BECKMAN COULTER

The solution for all of your nanoparticle sizing and zeta potential needs.

DelsaNano Series

Blood Banking
Capillary Electrophoresis
Cell Analysis
Centrifugation
Genomics
Lab Automation
Lab Tools
Particle Characterization

BR-11313B

DelsaNano – Your Solution to Nanoparticle Sizing and Zeta Potential Measurements

The DelsaNano utilizes photon correlation spectroscopy and electrophoretic light scattering techniques to determine particle size and zeta potential of materials including flat surfaces. Offering an excellent degree of accuracy, resolution and reproducibility, the DelsaNano has been designed to simplify your submicron particle size and zeta potential analyses.

Whether in a QC environment or research and development, the DelsaNano provides the solutions necessary to obtain results fast and accurately.

The Challenges	The Solutions
Determine electrophoretic mobility and zeta potential of concentrated samples	Patented Forward Scattering through Transparent Electrode (FST) method
Evaluate surface charge of solid flat surfaces by electrophoretic light scattering	Unique electroosmotic probing technology
Determine size distributions of particles that scatter light weakly	The highly sensitive DelsaNano HC

Designed with the user in mind – easy and simple, yet so complete.

DelsaNano Series –

Power, Flexibility and Simplicity

DelsaNano C

Offers particle size and zeta potential analyses with high accuracy and resolution.

Features:

- Size range from 0.6 nm to 7 µm
- Size range for zeta potential measurement from 0.6 nm to 30 µm
- Sample concentration ranging from 10 ppm to 40%*
- Dual 30 mW laser separately for size and zeta potential measurements
- Three scattering angles for more complete information
- Two correlators either in log or linear scale for greater accuracy and resolution
- Size and zeta potential analyses in the *same* sample cell
- Zeta potential of flat surfaces
- Autotitration ready for suspensions and flat surfaces

Applications:

- ✓ *Shelf life studies*
- ✓ *Pharmaceuticals*
- ✓ *Food & beverage*
- ✓ *Semiconductors*
- ✓ *Emulsion stability*
- ✓ *Textiles & fabrics*
- ✓ *Formulation stability*
- ✓ *Biotechnology*

DelsaNano HC

Offers higher sensitivity and better capability for small particles and weak scatterers, in addition to the same features as offered by DelsaNano C.

- Size range from 0.6 nm to 7 µm
- Size range for zeta potential measurement from 0.6 nm to 30 µm
- Sample concentration ranging from 1 ppm to 40%*

Additional Applications:

- ✓ *Small particles*
- ✓ *Weak scatterers*

DelsaNano S

Offers accurate, reliable and repeatable particle size analysis, time after time.

Features:

- Size range from 0.6 nm to 7 µm
- Sample concentration ranging from 10 ppm to 40%*
- Single 30 mW laser
- Two correlators either in log or linear scale for greater accuracy and resolution

Applications:

- ✓ *Nanoparticles*
- ✓ *Pharmaceuticals*
- ✓ *Inks*
- ✓ *Food & beverage*
- ✓ *Biotechnology*

DelsaNano Z

Offers accurate, reliable and repeatable zeta potential analysis covering a wide sample concentration range.

Features:

- Size range for zeta potential measurement from 0.6 nm to 30 µm
- Sample concentration ranging from 10 ppm to 40%*
- Single 30 mW laser
- Two scattering angles for more complete information
- Zeta potential of flat surfaces
- Autotitration ready for suspensions and flat surfaces

Applications:

- ✓ *Shelf life studies*
- ✓ *Emulsion stability*
- ✓ *Food & beverage*
- ✓ *Textiles & fabrics*
- ✓ *Formulation stability*

*Sample dependent

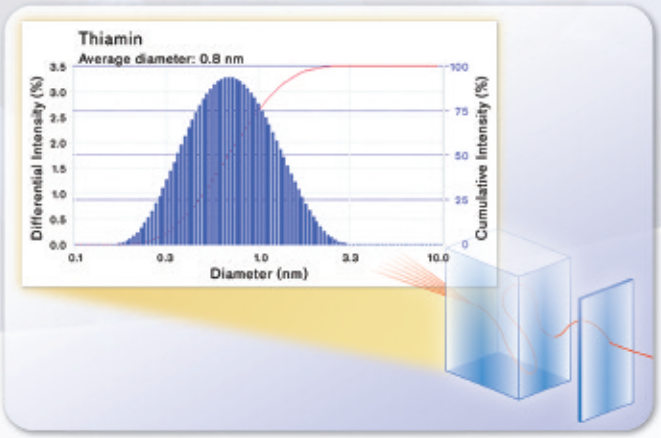
Theory and Function

Photon Correlation Spectroscopy

Photon correlation spectroscopy is a technique used to determine the diffusion coefficient of small particles in fluid. The coefficient is determined by accurately measuring the light scattering intensity of the particles as a function of time.

Measurement Process

As the particles of interest diffuse within the sample cell due to Brownian motion, an incident beam of laser light illuminates the particles. The particles scatter the light, producing fluctuations in the scattering intensity as a function of time. The scattered light is collected at a chosen angle, and is measured by a highly sensitive detector. Since the diffusion rate of particles is determined by their size, information about their size is contained in the rate of fluctuation of the scattered light. So, by correlating the fluctuation, we can determine the particle size distribution of the population present.

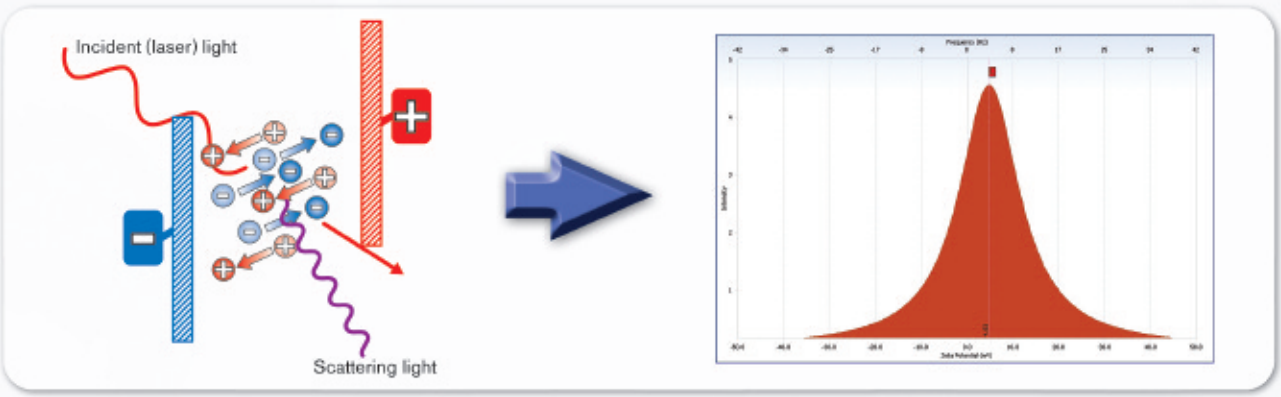


Electrophoretic Light Scattering

Electrophoretic light scattering is the method most popularly used to determine the velocity of the particles suspended in a fluid medium under an applied electric field. In order to determine the speed of the particles' movement, the particles are irradiated with a laser light and the scattered light emitted from the particles is detected. Since the frequency of the scattered light is shifted from the incident light in proportion to the speed of the particles' movement, the electrophoretic mobility of the particles can be measured from the frequency shift (Doppler shift) of the scattered light.

Measurement Process

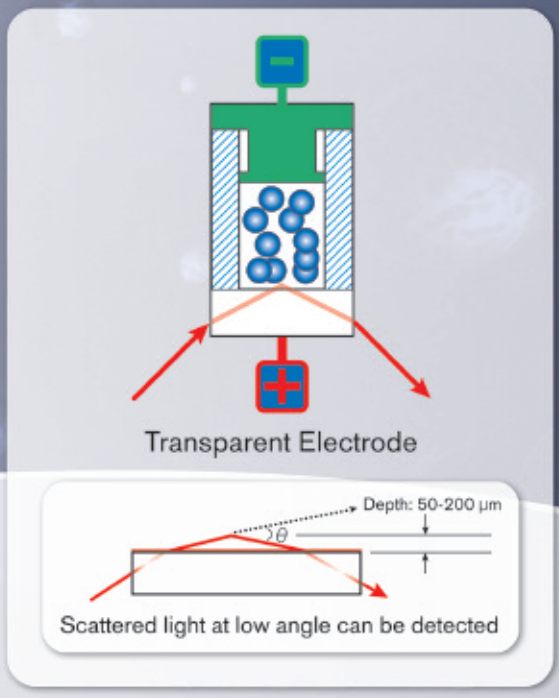
When an electric field is applied to charged particles in the suspension, particles move toward an electrode opposite to their surface charge. Since the velocity is proportional to the amount of charge of the particles, zeta potential can be estimated by measuring the velocity of the particles.



Major Features

Zeta Potential of Concentrated Samples

Electrophoretic light scattering measurements on concentrated samples are now available, thanks to the DelsaNano patented Forward Scattering through Transparent Electrode Technology (FST). This method detects the scattered light from particles through a transparent electrode at a 30° scattering angle by using a short optical path that reduces effects due to multiple scattering with very high accuracy.



Get a true zeta potential without the need to dilute your sample.

One of the Widest Concentration Ranges

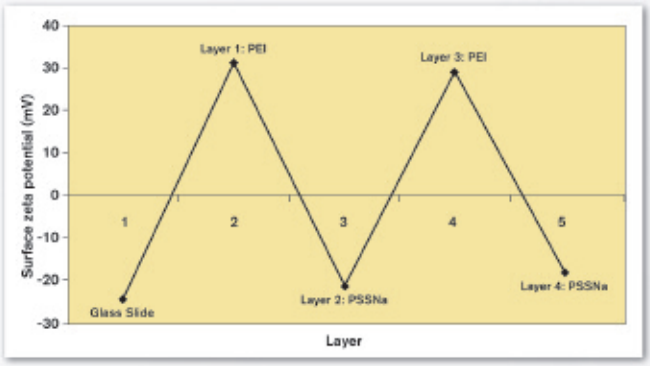
The DelsaNano is capable of analyzing samples with concentrations ranging from 1 ppm to 40% (sample dependent), for both particle size and zeta potential.

Zeta Potential of Flat Samples

Novel method to measure the zeta potential of flat surfaces like films, fibers, etc. using probing particles.

Advantages:

- Measures electrostatic interactions between particles and flat surfaces
- Two zeta potentials (particles and flat surface) in one click
- Zeta potential vs. pH/additive volume also available
- Simple, easy and straight forward technique



Zeta potential of glass slide coated with PEI and PSSNa polyelectrolytes layer by layer (LBL) alternatively.

Applications:

- ✓ *Fibers & textiles*
- ✓ *Thin films*
- ✓ *Shampoo & conditioner industry*
- ✓ *Membranes & filters*
- ✓ *Biological surfaces & biomaterials*
- ✓ *Semiconductor industry*
- ✓ *Polymer surfaces & coatings*
- ✓ *Optical glass polishing*
- ✓ *Protein adsorption studies*
- ✓ *Printing & paint industry*
- ✓ *Paper & pulp industry*
- ✓ *Antimicrobial surfaces*
- ✓ *Packaging materials*
- ✓ *Recording media*
- ✓ *Leaves*

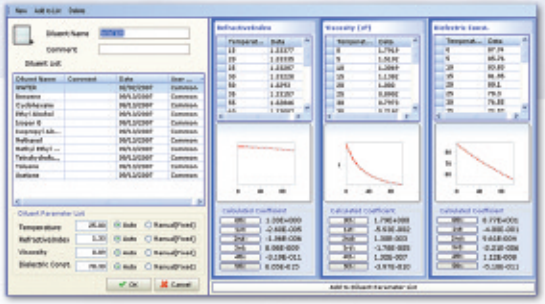
Software – Flexible and Easy to Use

Standard Operating Procedures - SOP - Your Smart Solution for Consistent Results Run-after-Run

- Perform analysis as easy as 1-2-3:
  1. *Load your sample*
  2. *Create or select an SOP*
  3. *Start your analysis and view your results*
- Get accurate results time-after-time from different operators and/or instruments

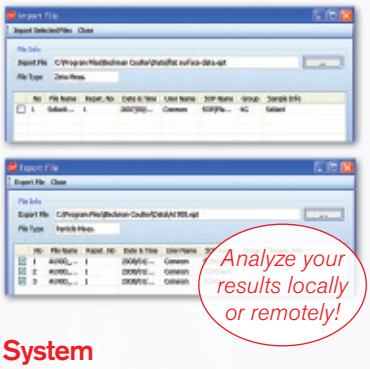
Editable Diluent Tables

- Manage your diluents with the editable diluents table
- Let the software do the work for you. Input just two values for each diluent parameter and the software will automatically determine the rest for you.



Flexible Data Export and Import

Provides you with the flexibility to share your results with your colleagues. All data may be exported and later imported.

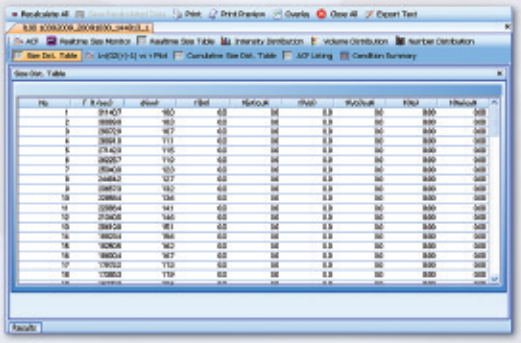


Configurable Security System

Choose from three levels of security: no security, security or 21 CFR Part 11. By selecting the 21 CFR Part 11 option, the system automatically reconfigures to comply with the FDA regulation.

Accessible Raw Data

Raw data is accessible during and after measurements. Analyze your sample raw data any time post measurement.

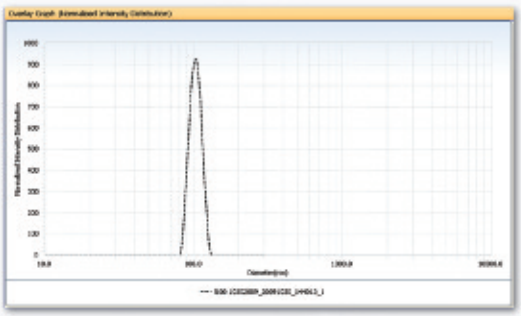


Multimodal Size and Zeta Potential Analysis Methods

Specialized analysis methods for multimodal size distributions and zeta potential/electrophoretic mobility distributions.

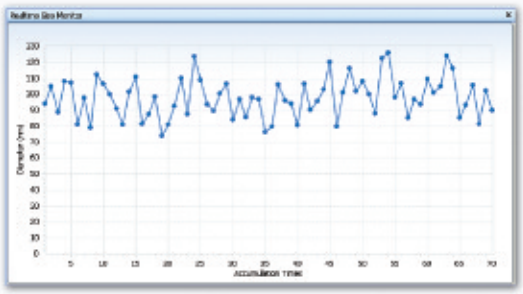
Normalized Size Distribution Data According to ISO 22412*

The software automatically plots the normalized data according to ISO 22412.



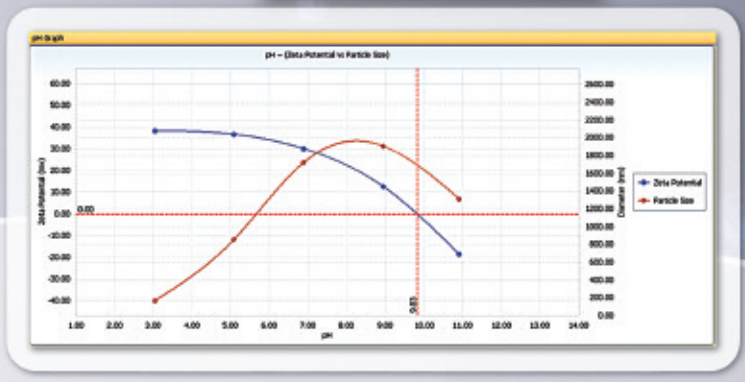
Real-time Sizing Data

Monitor your sample stability using real-time size plots.



*ISO 22412 is the International Organization for Standardization publication on particle size analysis – Dynamic Light Scattering (DLS)

DelsaNano Accessories



DelsaNano AT Autotitrator

The DelsaNano AT is an optional accessory used with the DelsaNano to titrate sample suspensions in a pH range from 1 to 13. It automatically controls the pH of solutions and performs titrations during zeta potential or size analysis measurements.

- Walk away operation
- Automatically determines iso-electric point
- All settings of the titration and measurement controlled by the software via standard operating procedures (SOP)
- Reports and graphs automatically generated
- Plot size and zeta potential vs. pH value and additive volume

Optional Cells

DelsaNano Series are compatible with a variety of cells for measuring size and zeta potential of particles in fluid suspensions including the zeta potential of flat samples. Below is table listing all cells and their major benefits.

Cell Compatibility with DelsaNano Models	S	C	Z	HC
Micro Volume Size Cell (Quartz)	✓	✓	✗	✓
Size Cell (Glass)	✓	✓	✗	✓
Disposable Size Cell	✓	✓	✗	✓
Flow Cell	✗	✓	✓	✓
Disposable Zeta Cell	✗	✓	✓	✓
High Concentration Zeta Cell	✗	✓	✓	✓
Flat Surface Cell	✗	✓	✓	✓
Low Conductivity Zeta Cell	✗	✓	✓	✓

Cell	Function	Major Benefits	Part Number*
Micro Volume Size Cell (Quartz)	Particle size in aqueous suspensions and organic solvents	Quartz cuvette for enhanced signal; Handles low volume samples down to 30 µL	A54094
Size Cell (Glass)	Particle size in aqueous suspensions and organic solvents	Glass cuvette for enhanced signal; Reusable	A54092
Disposable Size Cell	Particle size in aqueous suspensions	Disposable	A54093
Flow Cell	Particle size and zeta potential in aqueous suspensions	Measures both size and zeta potential in the same cell without the need to remove the sample; Compatible with DelsaNano Autotitrator	A54114
Disposable Zeta Cell	Zeta potential of particles in aqueous suspensions	Disposable sample holder; Reusable electrodes	A54118
High Concentration Zeta Cell	Zeta potential of particles in aqueous suspensions	Handles high concentration samples up to 40% (sample dependent)	A54116
Flat Surface Cell	Zeta potential of flat surfaces	Measures zeta potential of flat surfaces and particles in one click; Compatible with DelsaNano Autotitrator	A54117
Low Conductivity Zeta Cell	Zeta potential of particles in organic solvents	Specially designed for handling organic solvent based samples; Easy to clean and reusable	A54119

*Cell assembly

	DelsaNano C	DelsaNano S	DelsaNano HC	DelsaNano Z
Function	Size and zeta potential measurement of particles in fluid suspensions; Zeta potential measurement of flat surfaces	Size measurement of particles in fluid suspensions	High sensitivity sizing and zeta potential measurement of particles in fluid suspensions; Zeta potential measurement of flat surfaces	Zeta potential measurement of particles in fluid suspensions; Zeta potential measurement of flat surfaces
Principle	Photon correlation spectroscopy and Electrophoretic light scattering	Photon correlation spectroscopy	Photon correlation spectroscopy and Electrophoretic light scattering	Electrophoretic light scattering
Size Analysis Methods	CONTIN, NNLS and Marquardt including Cumulants diameter	CONTIN, NNLS and Marquardt including Cumulants diameter	CONTIN, NNLS and Marquardt including Cumulants diameter	NA
Zeta Potential Analysis Modes	Smolochowski, Huckel and Other	NA	Smolochowski, Huckel and Other	Smolochowski, Huckel and Other
Measurement Range	Size: 0.6 nm-7 µm Molecular Weight: 10^3 - 3 × 10^7 Daltons Size Range for Zeta Potential: 0.6 nm - 30 µm Electrophoretic Mobility: ± 1.2 × 10^{-3} $cm^2/V.s$ Zeta Potential: ± 200 mV Voltage Range: 0-300 V	Size: 0.6 nm-7 µm Molecular Weight: 10^3 - 3 × 10^7 Daltons	Size: 0.6 nm-7 µm Molecular Weight: 10^3 - 3 × 10^7 Daltons Size Range for Zeta Potential: 0.6 nm - 30 µm Electrophoretic Mobility: ± 1.2 × 10^{-3} $cm^2/V.s$ Zeta Potential: ± 200 mV Voltage Range: 0-300 V	Size Range for Zeta Potential: 0.6 nm - 30 µm Electrophoretic Mobility: ± 1.2 × 10^{-3} $cm^2/V.s$ Zeta Potential: ± 200 mV Voltage Range: 0-300 V
Sample Concentration*	10 ppm to 40%	10 ppm to 40%	1 ppm to 40%	10 ppm to 40%
Conductivity Range	Up to 200 mS/cm	NA	Up to 200 mS/cm	Up to 200 mS/cm
Minimum Sample Volume	Size: 30 µL Zeta Potential: 0.7 mL	Size: 30 µL	Size: 30 µL Zeta Potential: 0.7 mL	Zeta Potential: 0.7 mL
Voltage Mode	Auto or Fixed	NA	Auto or Fixed	Auto or Fixed
Correlator (s)	Two; Time domain and time of arrival; Maximum of 1,000,000 equivalent channels	Two; Time domain and time of arrival; Maximum of 1,000,000 equivalent channels	Two; Time domain and time of arrival; Maximum of 1,000,000 equivalent channels	Time domain
Scattering Angle (s)	Size: 15°, 165° Zeta Potential: 15°, 30°	Size: 165°	Size: 15°, 165° Zeta Potential: 15°, 30°	Zeta Potential: 15°, 30°
Light Source	Dual 30 mW laser diodes, 658 nm	Single 30 mW laser diode, 658 nm	Dual 30 mW laser diodes, 658 nm	Single 30 mW laser diode, 658 nm
Detector	PMT	PMT	PMT	PMT
Temperature Range	15°C below ambient to 90°C	15°C below ambient to 90°C	15°C below ambient to 90°C	15°C below ambient to 90°C
Dimensions (W x D x H)	380 mm x 550 mm x 212 mm (15 in x 21.7 in x 8.3 in)	380 mm x 550 mm x 212 mm (15 in x 21.7 in x 8.3 in)	380 mm x 550 mm x 212 mm (15 in x 21.7 in x 8.3 in)	380 mm x 550 mm x 212 mm (15 in x 21.7 in x 8.3 in)
Weight	21 kg (46.3 lb)	20 kg (44.1 lb)	21 kg (46.3 lb)	21 kg (46.3 lb)

*Sample dependent

	DelsaNano AT
Number of Titrants	Maximum of three
Titrant Volume	Standard glass vials: 50 mL Plastic vials: 50 mL
Sample Volume	Minimum: 30 mL Maximum: less than 50 mL for standard vial
Titrant Dispense Volume	Minimum: 0.1 µL
Circulation Flow Rate	10 - 40 mL/min
Maximum Number of pH Settings	100
pH Probe	Fast response liquid filled glass combination electrode
pH Range	1 - 13
pH Calibration	User defineable up to three points
Sample Stirrer	Magnetic
Dimensions (W x D x H)	250 mm x 310 mm x 290 mm 9.8 in x 12.2 in x 11.4 in
Weight	7.5 kg (16.5 lb)

For more information on our Particle Characterization products, please visit us at www.CoulterCounter.com

Visit our online store at:
www.beckmancoulter.com/eStore

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