



PARTICLE SIZE

ZETA POTENTIAL

MOLECULAR WEIGHT

RHEOLOGICAL PROPERTIES



BeNano 90 Zeta

Be the Nanoparticle Expert You Need

Bettersize
BETTER PARTICLE SIZE SOLUTIONS

Unlock Greater Research Potential With BeNano

The BeNano 90 Zeta is a state-of-the-art nanoparticle analyzer that combines different light scattering techniques. It provides precise measurements of particle size, zeta potential, molecular weight, and rheological properties, all within a single compact system.



MEASUREMENT MODES

Size

Zeta Potential

Molecular Weight

Microrheology

Flow Mode

Temp. Trend

VV Polarizer

VH Polarizer

Fluorescence Filter

Autotitration

Phase Analysis Light Scattering

Precisely distinguishes weak to strong electrophoretic signals, enabling superior zeta potential measurements, especially near isoelectric points or in high-salinity conditions.

Autotitrator & Degasser

The BAT-1 autotitrator enables automated pH titration from 1 to 13. It can be integrated with a triple-channel degasser to eliminate air bubbles during titration.

Ultra-Low Sample Volume

Ideal for early-stage research, the capillary sizing cell requires only 3 to 5 μ L, enabling precise size measurements with minimal sample consumption.

Adjustable Correlator Mode

Offers short, medium, and long-time correlator modes that can be configured based on sample type, ensuring powerful and adaptable correlation function calculation.

Works in Combination with GPC/SEC or FFF

Flow mode enables high-resolution size analysis. The BFC-1 signal collector auto-triggers and captures RI or UV signals from GPC/SEC or FFF, delivering accurate volume-weighted results.

Regulatory Compliance

Compliant with ISO 22412 and ISO 13099, featuring IQ/OQ tools and FDA 21 CFR Part 11 support for use in regulated environments.

Features	BeNano 90 Zeta
Particle Size - 90° DLS	✓
Zeta Potential	✓
Molecular Weight	✓
Microrheology	✓
Temperature Trend	✓
VV Polarizer	✓ (Opt.)
VH Polarizer	✓ (Opt.)
Fluorescence Filter	✓ (Opt.)
Flow Mode	✓ (Opt.)
Autotitration	✓ (Opt.)

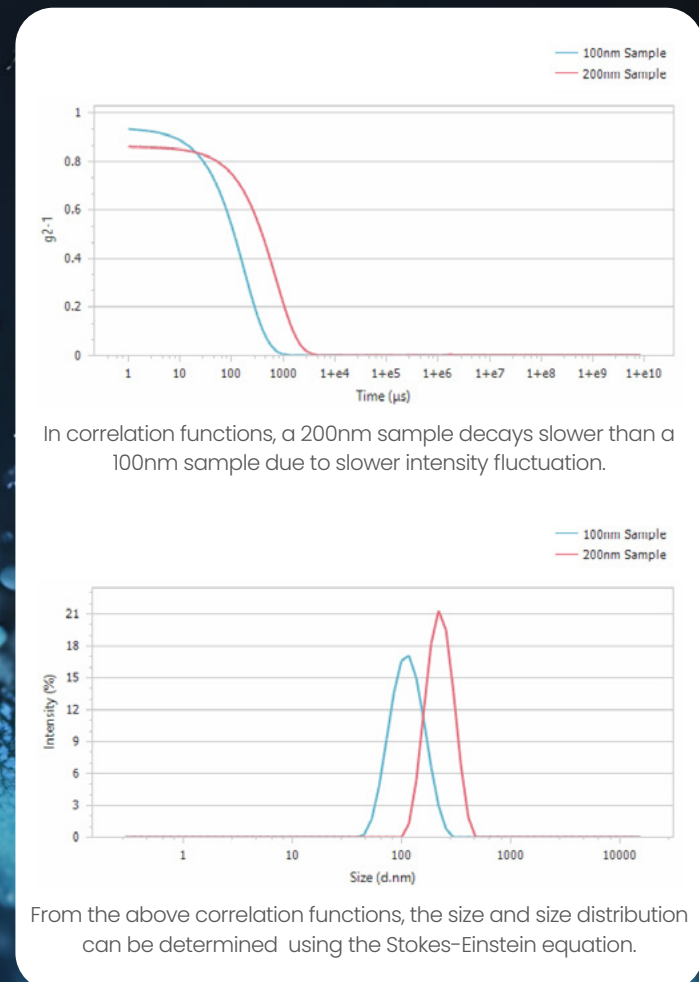
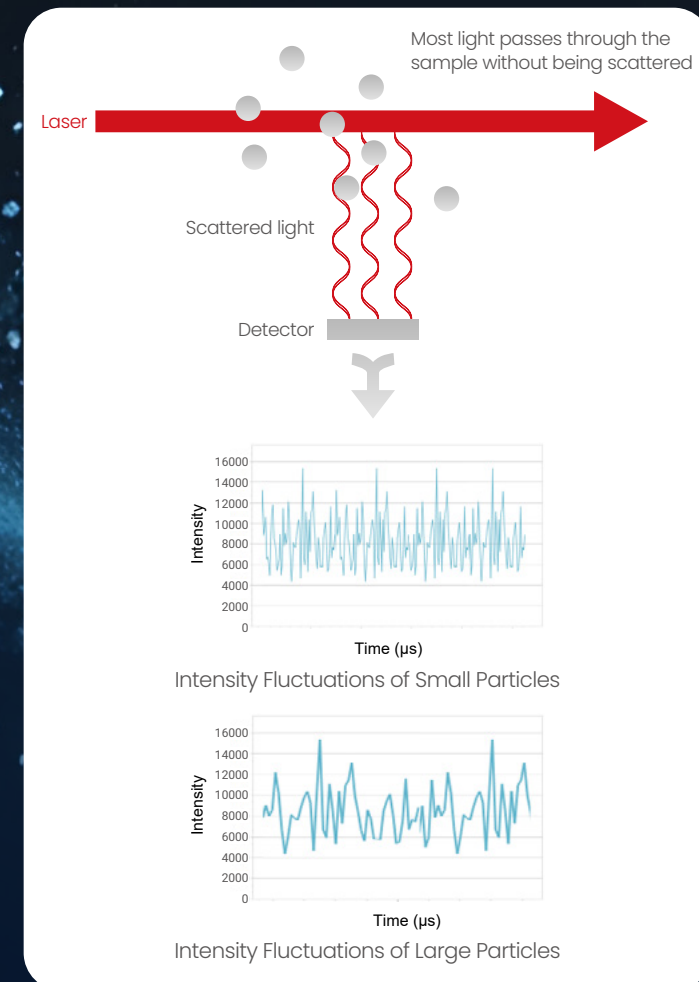


Size Measurement

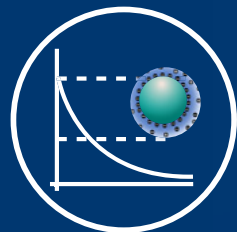
Dynamic Light Scattering (DLS), also known as Photon Correlation Spectroscopy (PCS) or Quasi-Elastic Light Scattering (QELS), is a technique used to determine particle size by analyzing the Brownian motion of particles in a dispersion.

DLS is based on the principle of Brownian motion, which relates particle size to velocity—smaller particles diffuse more rapidly, while larger particles move more slowly. The scattering intensities of the particles are detected by an avalanche photodiode (APD) and then converted into a correlation function. From this correlation function, a mathematical algorithm can be applied to obtain the diffusion coefficient (D). The hydrodynamic diameter (D_H) and its distribution can be calculated using the Stokes-Einstein equation, which relates the diffusion coefficient to the particle size.

$$D = \frac{k_B T}{3\pi\eta D_H}$$



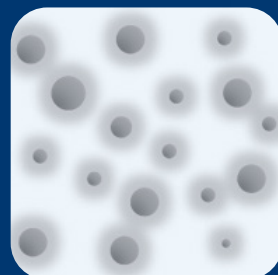
From the above correlation functions, the size and size distribution can be determined using the Stokes-Einstein equation.



Zeta Potential Measurement

In aqueous systems, charged particles are surrounded by counter-ions that form an inner Stern layer and an outer shear layer. Zeta potential is the electrical potential at the interface of the shear layer. A higher zeta potential indicates greater stability and less aggregation of the suspension system. Electrophoretic light scattering (ELS) measures electrophoretic mobility via Doppler shifts of scattered light, which can be used to determine the zeta potential of a sample by Henry's equation.

COLLOIDAL STABILITY



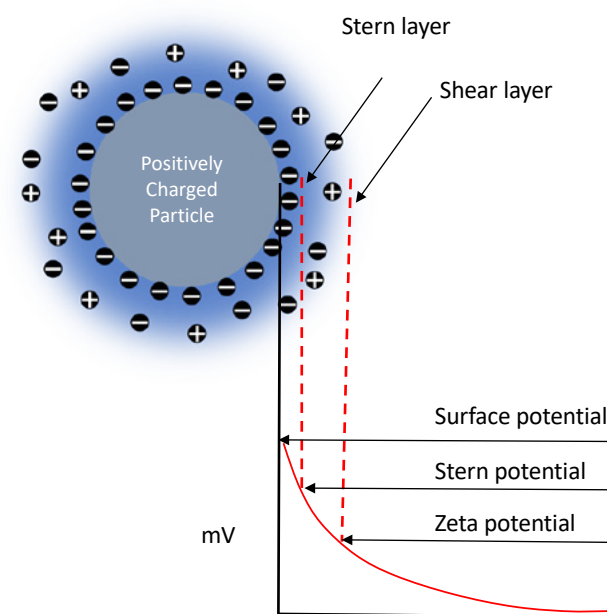
Stable particle system

- High repulsion force of particles
- High zeta potential

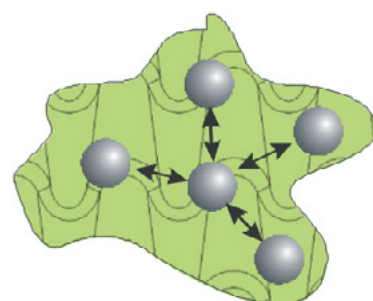


Unstable particle system

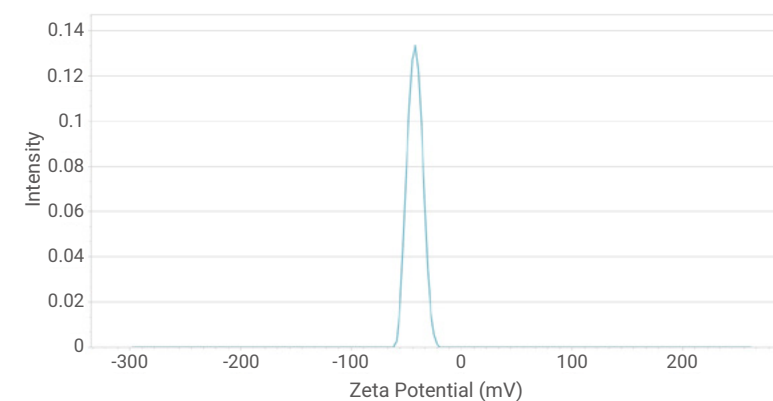
- Flocculation, aggregation, sedimentation
- Low or zero zeta potential



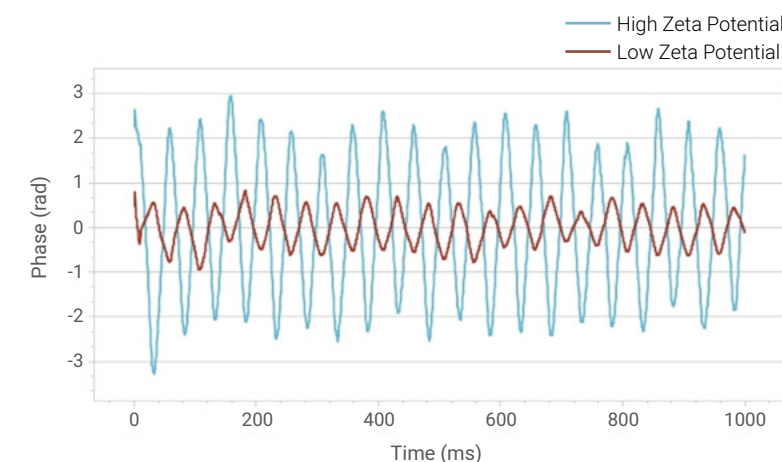
Potential Distribution at Particle Surface



Electrostatic Forces Between Particles



Zeta Potential Distribution



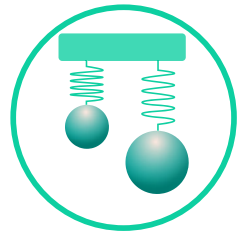
Phase Plot of PALS

Phase Analysis Light Scattering (PALS)

Phase Analysis Light Scattering (PALS) is a more advanced technique than traditional ELS, which has been further developed by Bettersize to measure the zeta potential.

FEATURES & BENEFITS

- Accurate measurement of samples with low electrophoretic mobility
- Effective for samples in organic solvents with low dielectric constant
- More accurate results for samples with high conductivity
- Effectively measures the zeta potential of particles whose charge approaches the isoelectric point



Molecular Weight Measurement

Static light scattering (SLS) is a technique that measures scattering intensities to calculate the weight-average molecular weight (M_w) and the second virial coefficient (A_2) of a sample using the Rayleigh equation.

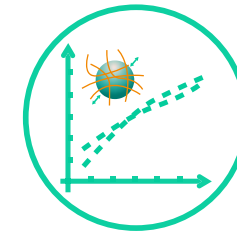
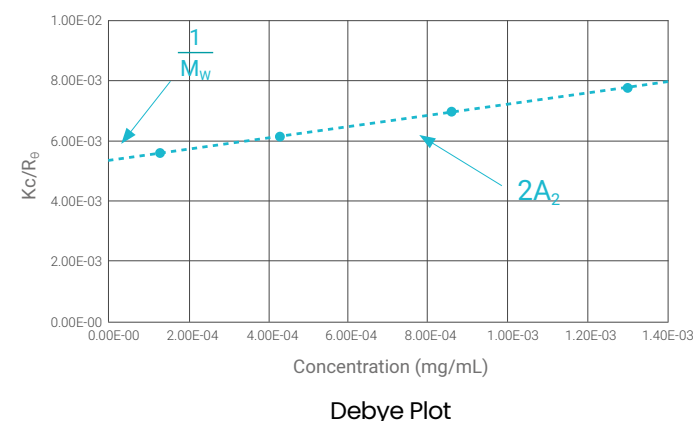
$$\frac{Kc}{R_\theta} = \frac{1}{M_w} + 2A_2c$$

where c is the sample concentration, θ is the detection angle, R_θ is the Rayleigh ratio used to characterize the intensity ratio between the scattered light and the incident light at the angle of θ , M_w is the sample's weight-average molecular weight, A_2 is the second virial coefficient, and K is a constant related to $(dn/dc)^2$.



FEATURES & BENEFITS

- Non-invasive technique
- Suitable for particles dissolved in liquid
- Measures molecular weight of samples smaller than 30 nm
- Provides second virial coefficient A_2 indicating the intermolecular interactions



Microrheology Measurement

Dynamic Light Scattering Microrheology (DLS Microrheology) is an economical and efficient technique that utilizes dynamic light scattering to determine rheological properties. By analyzing the Brownian motion of colloidal tracer particles, information about the viscoelastic properties of the system, such as viscoelastic modulus, complex viscosity and creep compliance, can be obtained with the generalized Stokes-Einstein equation.

FEATURES & BENEFITS

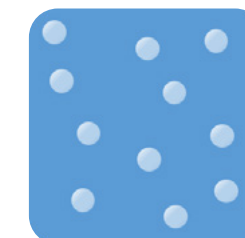
- Investigates rheological behaviors by measuring the thermally-driven motion of tracer particles within a material being studied
- Facilitates the measurement of a broad frequency range in a single measurement
- Suitable for dilute, weakly structured solutions
- Delivers fast results in 1 – 2 minutes with easy operation
- Offers rheological insights across a wide temperature range from -15 °C to 120 °C
- Complements conventional mechanical rheology

Stokes-Einstein equation

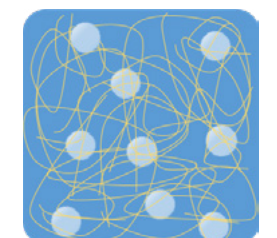
$$G^*(\omega) = \frac{k_B T}{\pi R i \langle \Delta r^2(i\omega) \rangle} = G'(\omega) + iG''(\omega)$$

Microrheology Information

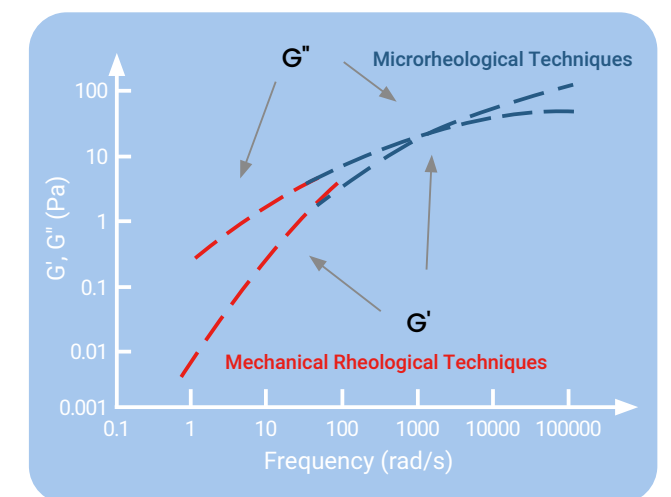
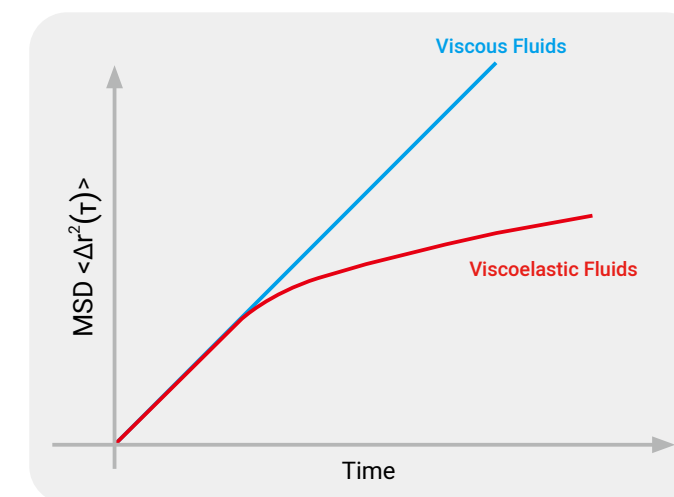
Elastic (storage) modulus	G'
Viscous (loss) modulus	G''
Complex viscosity	η^*
Creep compliance	J



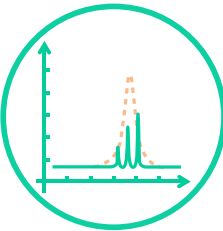
Particles in pure viscous fluids



Particles in complex viscoelastic fluids



Flow Mode Measurement



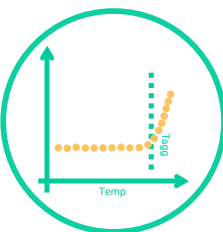
DLS flow mode provides a high-resolution size result of a complex, polydisperse system. When combined with front-end separation equipment such as **GPC/SEC** or **FFF**, particles are separated into monodisperse fractions and flow through the BeNano in sequence by size. The size of each fraction is continuously measured and summed into a high-resolution size distribution.

BeNano can acquire **RI or UV signals**, offering a more accurate volume and number distributions independent of algorithm compared to a batch-mode measurement.

FEATURES & BENEFITS

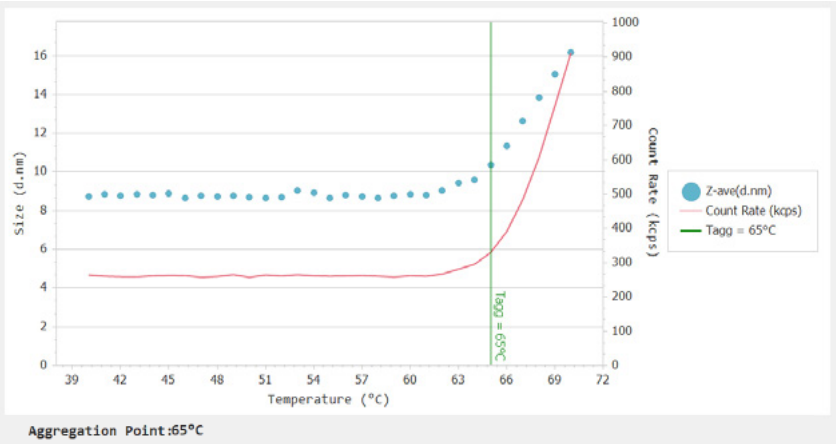
- DLS analyzer connecting with GPC/SEC, FFF, etc.
- Receiving up to 3 signals from RI, UV or other detectors
- 27 µL low-volume flow cell to avoid band broadening
- Size resolution as high as 1.3 : 1
- Size distributions weighted by number and volume in addition to intensity
- Suitable for complex, polydisperse systems such as proteins, polymers, etc.

Temperature Trend Measurement

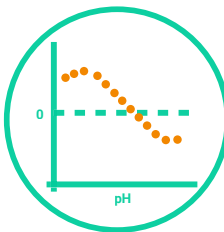


FEATURES & BENEFITS

- Programmed temperature trend measurement from -15 °C to 120 °C
- Important for analyzing particle size and zeta potential across varying temperatures
- Easy examination of protein formulation stability
- Accelerates real-time aging through elevated temperature simulation



Size vs. Temperature trend measurement of the BSA protein



pH Autotitration Measurement

The **BAT-1 + Degasser** units integrate seamlessly with the BeNano for automatic acid-base titration and isoelectric point (IEP) determination. The system automatically enables sample flow during measurement, ensuring high efficiency, and consistent, operator-independent results as well as precise titration.

MEASUREMENT PARAMETERS

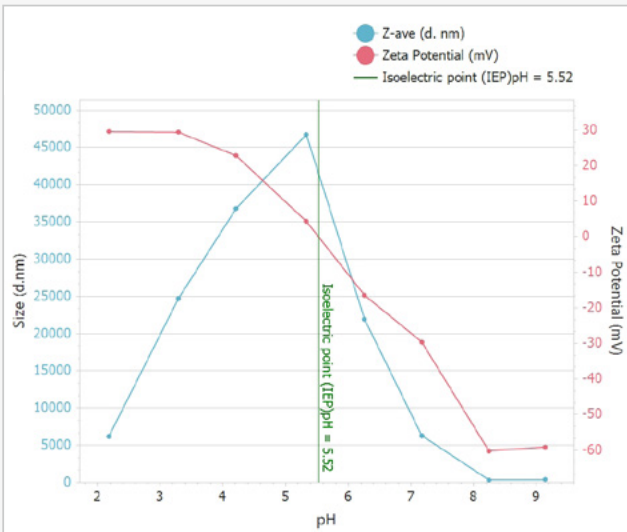
- Zeta potential vs. pH
- Size vs. pH
- Size and Zeta Potential vs. pH
- Conductivity vs. pH
- Isoelectric point

FEATURES & BENEFITS

- Accurate size and zeta potential analysis from pH 1 to 13
- Enhanced safety with minimal exposure to corrosive liquids
- Automated workflow reduces training needs and researcher workload
- Fewer manual steps minimize human error
- Completes each measurement cycle in as little as 30 minutes
- Smart Titration: Based on the initial pH and the target pH, the required titrants can be chosen automatically via the software



An optional degasser is available to remove dissolved gases from titrants. Preventing bubbles improves the accuracy of zeta potential measurements.



The software can automatically generate the size and zeta potential vs. pH curve and identify the isoelectric point (IEP).

pH Autotitration Measurement	
Cell compatibility	BT-C1, BT-C1-Pt
pH range	1 - 13
Titration Accuracy	0.28 µL
Titrant container quantity	3
Typical sample volume	15 mL

CELLS

Standard



Folded Capillary Cell BT-CI

Compatibility: Aqueous samples for zeta potential measurement
Material: **PC, Gold-plated Phosphor Bronze**
Min. Sample Volume: **0.75 mL**
Temp. Upper Limit: **70 °C**



Capillary Sizing Cell

Compatibility: Aqueous/organic samples with ultra-micro volume for size measurement
Material: **Quartz**
Min. Sample Volume: **3 µL**
Temp. Upper Limit: **70 °C**



PS Cuvette

Compatibility: Aqueous samples for size measurement
Material: **Polystyrene**
Min. Sample Volume: **1 mL**
Temp. Upper Limit: **70 °C**



Glass Cuvette

Compatibility: Aqueous/organic samples for size measurement, good sealing performance
Material: **Glass**
Min. Sample Volume: **1 mL**
Temp. Upper Limit: **120 °C**



Folded Capillary Cell BT-CI-Pt

Compatibility: Aqueous samples with moderate to high salinity (conductivity up to 260 mS/cm) for zeta potential measurement
Material: **PC, Platinum**
Min. Sample Volume: **0.75 mL**
Temp. Upper Limit: **70 °C**



Dip Cell

Compatibility: Aqueous/organic samples for zeta potential measurement
Material: **PEEK, Platinum**
Min. Sample Volume: **1 mL**
Temp. Upper Limit: **70 °C**



Micro-volume PMMA Cuvette

Compatibility: Aqueous samples with micro volume for size measurement
Material: **PMMA**
Min. Sample Volume: **40 µL**
Temp. Upper Limit: **70 °C**



Micro-volume Glass Cuvette

Compatibility: Aqueous/organic samples with micro volume for size measurement
Material: **Quartz**
Min. Sample Volume: **25 µL**
Temp. Upper Limit: **120 °C**



High Concentration Zeta Cell

Compatibility: Aqueous samples with moderate to high concentrations (up to 80% w/v) for zeta potential measurement
Material: **Quartz**
Min. Sample Volume: **64 µL**
Temp. Upper Limit: **70 °C**



Micro-volume VV Cell

Compatibility: Aqueous samples, eliminates the horizontal element of scattered light
Material: **Quartz**
Min. Sample Volume: **16 µL**
Temp. Upper Limit: **90 °C**



Micro-volume VH Cell

Compatibility: Aqueous samples, eliminates the vertical element of scattered light
Material: **Quartz**
Min. Sample Volume: **16 µL**
Temp. Upper Limit: **90 °C**



Micro-volume Fluorescence-filtered Cell

Compatibility: Aqueous samples for size measurement, equipped with a narrow-band filter
Material: **Quartz**
Min. Sample Volume: **16 µL**
Temp. Upper Limit: **90 °C**



Flow Cell

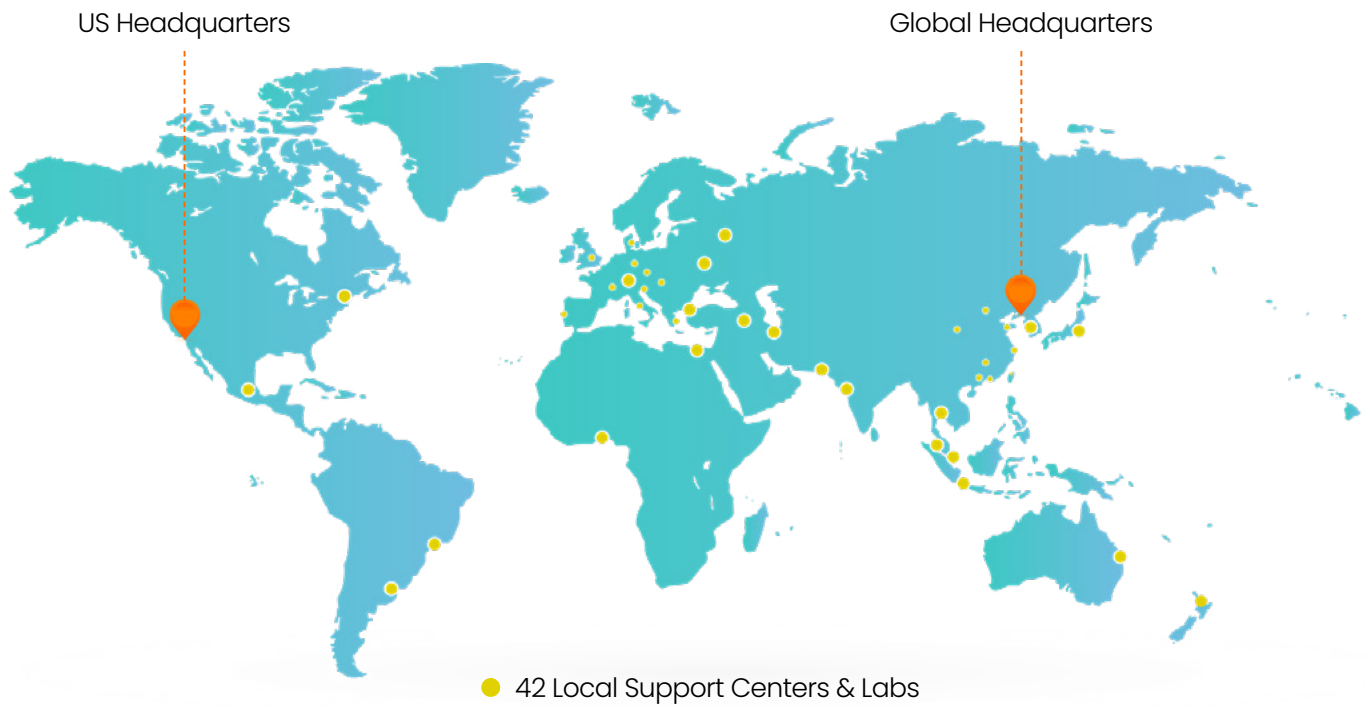
Compatibility: Aqueous/organic samples for DLS flow mode measurement
Material: **Quartz**
Min. Sample Volume: **27 µL**
Temp. Upper Limit: **70 °C**



Functionality	Parameter	BeNano 90 Zeta
Size measurement	Size measurement range	0.3 nm – 15 µm*
	Sample volume	3 µL – 1 mL*
	Detection angle	90° & 12°
	Analysis algorithm	Cumulants, General Mode, CONTIN, NNLS
	Upper limit of concentration range	40% w/v*
Zeta potential measurement	Detection angle	12°
	Zeta potential measurement range	No actual limitation
	Electrophoretic mobility	> ± 20 µm·cm/V·s
	Conductivity	0 – ≥ 270 mS/cm
	Sample volume	64 µL – 1 mL
	Sample size	1 nm – ≥ 120 µm*
Other measurements	Molecular weight (Mw) measurement	342 Da – 2 × 10 ⁷ Da*
	DLS microrheology measurement	MSD, G', G'', η*, J
System parameter	Temperature control range	-15 °C – 120 °C, ± 0.1 °C
	Condensation control	Dry air or nitrogen
	Laser source	50 mW Solid-state laser, 671 nm [†] , Class 1
	Correlator	Up to 4000 channels, 10 ¹¹ linear dynamic
	Detector	Avalanche photodiode (APD)
	Intensity control	0.0001% – 100%, manual or automatic
	Dimensions (L x W x H)	62.5 x 40 x 24.5 cm (26 kg)
	Power supply	AC 100 – 240 V, 50 – 60 Hz, 4A
	Compliance	21 CFR Part 11, ISO 13321, ISO 22412, ISO 13099

* Dependent on samples and accessories † 10mW 633 nm HeNe laser available on request

Global Footprint



Compliance

All Bettersize instruments are manufactured under **ISO 9001** standards and comply with **CE requirements**. The software complies with **U.S. FDA 21 CFR Part 11**, ensuring the validity and reliability of measurement results and meeting traceability requirements.



Certified Service and Support

We provide exceptional customer care throughout your product’s lifecycle, including:

- **3-Year Warranty** for reliable performance.
- **Expert Support:** Installations, training, workshops, and troubleshooting.
- **Maintenance & Upgrades:** Preventive care, hardware and software updates, and repair services.
- **24/7 Emergency Service** for critical assistance.

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BREAKING
BOUNDARIES
SHAPING
THE FUTURE

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