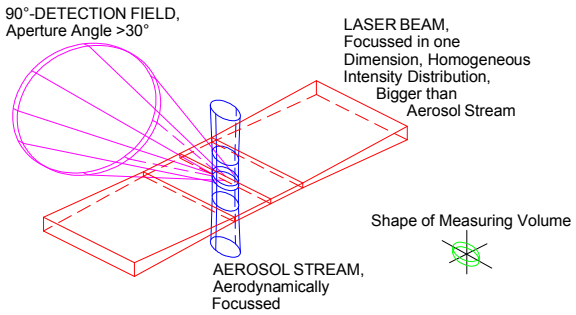
- determination of particle size distributions (sprays, dusts, powders, oil mists)
- analysis of test and calibration aerosols
- measurement of ambient air aerosols
- filter testing and classification
- determination of the fractional efficiency
- characterization of pharmaceutical aerosols (DPI, MDI)
- measurements at oil mist separators (blow-by)

LAP 322 with Sample Switching Unit SYS 520

Principle

Measuring Arrangement

The optical design of the LAP 322 Series spectrometers uses the wide 90° light scattering technique, which has well documented advantages over other methods. This method is specially designed for single particle counting in high concentration aerosols.



Schematic view of 90° measuring arrangement

This innovative solution is based on the defined limitation of a measuring volume, being sufficiently small for the desired particle size range. Basically, the aerodynamically focussed aerosol flow and the unidimensional focussed illuminating laser beam are in perpendicular planes. The detection plane is also perpendicular to two other planes. By illuminating the whole aerosol stream there is no border zone.

Merely the centre of the illuminating beam cuts the aerosol stream so as to a nearly homogeneous illumination of measuring zone is assured.

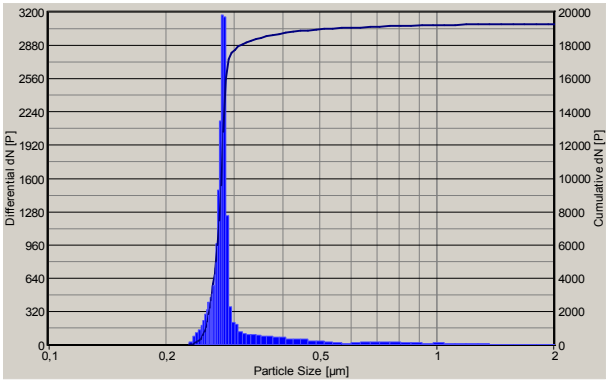
Special features resulting from the implemented design of the measuring volume are:

- an effective particle separation
- homogeneous illumination of measuring zone
- no border zone

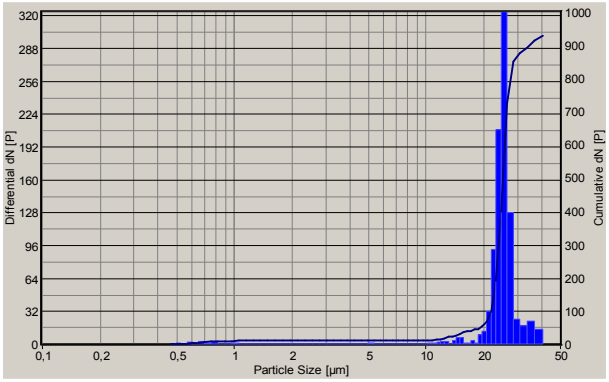
The detected scattered light signals are recorded and classified by an internal processor and transferred to the Topas Software PASWin by means of a standard interface (RS232, USB).

Calibration

The calibration by means of monodisperse test aerosols is based on the classification of scattered light intensities into 128 classes (pulse height multichannel analysis).
The device-internal calibration function is based on primary data like those displayed in the diagrams below.



Primary measuring result for a 301 nm polystyrene latex (PSL) aerosol



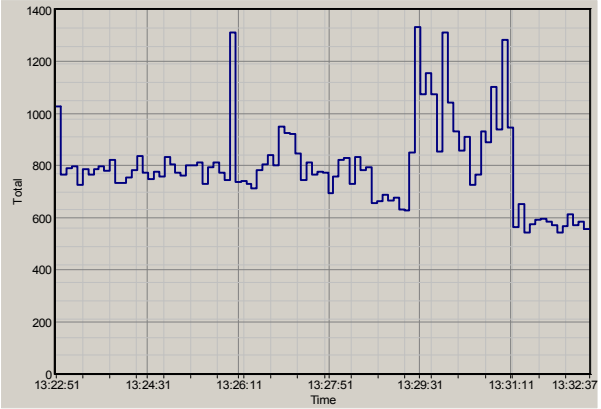
Primary measuring result for a 26.15 µm polystyrene latex (PSL) aerosol

Applications

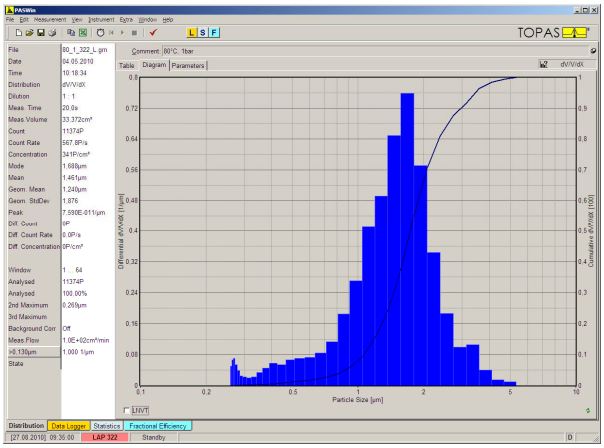
Measurement of Particle Size Distributions and Aerosol Research

The high particle size resolution as well as the wide concentration and particle size measuring range are advantageous for:

- inhalation-toxicological experiments
- time-resolved aerosol measurements
- determination of fractional efficiencies
- environmental studies
- reference measurements of model aerosols
- measurement of droplets and sprays
- dust measurement, powder characterization



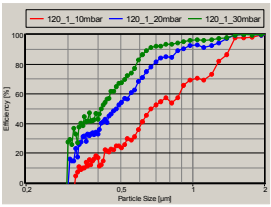
Measured particle concentration vs. time plot, recorded by means of the data logger

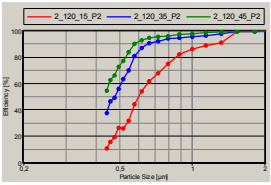


Oil droplet size distribution, measured at 80°C, 4 bar nozzle pressure within Topas oil mist separator test rig SPT 140.

Filter Testing

The LAP Series is suitable to determine the fractional collection efficiencies in a particle size range of 0.2 to 40 µm.
The use of a Topas Switching Unit SYS 520 enables control of the sampling in an alternating manner between raw gas, scavenging air and clean gas. The switching times can be freely adjusted by the user.





Fractional collection efficiency of oil mist separators, determined by means of a Topas Separator Performance Tester SPT 140

Straightforward investigation of the fractional collection efficiency in dependence on the load in the raw gas (setup including a SYS 520 switching unit below a Topas filter testing channel AFC 131)

The control of the switching unit is performed by means of the evaluation software PASWin, which also simultaneously performs the calculation of the particle size distributions. Hence, a quasi-continuous determination and recording of fractional collection efficiencies is supported, e.g. during dust charging cycles of filters or lifetime investigations in:

- quality assurance
- filter media development
- filter classification

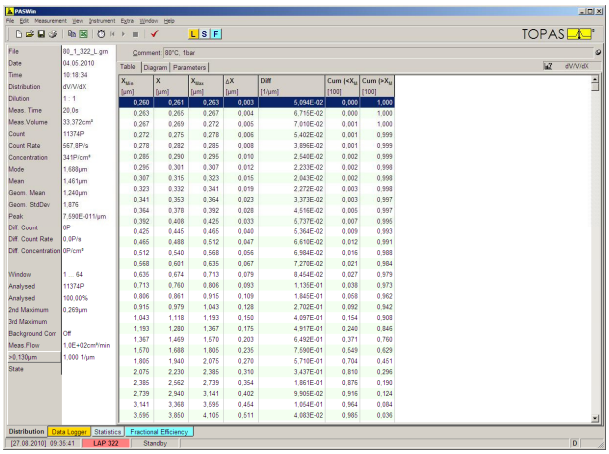
Specifications

Particle Analysis Software PASWin by Topas

As a result of many years of practical experience Topas has developed this comprehensive, capable and user-friendly control and evaluation software, PASWin. This software not only provides the measuring results with ease and speed, but will also allow a desirable degree of freedom for the experienced user, e.g. to establish and edit calibration data.

Fundamental characteristics are:

- user interface under Windows
- calculation of the particle size distributions (related to particle number, integral surface area, integral volume) and output in both graphic and tabular modes
- real-time signal processing and data display with parallel operation of the16 bit measurement processor and the PC processor
- adjustable channel resolution, logarithmic or linear plots, selectable integration limits
- calculation of results in up to a max. 128 classes or in a user-defined class division
- merging of both measuring sub ranges
- comprehensive data recording (data logger function)
- measured statistical data output
- comparison of data from different measurements
- background correction



Main window of the particle analysis software PASWin

Specifications

Measuring range	0.2 to 40 µm (0.2 to 5 µm, 0.7 to 40 µm)
Measuring concentration	<10^4 particles/cm³ (*<28.4 x 10^7 particles/ ft³)*
Channels	max. 128 (64); or user-defined
Flowrates - Total - Measuring zone	 3 lpm (*0.106 ft³/min*) 0.1 lpm (*0.0035 ft³/min*)
Light source	Laser diode; 30 mW; Wavelength 660 nm; Operating life > 20.000 h
Interface	RS232 standard
Mains adaptor	110…230 V AC, 50-60 Hz; 12 V DC, 4.2 A
Dimensions	220 × 380 × 200 mm³
Weight	9.4 kg

- calibration by polystyrene latex aerosol (calibration standards) and DEHS aerosol (Di(2-ethylhexyl) sebacate)
- type of calibration: *polynomial* (max. 128 classes) or *discrete* according to instructions from the user
- option for connection of an automated switching unit (Topas SYS 520) for sampling and switch-over between measuring points (e.g. for fractional efficiencies measurements)

QMS certified to DIN EN ISO 9001.

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For more information please visit our website at www.topas-gmbh.de

Specifications are subject to change without notice.

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中国总代理:Nano电子商城
Tel: 021-52069907
Fax: 021-52061832*107
19mro@19mro.com
http://www.19mro.com