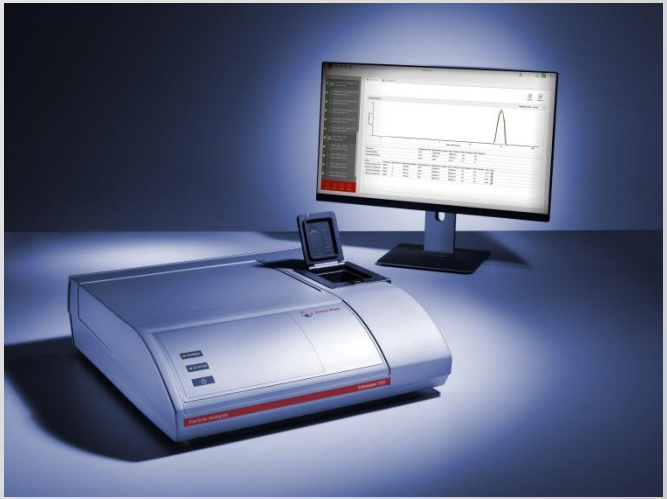
Litesizer 500



The Product: Litesizer™ 500

Measurement Modes

- Particle Size&Distribution
  - Dynamic light scattering (DLS)
- Zeta Potential
  - Electrophoretic light scattering (ELS)
- Molecular Weight
  - Static Light Scattering (SLS) and Debye Plot
- Transmittance

Why use light scattering?

Why measure size, zeta potential and molecular mass with light scattering?

- Light-scattering measurements are mostly non-invasive, simple, fast measurements
- Light-scattering techniques inform about size and stability of particle systems
- Size and stability are crucial to function, processing, transport and storage of particle systems.
- Light scattering can characterize particles in solution, dispersions, and emulsions
- Measure pH, temperature and concentration dependencies of the material
- Aggregation behavior, mono- and polydispersity can be measured

Advancements in Particle Characterization

1. Advanced Algorithms for Particle Size Analysis
2. 3 Angles of Detection
3. cmPALS technology
4. Omega-Shaped Cuvette
5. Transmittance Analysis
6. Maintenance-Free Instrumentation

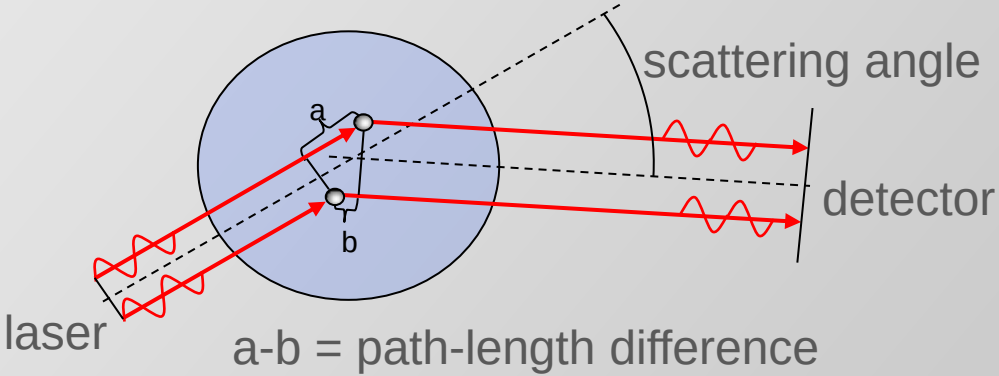
Litesizer 500 - Specifications

Particle Size

Measurement Range	**0.3 nm – 10.0 µm**
Measurement principle	DLS
Accuracy	Better than +/-2% on certified reference material
Repeatability	Better than +/-2% on certified reference material
Sensitivity	0.1 mg/ml (Lysozyme)
Measurement angle	15°, 90°, 175°
Min. Sample Volume	20 µl

Measuring Principle

- Particles dispersed in a liquid undergo Brownian motion.
- Smaller particles move faster, larger particles move more slowly.
- The Litesizer 500 measures the speed of the particle motion by light scattering.



Advancement #1: Algorithms

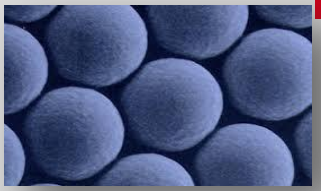
Anton Paar

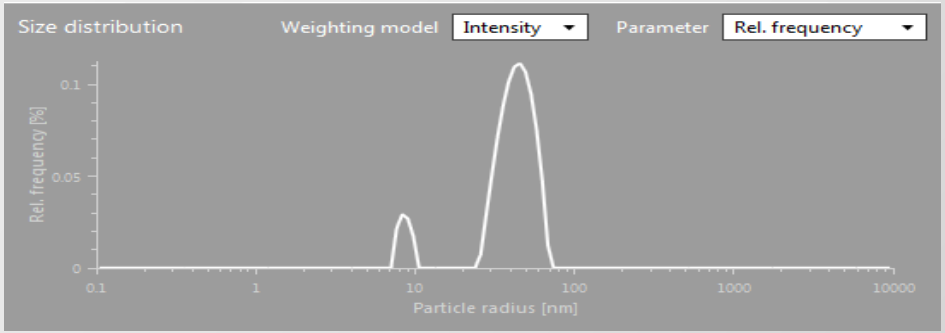
Advanced Algorithms in Size Distribution

- New, highly developed algorithms in the firmware deliver unprecedented resolution in particle size measurements
- The algorithms for assessing particle size distribution have been improved to give greater weight to high quality data and lower weight to noisy or poor quality data
- The overall affect is to improve particle size distribution, increase resolution of mixed particle system and narrow distribution curves

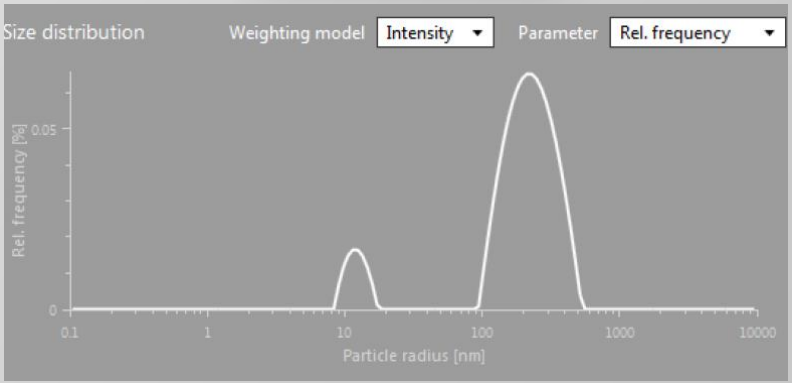
Chemical Industry: Polystyrene latex

- Mixtures of polystyrene latex particles were analyzed by DLS using the improved algorithms



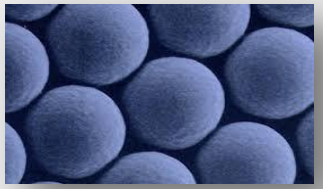


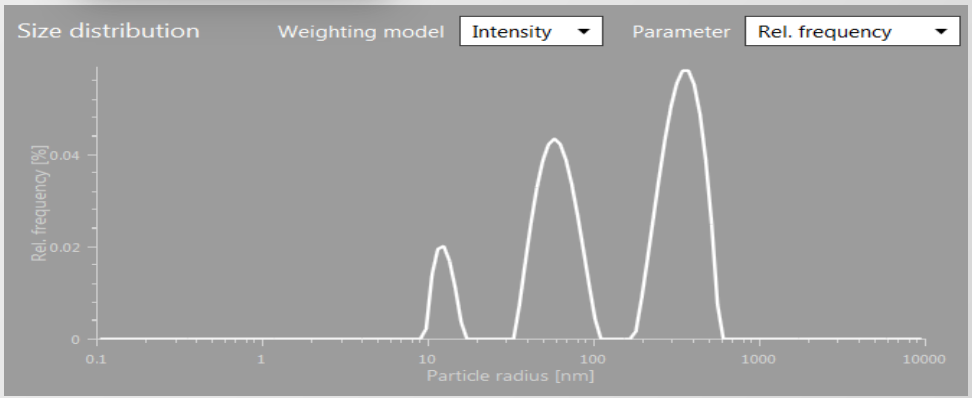
Size distribution of polystyrene latex particles of 22 and 100 nm in a 20:1 ratio



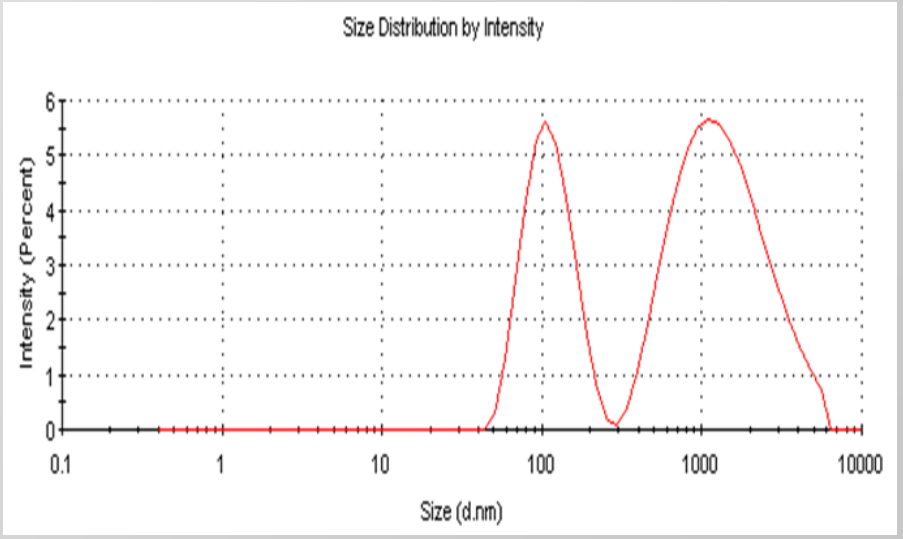
Size distribution of polystyrene latex particles of radius 22 and 500 nm in a 4:1 ratio

Chemical Industry: Polystyrene latex





Size distribution of a tridisperse polystyrene latex sample containing particles of 22, 100 and 700 nm in the ratio 9:3:1



Identical particle mixture but analyzed without advanced algorithms

Advancement #2: Comprehensive Characterization

3 particle size detection angles in one instrument, automatic or manual choice of angle.

Forward 15°: For small particles with a few big particles

Side, 90°: For weakly scattering dispersions of small particles

Back, 175°: For strongly scattering dispersions of large particles, turbid samples

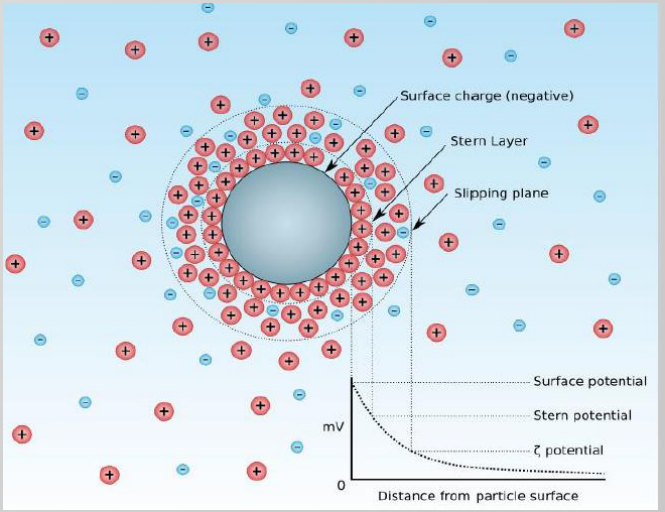
Litesizer 500 - Specifications

▸ Zeta Potential

Measuring range	**-600 to +600 mV**
Measurement principle	Electrophoretic light scattering
Accuracy	0.12 µm.cm/V.s for aqueous systems using NIST SRM1980 standard reference material
Sensitivity	1 mg/ml (Lysozyme)
Measurement angle	15°
Sample volume	350 µl
Measuring size range	3.8 nm – 100 µm

What is the Relevance of Zeta Potential?

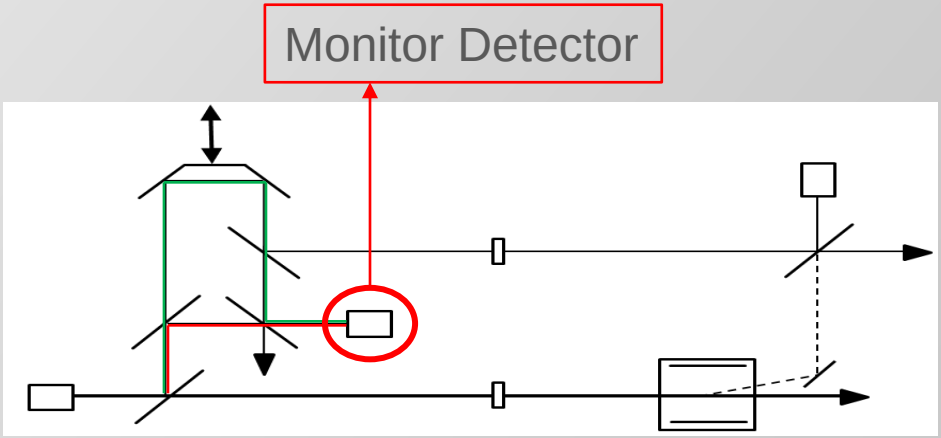
- Zeta potential is related to the stability of particle and colloid suspensions
  - The greater the absolute zeta potential the more the particles repel each other
  - A small absolute zeta potential may contribute to aggregation
- Zeta potential analysis is key in applications including formulation, stability, dispersion, flocculation and aggregation processes
- Zeta potential cannot be measured directly, it is instead calculated from the electrophoretic mobility (μ)



Advancement #3: cmPALS

- The patented cmPALS method is a further development of the classical PALS method

- An additional modulator monitor is implemented, which can exactly determine the Doppler shift caused by the modulator

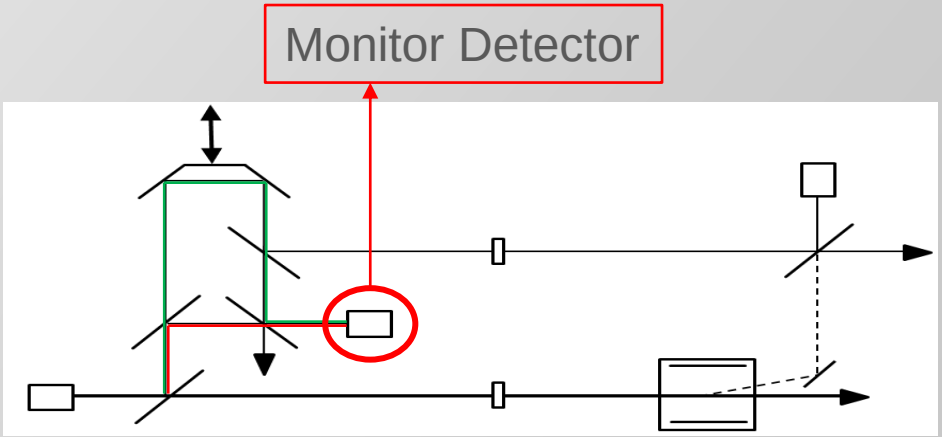


- The result is enhanced sensitivity and stability of the measurement which enables faster measurements and with lower potentials – to avoid degrading the sample

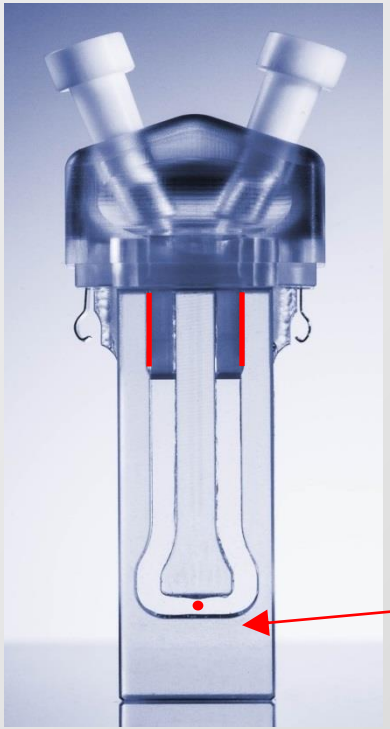
cmPALS Continued

The new cmPALS technology and algorithms from Anton Paar are specifically designed to enable:

- Detection of protein aggregates at high protein concentrations
- Sensitive, stable and reproducible measurements
- Analysis at lower potentials and faster measurement speeds to limit protein degradation

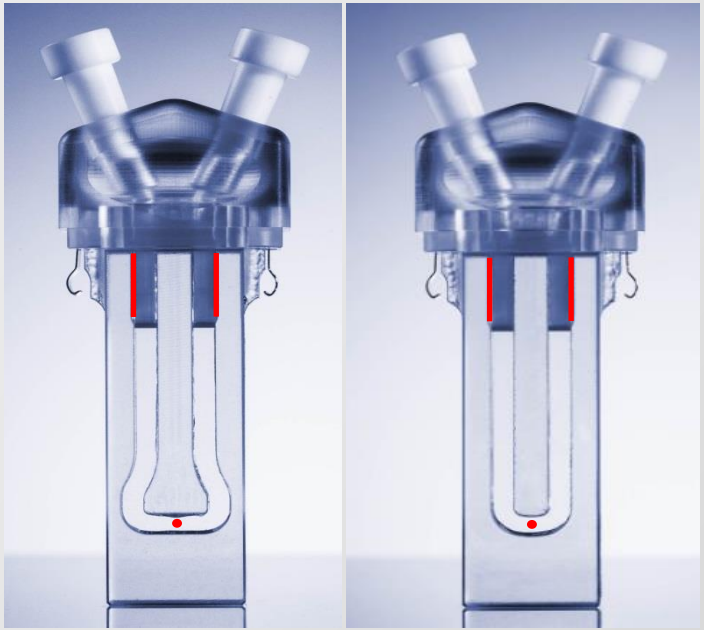


Advancement #4: The Omega Cuvette



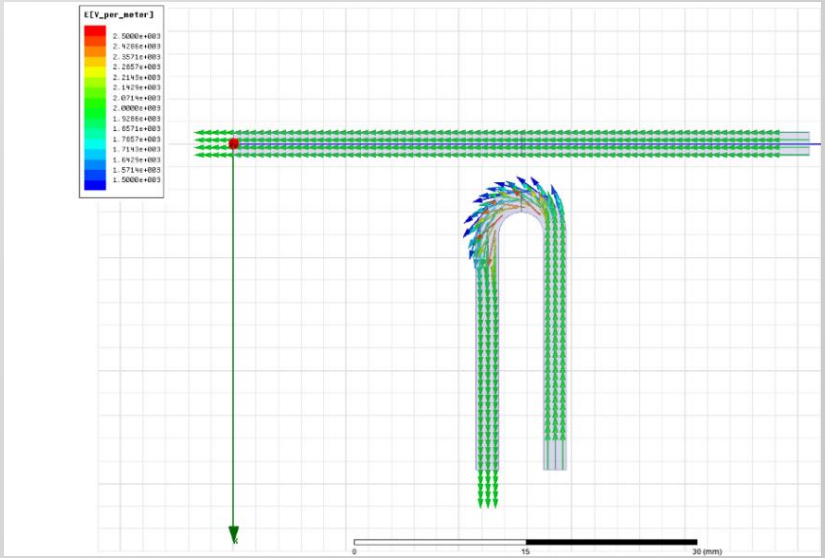
- Due to the straight part of the Omega shape there are no gradients of electric field within sample channel
- Electric field can be applied as the electrodes are in contact with the sample
- Cell fits into the standard Litesizer sample holder
- Offers the possibility to be used in flow through mode for use with dosing unit
- Made of an inert cell material (polycarbonate)
- Can test both zeta potential and size (forward scattering) in Omega cuvette

Omega shape cuvette



Omega-shaped

U-shaped



Litesizer 500 - Specifications

▸ Molecular Mass

Measurement Range	**1 KDa – 20 MDa**
Measurement Principle	Static light scattering using Debye plot
Sensitivity	0.1 mg/ml (lysozyme)
Accuracy	+/- 10%
Measurement angle	90°

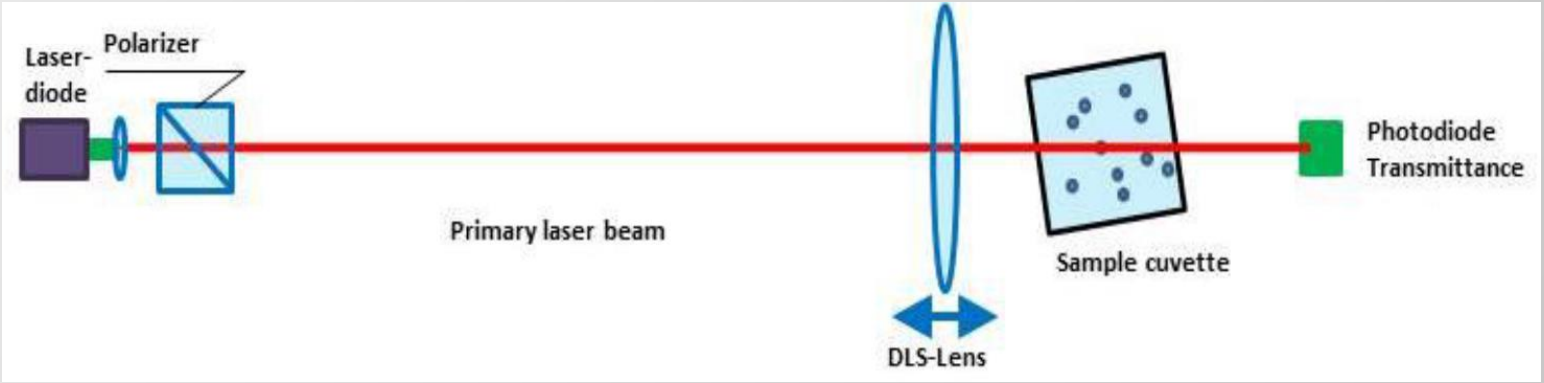
Advancement #5: Transmittance Analysis

Anton Paar

• In turbid samples, DLS measurements can be affected by multiple scattering events which lead to inaccurate results

• Transmittance analysis offers additional information about the sample such as turbidity, aggregation, dilution requirements, etc.

• Transmittance data is used by the instrument to auto-determine optimal settings for the measurement such as focus, filter position and measurement angle



Litesizer 500 - Specifications

- Transmittance

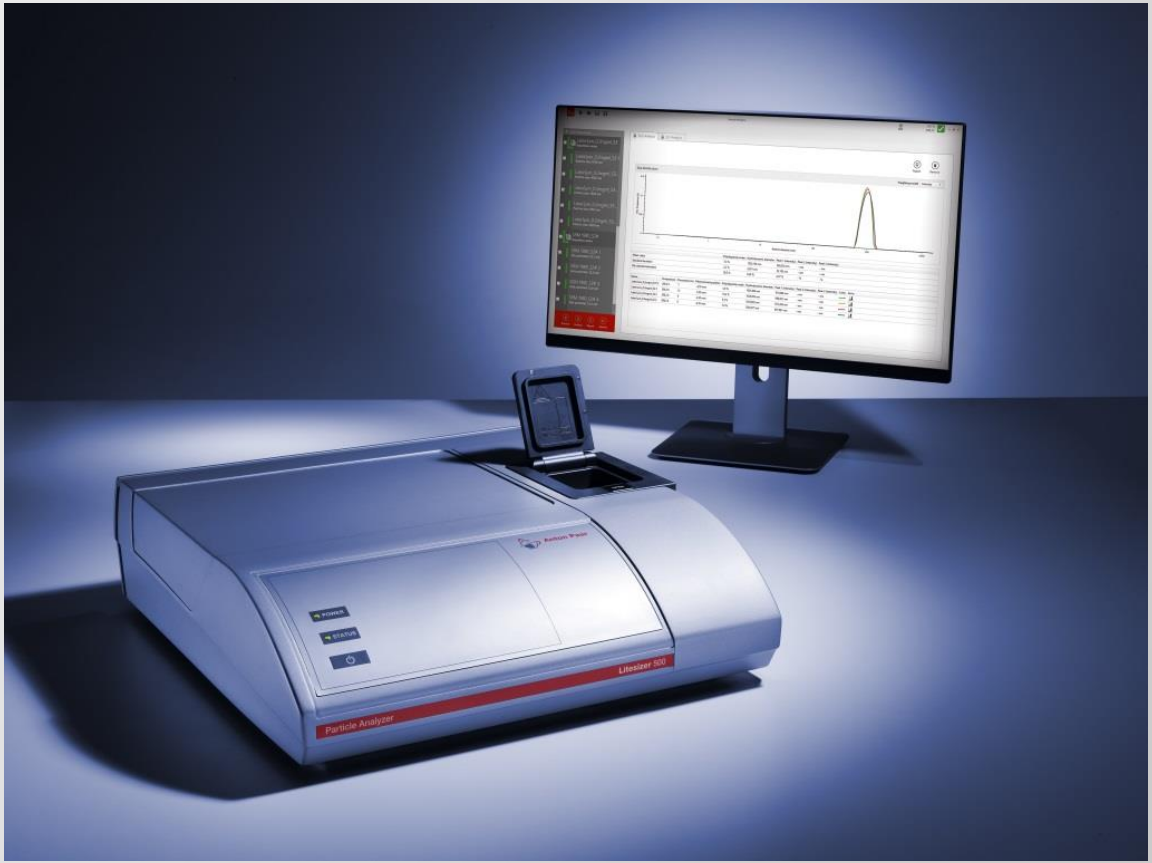
Size range	**No limit**
Measuring time	10 s
Min. Sample Volume	20 µl

Advancement #6: Maintenance-Free Optical Bench

Maintenance-free closed optical bench provides protection from dust, temperature, and vibrations throughout the lifetime of the instrument.

- No regular preventative maintenance required
- Keeps your system up and running when you need it most
- Saves your lab funding: No annual maintenance visit costs

Software Kalliope



Software Kalliope

- User friendly software – modern 1-page workflow
- Measure in series – particle change over time, pH, temperature, concentration, etc.
- Automatic measurement modes – system auto-selects optimal parameters such as focus, filter and angle based on transmittance data
- Software works without an instrument so you can prepare and analyze experiments where and when it’s convenient
- Exports directly to Excel or PDF so you can manipulate your data and share with others easily
- CFR11 Part 21 Compliant

Litesizer 500 - Specifications

General Specifications

Size range	**No limit**
Temp. control range	0 °C to 90 °C
Light source	Semiconductor laser / 40 mW, 658 nm
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)

Summary

1. Advanced Algorithms for Particle Size Analysis
2. 3 Angles of Detection
3. cmPALS technology
4. Omega-Shaped Cuvette
5. Transmittance Analysis
6. Maintenance-Free Instrumentation