Anton Paar

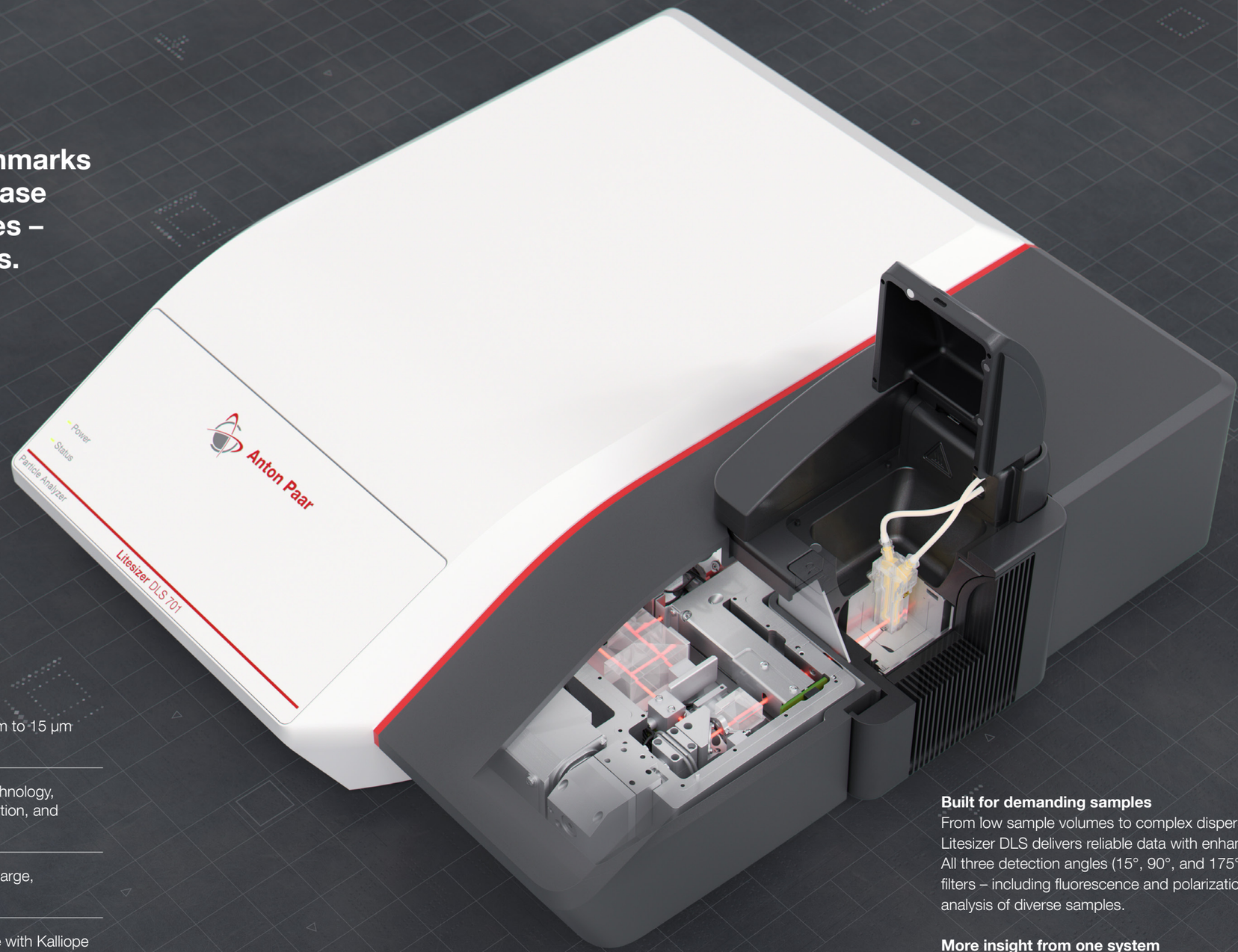
Precision Nanoparticle Analysis

Litesizer DLS Series

The Power to Explore

Litesizer DLS sets new benchmarks in precision, versatility, and ease of use for challenging samples – delivering fast, reliable results.

Find out more



Key benefits

- ✓ Fast, accurate particle sizing results for particles from 0.3 nm to 15 µm with sample volumes as low as 0.8 µL
- ✓ Reliable analysis of complex samples enabled by MAPS technology, continuous transmittance monitoring, automatic angle selection, and optical filters at all three detection angles
- ✓ All-in-one measurement solution for particle size, surface charge, molecular mass, concentration, and more
- ✓ Intuitive three-click workflows and full regulatory compliance with Kalliope software
- ✓ 10-year laser warranty for long-term confidence and reliable performance

Built for demanding samples
From low sample volumes to complex dispersions, Litesizer DLS delivers reliable data with enhanced resolution. All three detection angles (15°, 90°, and 175°) support optical filters – including fluorescence and polarization – for flexible analysis of diverse samples.

More insight from one system
Measure particle size, zeta potential, molecular mass, concentration, refractive index, and transmittance in one instrument family designed for modern R&D and QC workflows.

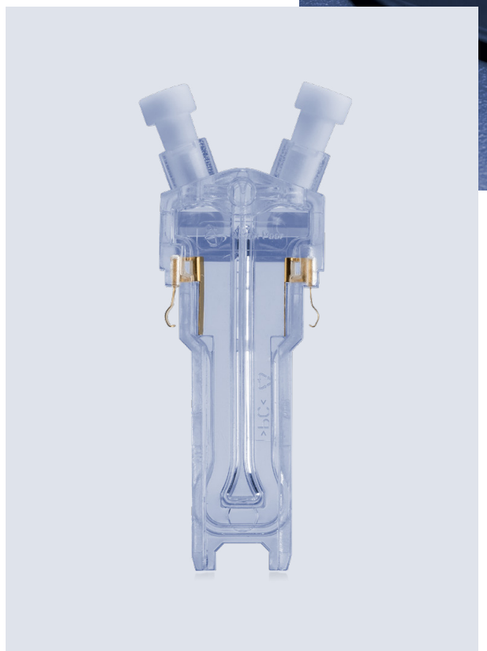
The Future of Zeta Potential Analysis

Revolutionary cmPALS technology
cmPALS represents a breakthrough in zeta potential measurement, addressing the fundamental limitations of traditional PALS systems. This patented technology (European Patent 2 735 870) allows the modulator to make large movements, enabling shorter measurements with lower electric fields. The result: dramatically reduced electrode fouling and deterioration, delivering superior accuracy and stability for even the most challenging samples.

How a zeta potential measurement works
Zeta potential is determined by measuring the electrophoretic mobility of particles in an electric field. A laser beam passes through the sample, scattering off moving particles. The speed of this motion indicates the zeta potential's magnitude, while the direction reveals its sign. cmPALS refines this process with enhanced sensitivity and precision, providing superior accuracy and repeatability that sets new industry standards.

Omega Cuvette innovation
The specially designed Omega Cuvettes feature a unique Omega-shaped capillary that ensures almost no gradients of the applied electric field at the measuring position. This breakthrough design delivers the highest possible repeatability because fluctuations in results depending on measurement position within the capillary are negligible. The result is consistent, reproducible measurements that you can trust.

Next-level performance
With cmPALS and Omega Cuvettes, Litesizer DLS 501 and 701 set new benchmarks in zeta potential measurement. This technology combination delivers more precise and reliable results across diverse applications, achieving measurement speeds that are over six times faster than traditional PALS methods.



Key benefits of cmPALS and Omega Cuvettes

- ✓ Improved sensitivity: Detect even subtle changes in particle zeta potential
- ✓ Enhanced stability: Achieve consistent, reproducible results every time
- ✓ Faster measurements: Get results in minutes without sacrificing accuracy
- ✓ Reduced sample damage: Safeguard sensitive and delicate samples during analysis with a dedicated protein measurement mode
- ✓ Extended electrode life: Minimize fouling and deterioration for long-term reliability

Measurement Modes

Particle size measurement with 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 obtain the highest peak resolution when choosing the most suitable single-angle DLS or multi-angle dynamic light scattering (MAPS) measurement mode (DLS 701).

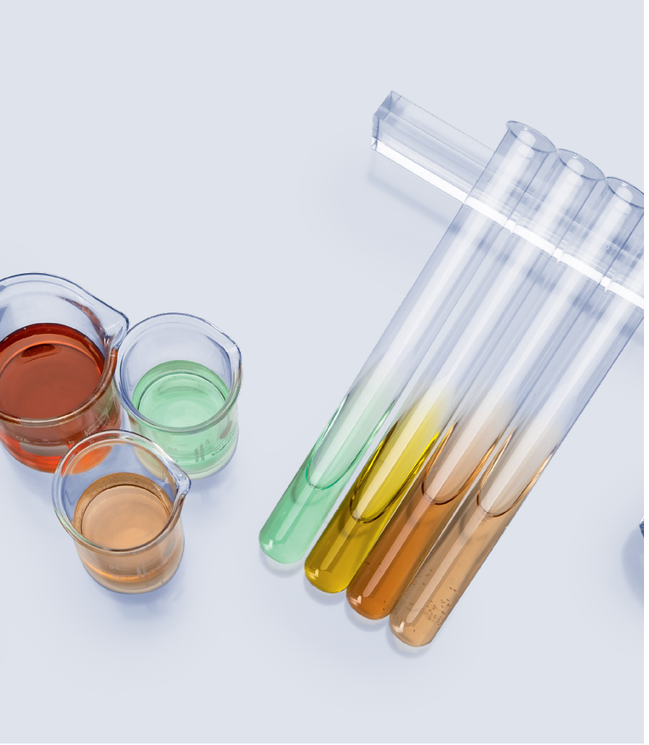
Zeta potential measurement with ELS
In electrophoretic light scattering (ELS), the speed of the particles is measured in the presence of an electric field. The faster the particles move, the higher the zeta potential of the particles. In general, zeta potential with a greater magnitude means that the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

Particle size specifications	
Particle analyzers	- Litesizer DLS 701 - Litesizer DLS 501 - Litesizer DLS 301 - Litesizer DLS 101
Measuring range	0.3 nm to 15 µm*
Sensitivity	0.1 mg/mL (lysozyme) lower than 0.00001 % (0.1 ppm, Latex 100 nm) 1 mg/mL (lysozyme, Litesizer DLS 301)
Max. sample concentration	50 % w/v (sample-dependent) 40 % w/v (Litesizer DLS 301)
Accuracy	Better than ±2 % on NIST traceable standards
Repeatability	Better than ±2 % on NIST traceable standards
Min. sample volume	12 µL (Litesizer DLS 101) 0.8 µL (Litesizer DLS 301, 501 and 701)
Measurement angles	175° (Litesizer DLS 101) 90° (Litesizer DLS 301) 15°, 90°, 175° (Litesizer DLS 501 and 701)
Multi-angle particle sizing (MAPS)	Litesizer DLS 701

*Under laboratory conditions for Litesizer DLS 301, 501, and 701. Litesizer DLS 101 0.3 nm to 10 µm.

Zeta potential specifications	
Particle analyzer	- Litesizer DLS 701 - Litesizer DLS 501 - Litesizer DLS 301
Measuring range	> ±1,000 mV
Size range	1.3 nm to 125 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, no special sample preparation required



Molecular mass measurement with 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 Litesizer DLS 301, 501 and 701 are simple, fast, and non-invasive. They also give you the second virial coefficient, which reflects protein solubility.

Molecular mass specifications	
Particle analyzer	- Litesizer DLS 701 - Litesizer DLS 501 - Litesizer DLS 301
Measuring range	300 Da to 20 MDa
Sensitivity	0.1 mg/mL (lysozyme)
Accuracy	±10 %
Repeatability	±5 %
Measurement angle	90°

Refractive index

Performing DLS and ELS on particles in solution requires prior knowledge of the solvent's refractive index. With Litesizer DLS 501 and 701 you won't need to gather these indices from external sources anymore: They measure the solvent's refractive index for the exact wavelength and temperature of your experiment. Litesizer DLS 501 and 701 are the only DLS-based instruments able to determine the solvent refractive index within ±0.5 %, as defined by ISO 22412:2017 (accuracy of the refractive index required for DLS). All settings can be accessed via the dedicated Litesizer software Kalliope.

Refractive index specifications	
Particle analyzer	- Litesizer DLS 701 - Litesizer DLS 501
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

Particle concentration measurement

Litesizer DLS 701 determines 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 samples – giving you maximal flexibility.

Particle concentration specifications	
Particle analyzer	Litesizer DLS 701
Concentration range	10^8 to 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

Transmittance

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 sample's behavior during the measurement and learn if, for example, sedimentation or aggregation has taken place. In addition, this measurement allows Litesizer DLS to select the best parameters for your sample (focus position, measuring angle, and measurement duration).

Transmittance specifications	
Particle analyzers	- Litesizer DLS 701 - Litesizer DLS 501 - Litesizer DLS 301 - Litesizer DLS 101
Measuring time	10 s
Min. sample volume	15 µL (Litesizer DLS 101) 0.8 µL (Litesizer DLS 701 and 501)

Cuvettes

> **Litesizer DLS analyzers support a wide range of cuvette types for measuring particle size, concentration, zeta potential, molecular mass, transmittance, and liquid refractive index. The table below summarizes the available cuvettes and their main applications.**

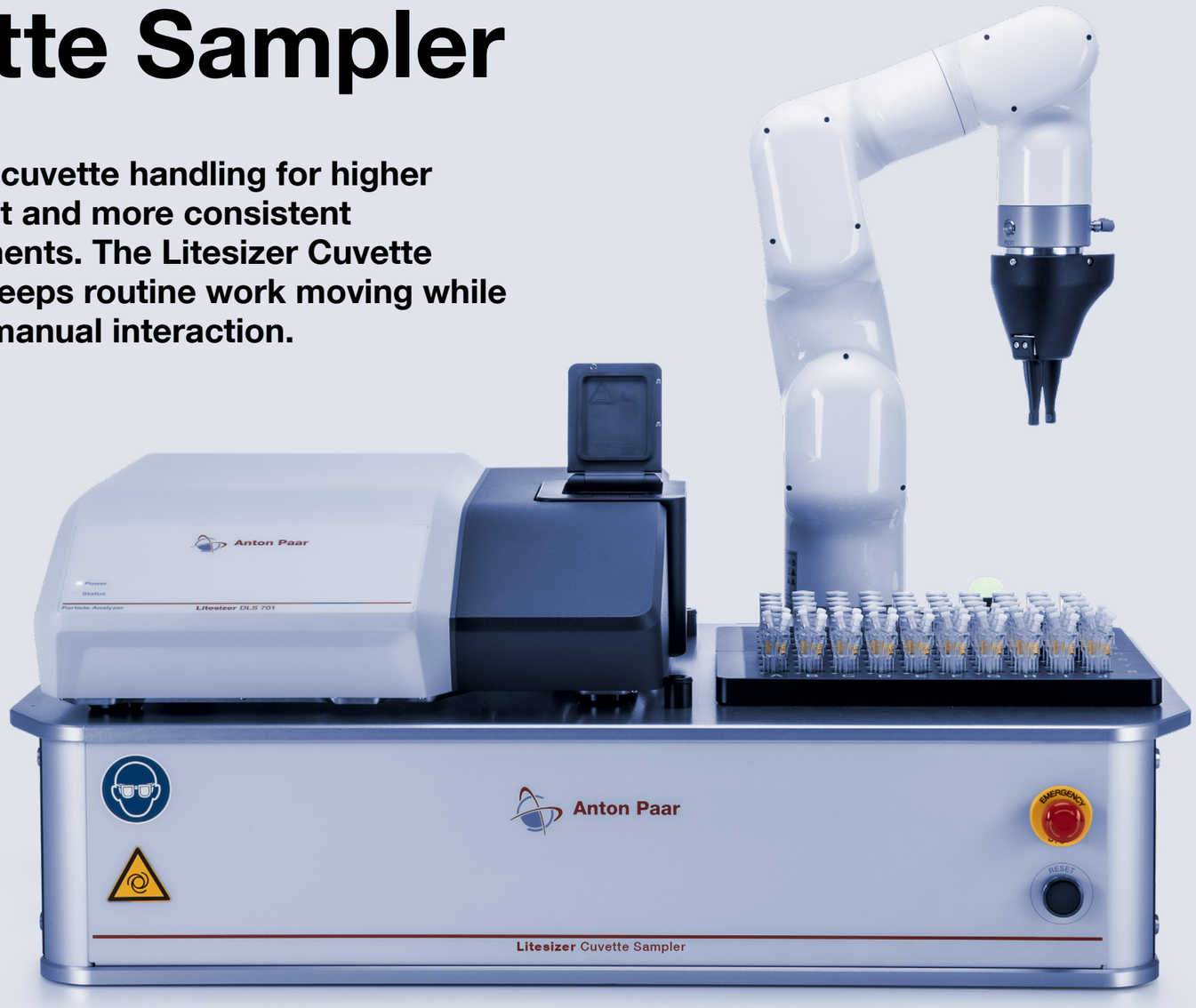
	Disposable cuvette	Glass cuvette	Quartz cuvette	Quartz low-volume cuvette	Uvette® low-volume cuvette	C-vette	Omega cuvette	Univette
	↓	↓	↓	↓	↓	↓	↓	↓
APPLICATION (MEASURING PARAMETER)								
	- Particle size, MAPS - Transmittance - Particle concentration	- Particle size, MAPS - Molecular mass - Transmittance - Particle concentration	- Particle size, MAPS - Molecular mass - Transmittance - Refractive index - Particle concentration	- Particle size, MAPS - Molecular mass - Transmittance - Particle concentration	- Particle size - Transmittance	- Particle size - Transmittance	- Zeta potential - Particle size - Transmittance	- Zeta potential - Particle size - Transmittance - Particle concentration
DETAILS								
	- For aqueous solvents - Ideal sample volume: 1 mL (not less than 0.85 mL)	- For aqueous and organic solvents - Ideal sample volume: 1 mL (not less than 0.85 mL)	- For aqueous and organic solvents - Ideal sample volume: 1 mL (not less than 0.85 mL)	- For aqueous and organic solvents - Maximum volume: 45 µL - Minimum sample volume: 12 µL (when inserting a supporting plate into the module)	- For aqueous solutions and organic solvents - Minimum sample volume: 50 µL - Maximum sample volume: 2 mL	- For aqueous solutions only - Minimum sample volume: 0.8 µL	- Disposable cell - For aqueous solutions only - Minimum sample volume: 650 µL	- For aqueous solutions and organic solvents* - Minimum sample volume: 50 µL - Chemical resistance - Reusable - For highly concentrated samples
Cuvette compatibility with Litesizer DLS 301, 501, and 701								
	✓	✓	✓	✓	✓	✓	✓	✓
Cuvette compatibility with Litesizer DLS 101								
	✓	✓	✓	✓	✓	✕	✕	✓

Legend: ✓ Compatible ✕ Not compatible

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

Litesizer Cuvette Sampler

Automate cuvette handling for higher throughput and more consistent measurements. The Litesizer Cuvette Sampler keeps routine work moving while reducing manual interaction.



Automated productivity
The Litesizer Cuvette Sampler runs long unattended sequences of up to 80 cuvettes, helping labs process more samples with less hands-on time and integrate automated studies directly into existing Kalliope workflows.

Reliable routine work
A standardized pick-and-place approach improves consistency across sample runs and shifts. Reduced manual interaction between measurements helps support clean, reproducible workflows and lowers the risk of handling-related carryover.

Other Accessories

Flow module FM11 and FM11 on-line
FM11 enables automatic size and zeta potential measurement of dispersed samples under varying pH conditions. The flow module can also be used for single measurements in standard cuvettes, making it a versatile solution for a wide variety of applications. FM11 on-line connects Litesizer DLS directly to process streams for continuous, real-time zeta potential monitoring and control. This opens up new opportunities in water treatment, where on-line zeta potential is increasingly used to optimize coagulant dosing, reduce chemical consumption, and improve plant performance.

Optical filters
Litesizer DLS 501 and 701 can be equipped with fluorescence, horizontal or vertical polarization filters in any of the three measurement angles. This allows for maximum flexibility and covers not only single angle DLS measurements, but also multi-angle particle sizing and concentration measurements.

Dosing System
The Dosing System is an optional accessory 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, and the tedious process of adjusting the pH manually between every measurement can now be avoided. Automating this process not only saves time and effort but, most importantly, also reduces human error.

Kalliope Software for Particle Analysis

> **The Kalliope software is a highlight of Litesizer DLS – enabling particle analysis at the touch of a button.**

Become an expert in minutes
Perform expert-level measurements with minimal or no experience. Kalliope 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 your results are always top-class. With Kalliope, everyone's an expert.

Ingenious simplicity
Kalliope's one-page workflow displays all relevant data in a straightforward 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 zeta potential and particle size change, along with time, temperature, pH, and concentration. Data analysis and trend identification are easy because of very clear results presentation. The most important numeric data are tabulated under the graph to further simplify analysis.

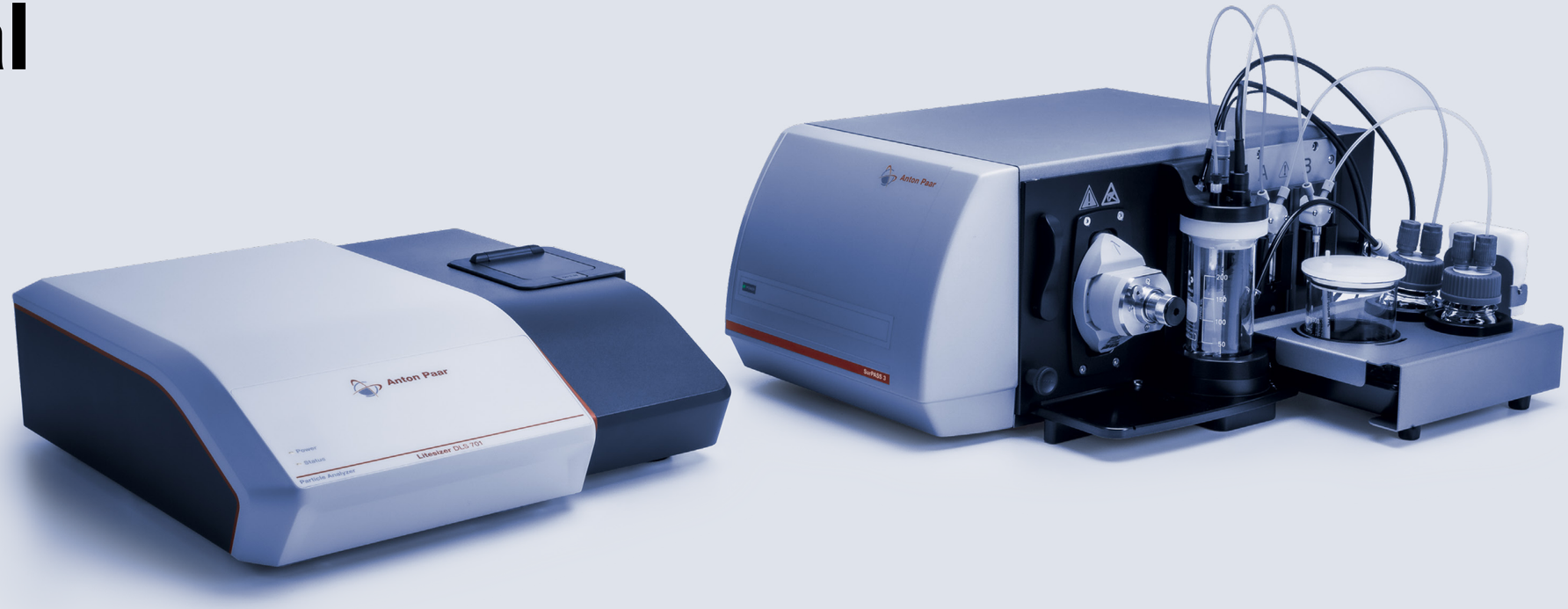
US FDA 21 CFR Part 11
A pharma option with built-in data security functions, user management, and audit trails makes Kalliope fully compliant with the US FDA's 21 CFR Part 11. Comprehensive analytical instrument and system qualification (AISQ) is also available.

Application-specific 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 reliable results.

One software – all instruments
Kalliope is compatible with Anton Paar particle-sizing instruments. From laser diffraction and dynamic image analysis, 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.

See the Full Zeta Potential Picture

From particles in dispersion to real surfaces, Anton Paar offers a complete zeta potential portfolio with Litesizer DLS and SurPASS 3.



Litesizer DLS measures zeta potential in dispersions, while SurPASS 3 reveals zeta potential on real surfaces. Together, they help you understand interactions, optimize products, and reduce development effort.

Where particle and surface insight come together

1. Drug delivery and biomaterials

→ Use Litesizer DLS to optimize nanoparticle carrier stability and SurPASS 3 to assess surface properties linked to adsorption, biocompatibility, or coating performance.

2. Membrane filtration

→ Measure colloidal stability of feed dispersions with Litesizer DLS and monitor membrane fouling, cleaning efficiency, and surface modification with SurPASS 3.

3. Cosmetics and personal care

→ Evaluate emulsion or dispersion stability with Litesizer DLS and quantify treatment effects on hair, fibers, or other relevant surfaces with SurPASS 3.

4. Polymers, coatings, and semiconductors

→ Characterize particle dispersions with Litesizer DLS and verify plasma treatment, coating success, wettability, contamination, or cleaning effectiveness with SurPASS 3.

Particle Characterization Solutions from Anton Paar

Anton Paar offers a comprehensive range of particle characterization instruments to meet the diverse needs of R&D and QC. Each system is engineered for accuracy, ease of use, and long-term reliability.

1. Dynamic light scattering (DLS) – Litesizer DLS Series
Size range: 0.3 nm to 15 µm

Designed for nanoparticle analysis, the Litesizer DLS series goes beyond size and zeta potential measurement with best-in-class performance across multiple parameters.

- → Best-in-class sizing in the nanometer range, plus five additional measurement modes
- → Exclusive cmPALS and Omega Cuvette technology for superior zeta potential accuracy
- → Advanced fluorescence and polarization filters, functional at all detection angles
- → Ultra-low sample volume capability – accurate sizing with as little as 0.8 µL

2. Dynamic image analysis – Litesizer DIA Series
Size range: 0.5 µm to 16,000 µm

When shape matters as much as size, the Litesizer DIA Series offers unparalleled insight into millions of individual particles.

- → Widest range of size and shape analysis
- → High-speed imaging and advanced data filtering
- → Comprehensive suite of size and shape descriptors for each detected particle in powders, granules, and more
- → Time-saving automation and safety features for handling hazardous powders or liquids

3. Laser diffraction – Litesizer DIF Series
Size range: 0.01 µm to 3,500 µm

Ideal for a wide range of particle sizes, the Litesizer DIF Series stands out with robust hardware and intuitive operation.

- → Switching between dry and liquid dispersion in just one move
- → Durable design for lab and production environments
- → Market-leading optical setup with powerful lasers and the widest angle range
- → Optional particle shape analysis add-on

Find out more

Versatility for Industry and Academia

1. Pharmaceuticals
Accurate particle size and shape control, compliant with 21 CFR Part 11, is critical for drug formulation, targeted delivery, and dissolution behavior.

- → Litesizer DLS monitors aggregation, size, and zeta potential in real-time for protein formulations and nanoparticle drug carriers, compliant with USP <729>, supporting automated pH titration for optimal stability
- → Litesizer DIF ensures precise, repeatable size measurements for raw materials, APIs, and final dosage forms, compliant with ISO 13320 and USP <429>
- → Litesizer DIA adds shape characterization, such as sphericity and aspect ratio, essential for understanding excipient processing behavior and optimizing bioavailability

2. Chemicals and advanced materials
In pigments, catalysts, and battery materials, particle properties impact flow, reactivity, and performance.

- → Litesizer DLS tracks particle size, molecular mass, and concentration for polymer dispersions and emulsions, supporting quality control and product development
- → Litesizer DIF quickly analyzes broad size distributions, helping tune slurry behavior and pigment performance
- → Litesizer DIA distinguishes particle morphology (e.g., fiber orientation or agglomerates), revealing functionality in polymers, composites, and ceramics

3. Cement and minerals
Efficient milling and consistent quality in high-tonnage operations depend on particle size monitoring.

- → Litesizer DLS characterizes nano-sized additives and colloidal phases, such as silica fume or specialty admixtures, which enhance cement properties
- → Litesizer DIF is a trusted tool in cement and mineral production, ideal for fast and reliable QC throughout the production process
- → Litesizer DIA detects shape outliers and quantifies fines or oversized particles in processed minerals

4. Food and beverages
Taste, mouthfeel, and solubility depend heavily on particle characteristics.

- → Litesizer DLS monitors particle size and stability in emulsions and suspensions, optimizing texture, appearance, and shelf life
- → Litesizer DIF offers fast, repeatable sizing for raw ingredients, emulsions, and final products
- → Litesizer DIA controls grind shape (e.g., coffee), particle fragmentation, and fines detection, improving extraction, texture, and consumer satisfaction

5. Additive manufacturing and battery materials
Consistent powder flow and packing are crucial for 3D printing and battery electrode manufacturing.

- → Litesizer DLS monitors agglomeration and particle stability in suspensions and slurries, improving dispersion for battery materials
- → Litesizer DIF quantifies size distributions to ensure stable layering and sintering
- → Litesizer DIA assesses sphericity, irregularities, and satellite structures to maximize flowability, packing density, and conductivity

	Litesizer DLS Series
Product compliance	Laser class 1, EN 60825-1:2014 and CDRH, LVD, EMC, RoHS
Light source	Semiconductor laser / 40 mW, 658 nm / 10-year warranty
Detector	Avalanche photodiode (APD)
Temp. control range	0 °C to 120 °C
Operating temp.	10 °C to 35 °C
Humidity	35 % to 80 % non-condensing
Dimensions (WxDxH)	450 mm x 505 mm x 135 mm
Weight	Approx. 18 kg (40 lbs)
Power consumption	50 W

Background Knowledge and Support

Your guide to particle size and zeta potential
Your guide to dynamic and electrophoretic light scattering explains particle size and zeta potential theory, with practical advice on sample preparation, measurement selection, and result interpretation.

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.

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

Our well-trained and certified technicians are ready to keep your instrument running smoothly.
Maximum uptime | Warranty program | Short response times | Global service network

	Litesizer DLS 701	Litesizer DLS 501	Litesizer DLS 301	Litesizer DLS 101
Particle size specifications				
Measurement principle	Dynamic light scattering (DLS)			
Measuring range	0.3 nm to 15 µm* (particle diameter)			0.3 nm to 10 µm* (particle diameter)
Measurement angles	15°, 90°, 175°, Multi-angle particle sizing (MAPS)	15°, 90°, 175°	90°	175°
Min. concentration	0.1 mg/mL (lysozyme) lower than 0.00001 % (0.1 ppm, Latex 100 nm)		1 mg/mL (lysozyme)	0.1 mg/mL (lysozyme)
Max. concentration	50 % w/v*		40 % w/v*	50 % w/v*
Min. sample volume	0.8 µL			12 µL
Accuracy	Better than ±2 % on NIST traceable standards			
Repeatability	Better than ±2 % on NIST traceable standards			
Particle concentration specifications				
Analysis model	Mie Theory	-	-	-
Measuring range	10^8 to 10^{13} particles/mL*	-	-	-
Size limit	1 µm	-	-	-
Measurement angles	15°, 90°, 175°, Multi-angle particle sizing (MAPS)	-	-	-
Min. sample volume	12 µL	-	-	-
Accuracy	±10 %*	-	-	-
Repeatability	±5 %*	-	-	-
Zeta potential specifications				
Measuring principle	Electrophoretic light scattering (ELS) / cmPALS			-
Measuring range	≥±1,000 mV			-
Mobility range	10^{-11} m²/V.s to 2 x 10^{-7} m²/V.s			-
Size range	1.3 nm to 125 µm (diameter)			-
Min. sample concentration	0.1 mg/mL (lysozyme)			-
Max. sample concentration	70 % w/v*			-
Max. sample conductivity	200 mS/cm			-
Min. sample volume	50 µL (sample-viscosity-dependent)			-
Accuracy	Better than ±10 %			-
Repeatability	±3 %			-
Molecular mass specifications				
Measuring principle	Static light scattering (SLS)			-
Measuring range (mass)	300 Da to 20 MDa			-
Measuring range (particle size)	Up to 40 nm (diameter)			-
Measurement angle	90°			-
Min. sample concentration	0.1 mg/mL (lysozyme)			-
Accuracy	±10 %			-
Repeatability	±5 %			-

* Sample-dependent

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