Brookhaven Instruments Corporation

NanoBrook Family

Experts in Particle Characterization

Cutting-Edge Solutions for Particle Size and Zeta Potential Analysis

BETATEK INC.
Instrumentation Superbly Supported
L'instrumentation à son meilleur

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Why Choose Brookhaven Instruments?

With over 40 years of expertise in particle characterization, Brookhaven Instruments was founded by academics to support researchers with innovative, high-quality solutions.

What Sets Us Apart

Comprehensive Support

From pre-sales consultation and sample analysis to post-sales technical support, installation, and training, we offer personalized, flexible assistance tailored to each customer's needs.

Expert Team

Our scientifically trained sales teams, application and technical support staff, and R&D professionals provide individual attention to each of our customers to ensure the success of every project.

Proven Excellence

Trusted since 1982, our innovative products such as the Goniometer, PALS, and Correlator have been used by leading institutions, including national labs and top universities.

Made in the USA

We manufacture our equipment domestically, ensuring short lead times and fast delivery of instruments and parts.

Focus on Light Scattering

We are experts, dedicated solely to developing advanced light scattering equipment.

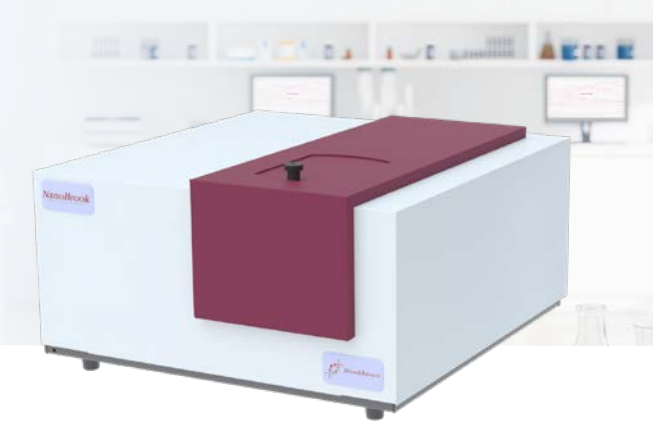
Open Architecture

Our systems are upgradable, offering long-term value and flexibility.

Customer Loyalty Program

Your purchase retains value through our loyalty program, offering ongoing benefits.

Brookhaven Instruments is committed to solving the unique challenges of particle analysis through collaboration and innovation, with a customer-first approach at every step.



Applications

Our products measure a variety of properties related to particle characterization. We also offer custom solutions to meet unique testing requirements

Destabilization

Markets: Water Treatment, Pulp & Paper, Mining, Fracking

Particle destabilization occurs when the surface charge of particle is lowered to a point that there is no repulsion and the particles tend to aggregate.

Stabilization

Markets: Cosmetics, Paints and Pigments, Textiles, Agriculture, Food and Beverage, Pharmaceuticals

Particle stabilization is essential for the formation of uniform particle size distributions that are required for many markets.

Encapsulation

Markets: Cosmetics, Paints, Textiles, Pesticides, Food, Batteries, Pharmaceuticals

Encapsulation, a technique used in various markets, is when a substance is enclosed within another material. There are various purposes for this, including protecting the entrapped substance from external factors.

Ball Milling

Markets: Paints, Coatings, Food, Batteries, Cosmetics, Ceramics, Pharmaceuticals

Ball milling is a process in which materials are mechanically ground into smaller particles.

Protein Engineering

Markets: Biopharmaceuticals, Biomaterials, Vaccines, Agriculture

Proteins can be modified by changing the amino acid sequence. This is done to produce proteins for specific applications or to enhance protein functionality.

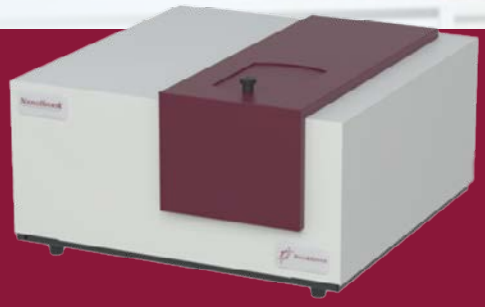
Polymer Engineering

Markets: Biopharmaceuticals, Biomaterials, Biofuels, Vaccines, Imaging, Agriculture and Environment

Polymer engineering is a vital tool across many markets for the production of polymers with various functionalities.

NanoBrook
Rapid, Reliable, and Accurate Analysis

Characterizing proteins, nanoparticles, and polymers confronts the user with a difficult choice of instrumentation.



Brookhaven Instruments makes that choice easier with the NanoBrook Series of instruments.

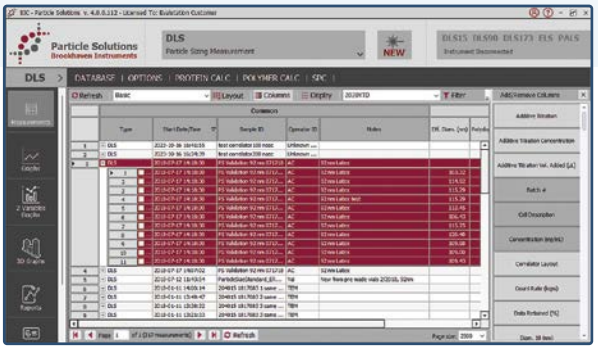
Choose from particle sizing including different detection angles, zeta potential by either ELS and/or PALS, or a combinations of both. Models that measure particle size also can measure molecular weight of small polymers and proteins.

- **Dynamic Light Scattering (DLS) Range:** <0.3 to 10 µm.
- **BIC Turbocorr digital correlator**
- **Adjustable Correlator Layout** for full control over the autocorrelation function
- **Rapid and accurate nanoparticle size distributions**
- **Zeta Potential by PALS** that is 1,000 time more sensitive making it ideal for low mobility particles whether due to high salt, organic solvents, or viscous media.
- **High-powered 40 mW** temperature-controlled semiconductor laser
- **Active temperature control** from -5° C to 110° C
- **21CFR Part 11** Compliant Software available

Particle Solutions Software

Advanced software solutions for data analysis and reporting

See the Data That You Want



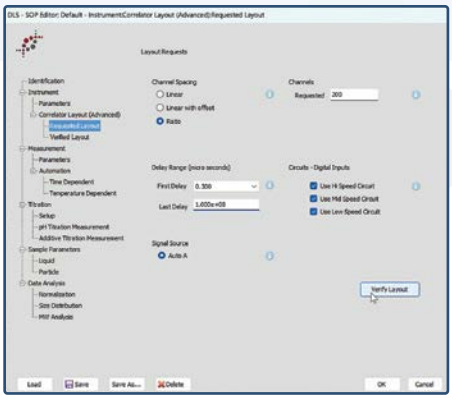
The data grid is completely customizable and includes a number of different standard display options. New column layouts can be saved as presets, and easily recalled. A wide range of column selections are available including count rate, diameter, PDI, and a host of others.

Particle Solutions v4.0 allows the import of data from previous versions of Particle Solutions, as well as from select legacy products, imported data can be given custom labels allowing for easy recall. Filtering options are available to sort data by date, column or tag label. Customized filters can also be saved as presets.

Customizable Correlator Layout

A unique feature found in Particle Solutions V4.0 that is not found in other DLS instrumentation is the ability to create custom correlator layouts.

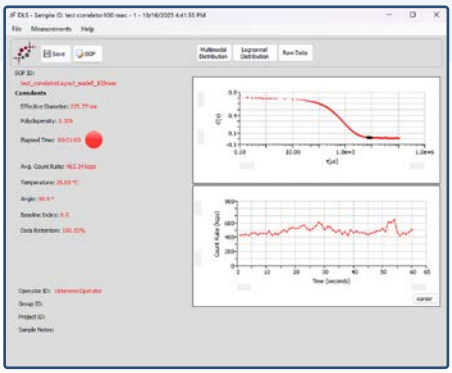
The ability to modify the channel spacing, number of channels, and the first and last delay is especially useful with samples that have a very slow decay rate due to very low mobility whether due to size of the particle or viscosity of the diluent used in sample preparation.



Measurement Review Flexibility

The multimodal and lognormal distributions can all be viewed with Intensity, Volume, Surface Area, or Number weighting applied.

The “Raw Data” view shows the normalized autocorrelation function, as well as count rate history. The baseline index and data retention rate is also displayed in this view. The baseline index is useful in interpreting the quality of the data, whereas the data retention rate can be used to infer the effectiveness of the dust rejection algorithm. Points discarded by the dust filter are identified in the graph of the count rate history.



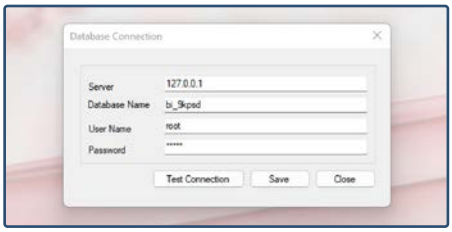
Optional 21CFR Part 11 Compliant Software

Password Protected User Account Profiles

Account profiles are created based on the role of the user. Privileges vary by profile and options include Administrator, Supervisor, and Operator roles. The user account is password protected using standard alphanumeric with a special character requirement. The password can be set to expire at any date in the future or disabled. A period of time of user inactivity can be set to automatically log the user out to prevent accidental measurements by a different user.

Remote Database Connection

The software application allows for the ability of a user to access the database from a remote workstation within the organization by entering the network path and credentials to the server with the database files. The ability to test the connection allows for quick diagnostics.



Principles of Operation

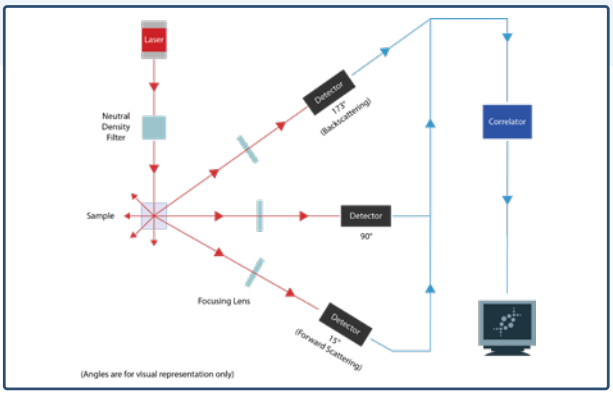
Particle Size

The NanoBrook family of instrumentation has models that measure Particle Size by the use of Dynamic Light Scattering (DLS) also referred to as Quasi-Elastic Light Scattering or Photo-Correlation Spectroscopy.

With DLS there is a laser light source, at a specific wavelength, that passes through a sample with particles that will scatter light. The light scattered is then collected by a detector. All NanoBrooks that measure particle size have a 90° detection angle. Additional detection angles are available including at 15° and 173°.

DLS relies on the fact that freely diffusing particles, moving randomly due to Brownian motion, will produce fluctuations in scattered laser light. These fluctuations are rapid, on the order of tens of nanoseconds to hundreds of milliseconds, and are directly related to the motion of particles.

The signal collected is transformed into an autocorrelation function to give either a simple mean size and polydispersity or more complete distribution data even for multimodal distributions.



- **Aggregate Detection with 15° DLS**
  The 15° detection angle can be used to detect the presence of even small quantities of aggregated materials due to its heightened sensitivity to large particles
- **Particle Sizing with 90° scattering**
  Measurements of traditional colloids are typically made at 90° scattering angle due to the unbiased results measured.
- **Backscattering with 173°**
  For nanoparticles and proteins, IgG and peptides, these < 50 nm samples can be measured using the backscattering angle (173°) for best signal to noise and reproducibility of measurements.

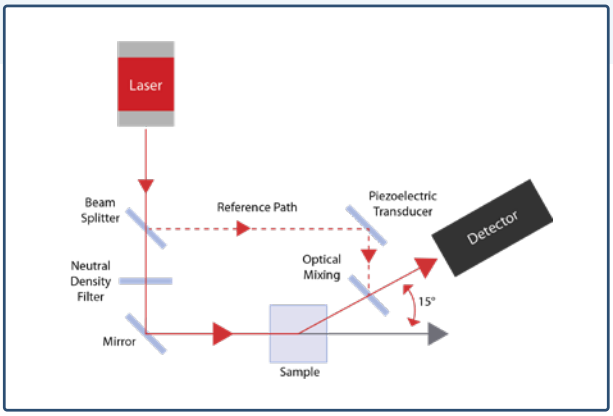
Zeta Potential

The Zeta potential (ζ) is the magnitude of the electrostatic charge that develops at the interface between a solid surface and its liquid medium. Almost all particles in contact with a liquid carry a formal charge on their surfaces.

Zeta potential is an important and useful indicator of the magnitude of this surface charge. It is used to predict and control the stability of colloidal suspensions and emulsions as well as to predict the tendency of particles to aggregate or self-assemble into larger, potentially unstable, structures.

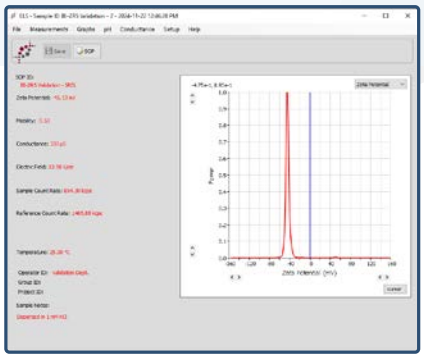
Brookhaven Instruments provides zeta potential instrumentation based on the principles of electrophoretic light scattering.

To measure zeta potential an electrode made with two palladium plates is placed into a cuvette that contains the sample of interest. A voltage is applied to create an electric field and the particles will move towards the pole of an opposite charge.



The electrophoretic velocity or movement of the particle is determined by using a laser light source and measuring scattered light with the APD positioned at a 15° scattering angle. This signal along with a reference signal are then optically mixed to determine the electrophoretic velocity.

Electrophoretic Light Scattering (ELS)

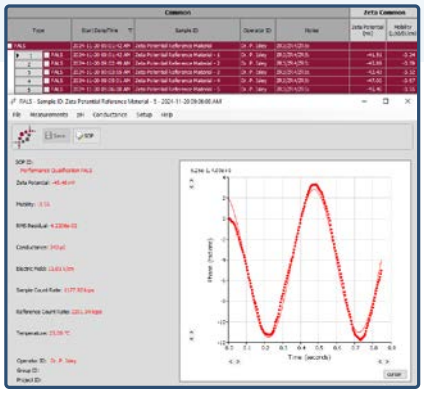


Here, ELS refers specifically to laser doppler electrophoresis, the most basic form of electrophoretic light scattering.

With ELS, zeta potential is determined by measuring the doppler shift that occurs when a particle moves towards a given electrode. The electrophoretic velocity measured is what is used to calculate zeta potential.

ELS can resolve simple multimodal distributions and offers high accuracy in low salt aqueous media.

Phase Analysis Light Scattering (PALS)



With PALS the zeta potential is determined by measuring a phase shift between reference and sample signals.

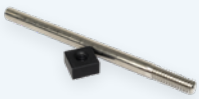
The PALS method is 1000X more sensitive than ELS. Having a higher sensitivity makes it ideal for particles with low mobilities caused by high salt, organic solvents, or viscous media.

It is also ideal for proteins, small peptides, antibodies, oligonucleotides, and other biological samples due to the lower voltage being applied to the electrode, which minimizes the denaturing effects of higher voltages used with other LDE technologies.

Speak to An Expert Today

Our team will help select the right product for your characterization needs.

Accessories

PARTICLE SIZING		DESCRIPTION	TEMPERATURE RANGE
	**BI-SCP**	Disposable PMMA cuvettes for use with aqueous samples and conventional polar solvents including water. Suitable for sample volume of 2.2 to 4 mL. Box of 100 with PE caps. Compatible with BI-SREL, BI-SVE175, and BI-SZP.	-5–70°C
	**BI-SCGO**	Reusable and solvent-resistant optical glass cuvettes. Suitable for sample volume of 2.2 to 4 mL. Box of 10 with Teflon caps. Compatible with BI-SREL.	-5–110°C
	**BI-SM10**	Reusable quartz cuvette for particle sizing of small-volume (10 µL) samples.	-5–110°C
	**BI-SM50**	UV-transparent plastic small-volume (50 µL) disposable cells for particle sizing with aqueous samples. Box of 80. Requires BI-SM50A.	-5–70°C
	**BI-SM50A**	Small-volume cell adapter for the NanoBrook. Required for BI-SM50.	
	**BI-RCG**	Borosilicate glass round glass cells for particle sizing. Box of 250 with 25 reusable Teflon caps. Requires BI-RCH.	-5–110°C
	**BI-RCH**	Adapter for the NanoBrook cell holder that allows the use of BI-RCG.	
	**BI-LTX90**	NIST traceable latex reference material (90 ± 3 nm). Actual mean value varies by production lot. Volume = 15 ML	

PARTICLE SIZING *(cont.)*		DESCRIPTION	TEMPERATURE RANGE
	**BI-SVK90**	Particle size validation kit. Includes 16 drops of BI-LTX90 latex, reference standard and 10 mM KNO_3 solution (20 mL).	
ZETA POTENTIAL		**DESCRIPTION**	**MATERIAL**
	**BI-SREL**	Solvent-resistant zeta potential electrode. Usable for both aqueous and nonpolar samples. Compatible with BI-SCP and BI-SCGO.	Body - PEEK Electrode - Palladium
	**BI-SVE 175**	Small-volume (200 µL) zeta potential electrode for use with aqueous samples. Compatible with BI-SCP.	Body - PMMA Electrode - Palladium
	**BI-SZP**	Surface zeta potential electrode for use with aqueous samples.Compatible with BI-SCP.	Body - PMMA Electrode - Palladium
	**BI-ZR5**	Zeta potential reference material (-44 ± 8 mV) and 1 mM KCl solution (20 ML).	
	**BI-ELECCK**	Electrode cleaning kit for BI-SREL and BI-SZP electrodes.Includes cleaning wand & polishing strips.	
MISC.		**DESCRIPTION**	
	BI-CC	Nitrogen-purge capability for condensation control.	

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Specifications

TECHNOLOGY		90PLUS	173 PLUS	ZETA PLUS	ZETA PALS	90PLUS ZETA	90PLUS PALS	OMNI
DLS	Scattering Angle	90°	173° & 90°			90° & 15°	90° & 15°	173°, 90° & 15°
	Size Range - Diameter*	1 nm to 6 µm	<0.3 nm to 10 µm			1 nm to 6 µm		<0.3 nm to 10 µm
	Sizing Precision (Typical)	± 1%				± 1%		
	Sample Cells	1 to 3 mL disposable plastic, 50 µL disposable, 40 µL quartz flow cell, 10 µL quartz minimum				1 to 3 mL disposable plastic, 50 µL disposable, 40 µL quartz flow cell, 10 µL quartz minimum		
	Min. Sample Volume	10 µL				10 µL		
	Concentration Range**	2 ppm to 50 mg/mL	0.1 ppm to 50 mg/mL			2 ppm to 50 mg/mL	0.1 ppm to 50 mg/mL	
	Data Presentation	NNLS, Contin, Cumulants, Lognormal				NNLS, Contin, Cumulants, Lognormal		
	Correlator	TurboCorr, multitau, research grade with 522 hardware channels, covering the equivalent of 10^{10} linearly-spaced channels, 100% efficiency, real-time operation over the entire delay-time range.				TurboCorr, multitau, research grade with 522 hardware channels, covering the equivalent of 10^{10} linearly-spaced channels, 100% efficiency, real-time operation over the entire delay-time range.		
	Compliance	ISO13321 and ISO22412				ISO13321 and ISO22412		
Zeta Potential	Scattering Angle			15°				
	Technology			ELS	ELS & PALS	ELS	ELS & PALS	
	Zeta Potential Range*			-500 mV to 500 mV				
	Precision***			± 3%				
	Mobility Range			10^{-9} to 10^{-7} m^2/Vs	10^{-11} to 10^{-7} m^2/Vs	10^{-9} to 10^{-7} m^2/Vs	10^{-11} to 10^{-7} m^2/Vs	

TECHNOLOGY		90PLUS	173 PLUS	ZETA PLUS	ZETA PALS	90PLUS ZETA	90PLUS PALS	OMNI
Zeta Potential	Size Range*			1 nm to 100 µm				
	Maximum Sample Conductivity			7.5 mS/cm	220 mS/cm	7.5 mS/cm	220 mS/cm	
	Concentration Range*			40% v/v				
	Min. Sample Volume			180 µL				
	Sample Cells			180 µL, 600 µL, 1250 µL				
	Data Presentation			Zeta potential calculated by Smoluchowski, Hückel, or Henry equations				
Molecular Weight	Size Range*	9,800 Da to 20 Mda	980 Da to 20 Mda			9,800 Da to 20 Mda		980 Da to 20 Mda
	Size Accuracy	± 10%				± 10%		
	Data Presentation	Molecular Weight: SLS Debye Plot & MHS Parameters				Molecular Weight: SLS Debye Plot & MHS Parameters		
General	Temperature Control	Automatic -5 °C to 110 °C, ± 0.1 °C, active control.						
	Laser	40 mW 640 nm temperature-controlled red semiconductor laser. Alternative wavelengths available.						
	Detector	Avalanche Photo Diode (APD)						
	Condensation Control	Purge facility using dry air, nitrogen recommended						
	Power Requirements	100/115/220/240 VAC, 50/60 Hz, 150 Watts						
	Dimensions	23.3 x 42.7 x 48.1 cm (HWD)						
	Weight	15 kg						
	Environmental Characteristics	Temperature: 10 °C to 75 °C; Humidity: 0% to 95%, non-condensing						
	CE Certificate	Class I laser product, EN 60825-1:2001, CDRH						

*Actual specification achieved are sample dependent.
**Dependent on refractive index and concentration.
***Dependent on salt concentration.

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