

Particle Analyzers

Litesizer DLS Series



Make the **Light Choice**

The size and stability of nanoparticles and microparticles are crucial to their function, as well as to their processing and transport properties.

Anton Paar, a leading developer and manufacturer of high-performance analytical instruments, has combined its physics and engineering expertise with modern software creativity to create intuitive particle analyzers that are a joy to use:

The Litesizer DLS particle analyzers measure particle size, particle concentration, zeta potential, and molecular mass by light scattering technology, such as transmittance and refractive index, with ingeniously simple software.

Litesizer DLS 100

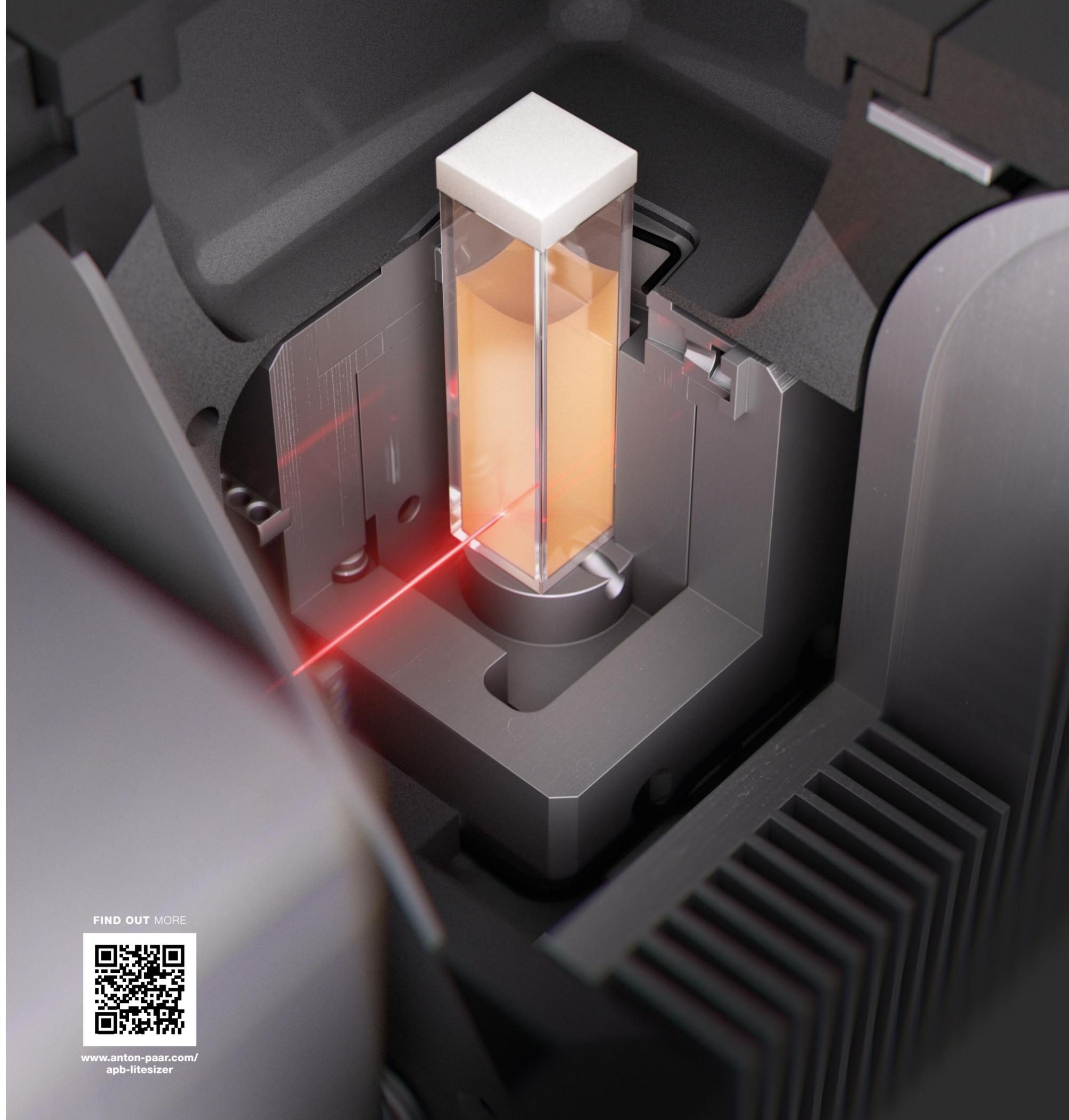
With the Litesizer DLS 100 you can determine the particle size and transmittance on a wide variety of samples. It gives you rapid and accurate insight into your particle systems, and provides the tools for optimizing them by revealing how they change with time, pH, temperature, and concentration.

Litesizer DLS 500

The Litesizer DLS 500 does all of the above, but also measures zeta potential, molecular mass, and refractive index. The unique omega-shaped cuvette for zeta potential combined with patented cmPALS technology (European Patent 2 735 870) guarantees fast, stable, and reproducible zeta potential measurements, even on sensitive and turbid samples.

Litesizer DLS 700

The Litesizer DLS 700 offers all of the features available for Litesizer DLS 500 as well as multi-angle particle sizing (MAPS). This ensures a higher peak resolution of multimodal samples in comparison to standard DLS mode. Furthermore, a dedicated measurement mode for determining particle concentration within the sample is available.



FIND OUT MORE



[www.anton-paar.com/
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Technical Highlights

Litesizer DLS Series Hardware



Product compliance	Laser class 1, EN 60825-1:2014 and CDRH, LVD, EMC, RoHS
Light source	Semiconductor laser / 40 mW, 658 nm
Detector	Avalanche photodiode (APD)
Temp. control range	0 °C to 90 °C
Operating temp.	10 °C to 35 °C
Humidity	35 % to 80 % non-condensing
Dimensions (WxDxH)	460 mm x 485 mm x 135 mm
Weight	Approx. 18 kg (40 lbs)
Power consumption	50 W

Trademarks

Kaliope (EU: 012709391), (UK: UK00912709391)
Litesizer (EU: 011695491), (UK: UK00911695491)

Continuous transmittance measurements

Continuously measuring sample transmittance allows the Litesizer DLS series to automatically adjust parameters like focus position, measurement angle, and measurement duration.

One instrument – three detection angles

Choose from back-, side- and forward scattering, or let the Litesizer DLS 500 and Litesizer DLS 700 select the best angle for your sample.

Unprecedented size resolution with DLS

Multi-angle particle sizing (MAPS) enables enhanced resolution of bi and trimodal particle mixtures.

Particle concentration

The Litesizer DLS 700 allows you to determine particle concentration based on single-angle DLS and MAPS.

Refractive index

The solvent refractive index can now be determined for the exact wavelength and temperature of your measurement with the Litesizer DLS 700 and 500. This ensures maximum accuracy for particle size and zeta potential results under all experimental conditions.

The Omega cuvette

The zeta-potential cell, which can be used with the Litesizer DLS 700 and 500, has an inverted Ω -shaped capillary tube. This facilitates a homogeneous electric field within the measuring channel, guaranteeing stable and reproducible results.

Patented ELS technology: cmPALS

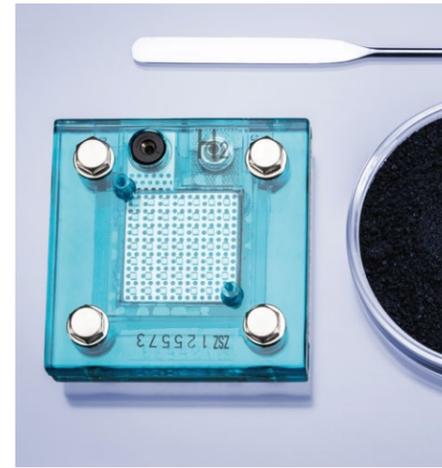
The Litesizer 700 and 500 use cmPALS, a novel patented PALS technology (European Patent 2 735 870) that defines a new state of the art in ELS optics. The result: zeta potential measurements with the highest accuracy and shortest measurement time.

Optical bench

The optical bench is the strong heart of the Litesizer DLS series. Highly sensitive measurement optics enable the accurate detection of even low-intensity signals, while the robust casing reduces the effects of vibrations and ensures that measurements remain unaffected by dust or temperature fluctuations.



Measurement Principles



Particle size measurement by DLS

Particles suspended in a liquid are constantly undergoing random motion, and the size of the particles directly affects their speed. Smaller particles move faster than larger ones. In dynamic light scattering (DLS), light passes through the sample, and the scattered light is detected and recorded at a certain angle. The time dependence of the scattered intensity reveals how fast the particles are moving. From this information, it's possible to calculate the average size of the particles as well as the size distribution.

Litesizer DLS particle analyzers give you accurate and precise size measurements. You can easily measure the effect of time, pH, temperature, and concentration on the particle size. With integrated measurement algorithms, you can get the highest peak resolution when choosing the most suitable single-angle DLS or multi-angle dynamic light scattering (MAPS) measurement mode (DLS 700).

PARTICLE SIZE SPECIFICATIONS

Particle analyzers	- Litesizer DLS 700 - Litesizer DLS 500 - Litesizer DLS 100
Measuring range	0.3 nm to 10 µm*
Sensitivity	0.1 mg/mL (lysozyme) lower than 0.00001% (0.1 ppm, Latex 100 nm)
Max. sample concentration	50 % w/v (sample-dependent)
Accuracy	Better than ±2 % on NIST traceable standards
Repeatability	Better than ±2 % on NIST traceable standards
Min. sample volume	12 µL
Measurement angles	175° (Litesizer DLS 100) 15°, 90°, 175° (Litesizer DLS 700 and 500)
Multi-angle particle sizing (MAPS)	Litesizer DLS 700

*Under laboratory conditions

Zeta potential measured by ELS

In electrophoretic light scattering (ELS), the speed of the particles is measured in the presence of an electric field. The faster the particles move, the higher the zeta potential of the particles. In general, a greater-magnitude zeta potential means that the particles will repel each other more strongly, giving a more stable suspension.

The Litesizer DLS 700 and 500 use a patented (European Patent 2 735 870) technology called cmPALS. This is a significant advance on existing PALS technology because it allows the modulator to make large movements. This means you can use shorter measurements and apply lower electric fields, reducing the effects of electrode fouling and deterioration.

ZETA POTENTIAL SPECIFICATIONS

Particle analyzer	- Litesizer DLS 700 - Litesizer DLS 500
Measuring range	> ±1000 mV
Size range	3.8 nm to 100 µm
Sensitivity	0.1 mg/mL (lysozyme)
Repeatability	± 3 %
Max. sample concentration	70 % w/v (sample-dependent)
Sample volume	50 µL*
Max. sample conductivity	200 mS/cm
Measurement angle	15°
pH range	2 to 12

*Sample viscosity dependent

Measurement Principles



Molecular mass measured by SLS

The intensity of the scattered light is directly related to molecular mass. If the scattering intensity is measured at several different concentrations, then a Debye plot can be generated, the intercept of which provides the molecular weight.

Static light scattering (SLS) measurements with the Litesizer DLS 700 and 500 are simple, fast, and non-invasive. They also give you the second virial coefficient, which reflects protein solubility.

Particle concentration measurement

The Litesizer DLS 700 can determine the concentration of particles for monomodal and multimodal samples. Particle concentration measurements are performed without calibration, and you can determine the concentration of up to three different size populations within one sample.

Since the measurement of the particle concentration can be based on single-angle DLS or multi-angle particle sizing (MAPS) measurements, this measurement mode is applicable to a broad range of different samples – so you get maximal flexibility.

MOLECULAR MASS SPECIFICATIONS

Particle analyzer	- Litesizer DLS 700 - Litesizer DLS 500
Measuring range	300 Da to 20 MDa
Sensitivity	0.1 mg/mL (lysozyme)
Accuracy	±10 %
Repeatability	±5 %
Measurement angle	90°

PARTICLE CONCENTRATION SPECIFICATIONS

Particle analyzer	Litesizer DLS 700
Concentration range	10 ⁸ - 10 ¹³ particles/mL
Size limit	1 µm
Min. sample volume	12 µL
Accuracy	+/- 10% (sample-dependent)
Repeatability	+/- 5% (sample-dependent)
Measurement angles	175°, 90°, 15°, MAPS

Refractive Index

Performing DLS and ELS on particles in solution requires prior knowledge of the solvent's refractive index. With the Litesizer DLS 700 and 500 you won't need to gather these indices from external sources anymore: Anton Paar's particle analyzers can measure the solvent's refractive index for the exact wavelength and temperature of your experiment.

Litesizer DLS 700 and 500 are the only DLS-based instruments able to determine the solvent refractive index within ±0.5 %, as defined by ISO 22412:2017 concerning the accuracy of the refractive index required for DLS. All settings can be easily accessed via the dedicated Litesizer software Kalliope. This guarantees easy operation and highly reliable results.

Transmittance

Transmittance is measured by detecting the fraction of light that passes through the sample. The Litesizer DLS particle analyzers continuously measure the transmittance for every sample. The value is reported in real time and is displayed during operation.

You obtain instant insight into the suitability of the sample for light-scattering measurements. In addition, this measurement allows the Litesizer DLS to select the best parameters for your sample (focus position, measuring angle, measurement duration).

REFRACTIVE INDEX SPECIFICATIONS

Particle analyzer	- Litesizer DLS 700 - Litesizer DLS 500
Measuring range	1.28 to 1.50
Accuracy	±0.5 %
Temperature range	0 °C to 90 °C
Wavelength	658 nm
Min. sample volume	1 mL

TRANSMITTANCE SPECIFICATIONS

Particle analyzers	- Litesizer DLS 700 - Litesizer DLS 500 - Litesizer DLS 100
Measuring time	10 s
Min. sample volume	15 µL

Cuvettes

The Litesizer DLS analyzers are compatible with a number of different cuvette types for measuring size, zeta potential, molecular mass, transmittance, and refractive index of particles dispersed in liquids. The table below lists all the available cuvettes and their major measurement applications.

Disposable cuvette	Quartz cuvette	Glass cuvette	Quartz low-volume cuvette	Uvette® low-volume cuvette	Omega cuvette	Univette
						
APPLICATION (MEASURING PARAMETER)						
<ul style="list-style-type: none"> - Particle size, MAPS - Transmittance - Particle concentration 	<ul style="list-style-type: none"> - Particle size, MAPS - Molecular mass - Transmittance - Refractive index - Particle concentration 	<ul style="list-style-type: none"> - Particle size, MAPS - Molecular mass - Transmittance - Particle concentration 	<ul style="list-style-type: none"> - Particle size, MAPS - Molecular mass - Transmittance - Particle concentration 	<ul style="list-style-type: none"> - Particle size - Transmittance 	<ul style="list-style-type: none"> - Zeta potential - Particle size - Transmittance 	<p>Univette is a high-quality reusable cuvette designed for zeta potential and particle size measurements with the Litesizer DLS 700 and 500. It enables measurement of particles suspended in organic as well as in aqueous solvents. The versatile Univette is also breaking new ground in terms of robustness and measurement under critical conditions: it's resistant to harsh chemicals, fully functional at high temperature and/or high conductivity, and is also able to measure highly concentrated or low-volume samples.</p>
DETAILS						
<ul style="list-style-type: none"> - for aqueous solvents - ideal sample volume: 1 mL (not less than 0.85 mL) 	<ul style="list-style-type: none"> - for aqueous and organic solvents - ideal sample volume: 1 mL (not less than 0.85 mL) 	<ul style="list-style-type: none"> - for aqueous and organic solvents - ideal sample volume: 1 mL (not less than 0.85 mL) 	<ul style="list-style-type: none"> - for aqueous and organic solvents - maximum volume: 45 µL - minimum sample volume: 12 µL (when inserting a supporting plate into the module) 	<ul style="list-style-type: none"> - for aqueous solutions and organic solvents* - minimum sample volume: 50 µL - maximum sample volume: 2 mL 	<ul style="list-style-type: none"> - disposable cell - for aqueous solutions only - minimum sample volume: 650 µL 	<p>Univette's main features include:</p> <ul style="list-style-type: none"> - ELS and DLS measurements in organic or aqueous solvents possible - Resistant to harsh chemicals - Functional even at critical temperatures - Excellent robustness at high conductivity - Ability to measure low-volume samples (50 µL) - Suitable for highly concentrated samples - Reusable - Particle concentration <p>Univette is the most versatile cuvette on the market.</p>
Cuvette compatibility with Litesizer DLS 700						
✓	✓	✓	✓	✓	✓	✓
Cuvette compatibility with Litesizer DLS 500						
✓	✓	✓	✓	✓	✓	✓
Cuvette compatibility with Litesizer DLS 100						
✓	✓	✓	✓	✓	×	×

Legend: ✓ Compatible × Not compatible

*Refer to the supplier material data sheet for the list of compatible solvents.

Kalliope Software for Particle Analysis

The ingeniously simple particle analysis software Kalliope is one of the major highlights of the Litesizer DLS. It enables particle analysis at the touch of a button.



Become an expert in only a minute

Perform expert-level measurements with minimum-to-no experience using our Kalliope software. It supports you every step of the way – for DLS and ELS measurements it automatically optimizes attenuation, focus position, and detection angle. The Expert Advice function ensures that your results are always top-class. With Kalliope, everyone's an expert.

Ingenious simplicity

Kalliope's one-page workflow displays all relevant data in an intuitive, easy-to-grasp overview. Input parameters, a live view of the measurement, and all results in one place consolidate measurement transparency. Additionally, measurements can be recalculated using different input parameter sets.

Real-time monitoring

Kalliope tracks and monitors (in real-life) zeta potential and particle size change, along with time, temperature, pH, and concentration. Data analysis and trend identification are easy because of super-clear results presentation. The most important numeric data are tabulated under the graph to further simplify analysis.

Pharma mode – US FDA 21 CFR Part 11

A pharma option with built-in data security functions, user management, and audit trails makes Kalliope fully compliant with the US FDA's 21 CFR Part 11. A comprehensive pharma qualification package (PQP) is also available.

Application-specific measurement modes

Single-click, application-specific measurement modes transform Kalliope into a completely new tool. Whether it's proteins that have to be measured or a parameter screened over the pH range, Kalliope automatically optimizes the measurement configuration and delivers watertight results.

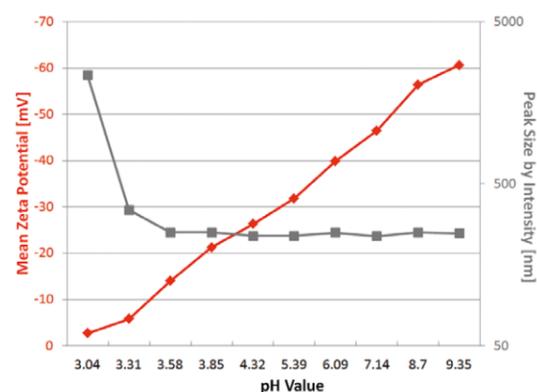
One software – for a range of instruments

Kalliope is compatible with Anton Paar particle-sizing instruments. From laser diffraction to DLS and ELS, it's all performable with the same software. Forward planning delivers continuous updates and improvements. New functions and features are frequently added as per user requirements.

Accessories

For automation, the Litesizer DLS series can be equipped with a dosing system and a flow module. Read more about these practical time-savers below.

pH Ramp-Down



Dosing System:

- Better accuracy and reproducibility
- Improved traceability
- Minimized errors in calculations and documentation
- Easy and fully programmable setting

The Dosing System is an optional accessory for the Litesizer DLS 700 and 500 that automates the adjustment of the sample's pH and enables the determination of the isoelectric point directly in the measurement cuvette. Fast and accurate characterization of zeta potential and particle size changes in response to pH are now possible.

The tedious process of adjusting the pH manually between every measurement can now be avoided. Furthermore, automating this process not only saves time and effort but, most importantly, also considerably reduces the possibility of human error.



Flow Module FM10:

The flow module enables the automatic size and zeta potential measurements of dispersed samples under varying pH conditions. It can be installed on the Litesizer DLS 700 and 500 instead of the general batch module BM-10, which accommodates cuvettes for single measurements. Of note, the flow module FM-10 can also be used for single measurements in standard cuvettes, thus representing a very versatile solution for a wide variety of applications.

Background Knowledge and Support

Your guide to particle size and zeta potential determination

Your guide to dynamic and electrophoretic light scattering introduces particle size and zeta potential analysis theory. It includes useful information for properly preparing suspensions and emulsions, choosing measurements, and interpreting results.

Access our knowledge collection

Learn more about Litesizer DLS in application reports and on the Anton Paar wiki. Join our live webinars or listen to recordings.

Application reports:

www.anton-paar.com/apb-litesizerreports

Wiki articles:

www.anton-paar.com/apb-wiki-pc

Webinars:

www.anton-paar.com/apb-webinars-pc

Contact our experts

Anton Paar has more than 30 subsidiaries and numerous partners worldwide. An expert is always close by and happy to help, in your language, free of charge. Call us for advice on sample preparation and measurement or to discuss specific particle characterization challenges.

FIND OUT MORE



www.anton-paar.com/apb-dls-els-guide

