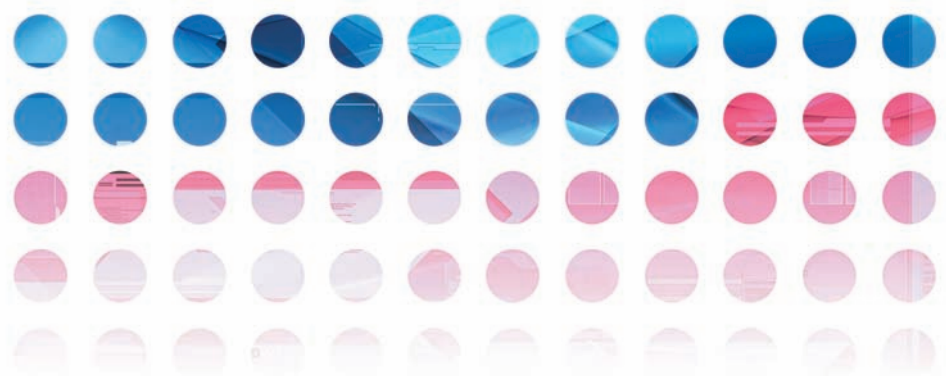


# Zetasizer Auto Plate Sampler

DLS Plate Sampling Technology™ for unparalleled data quality and automation



## Designed for protein applications

**The Zetasizer APS**

The Zetasizer APS is a robust, simple to operate, Dynamic Light Scattering system that automates measurements of samples in industry standard 96- or 384-well plates to add the power of advanced light scattering analysis to your laboratory. A minimum of user input is required to start the measurements. Improve accuracy, reliability and ease of use with the most advanced system available – The Zetasizer APS Auto Plate Sampler

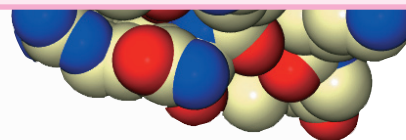
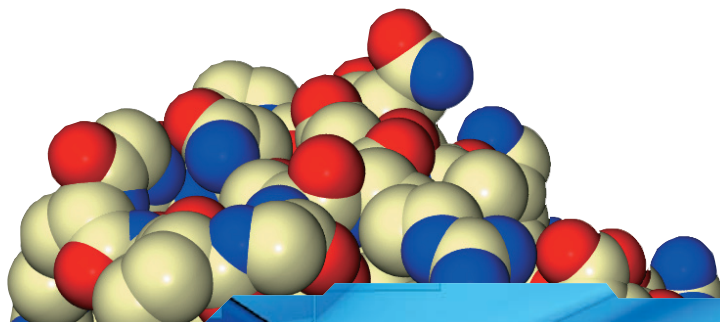
**Spotlight on proteins**

How do you know if your protein is well-behaved in certain buffers or if it aggregates over time in others? Is your protein still a monomer after thawing or reconstitution after freeze drying? Are your buffer conditions favorable to protein crystallization? The Zetasizer APS allows you to investigate the stability of your protein over a wide range of developmental conditions with minimal user intervention.

**Now you don't have to choose between quality or automation.**

The Zetasizer APS offers **both**.

- Automates your size measurements
- Uses only small, recoverable sample volumes (20µL)
- Automated sample 'sipping' offers the ultimate in sensitivity for high quality results
- Uses the world's favorite user-friendly software for fully customizable options
- Incorporates dual, independent temperature controls for both plate holder and measurement cell for high accuracy and repeatability



## Light Scattering - more than size measurement

The sensitivity, simplicity and non-invasive nature of dynamic light scattering makes the technique ideally suited for detecting aggregates and monitoring protein stability.

### Dynamic light scattering (DLS)

Dynamic light scattering measures the diffusion rate of molecules in solution, which enables the calculation of hydrodynamic radius, size distribution and homogeneity. The hydrodynamic radius is the size of the molecules as they exist in that particular buffer environment.

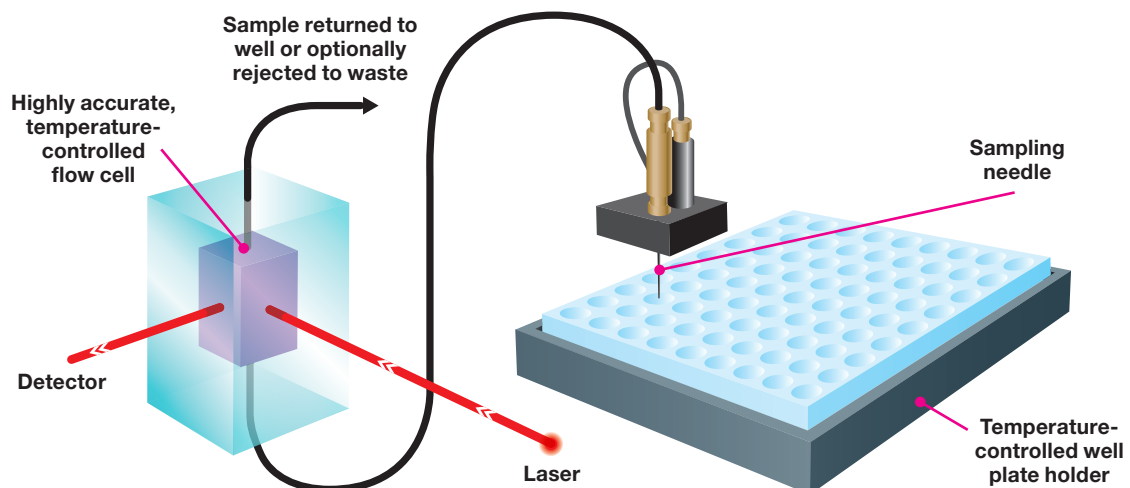
The advantage of this technique is that the material can be measured in any buffer of your choice. No sample preparation that can potentially change the solvation or oligomerisation state is required.

The sensitivity of DLS means that changes in oligomerisation state are easily detected.

Parameters measured include:

- Mean hydrodynamic radius, which is sensitive to the presence of even trace amounts of aggregates
- Polydispersity Index indicating the presence of a mixture of oligomers or aggregates
- Distribution of molecular sizes
- Molecular weight information estimated from size using established models
- Melting point determination

### Zetasizer APS sampling schematic

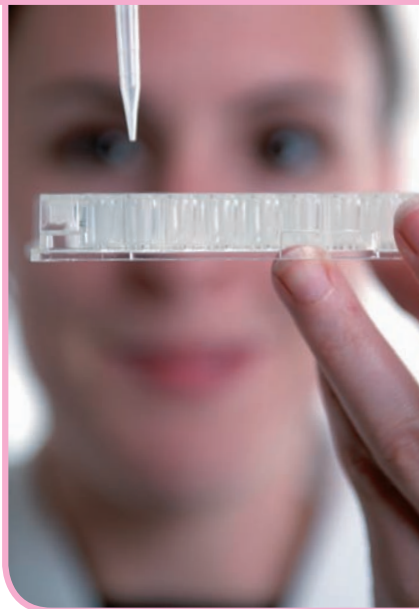


## Insight into your proteins

### Why size and molecular weight characterization is important in protein research

The real value in light scattering instrumentation is not the properties that are measured, but rather how these properties can be used to help solve application problems. The Zetasizer APS can be used during bioprocessing to screen for the effects of environmental factors, such as temperature, ionic strength, protein concentration, the presence of certain ligands or ions, or pH on a protein's monomeric or oligomeric state.

**In drug target development**, the Zetasizer APS can help you screen many buffer conditions, to find optimal crystallization conditions and speed up the structure determination process.



**In protein therapeutics**, the presence of aggregates can cause adverse effects in several ways. Large aggregates are easily removed by filtration whereas smaller soluble aggregates are more elusive. DLS measurements are exquisitely sensitive to the detection of these soluble aggregates due to the fact that the amount of light scattered depends so strongly on size. This means that DLS can be used to ensure successful purification, crystallization and formulation development.

## Typical applications

### Aggregate detection

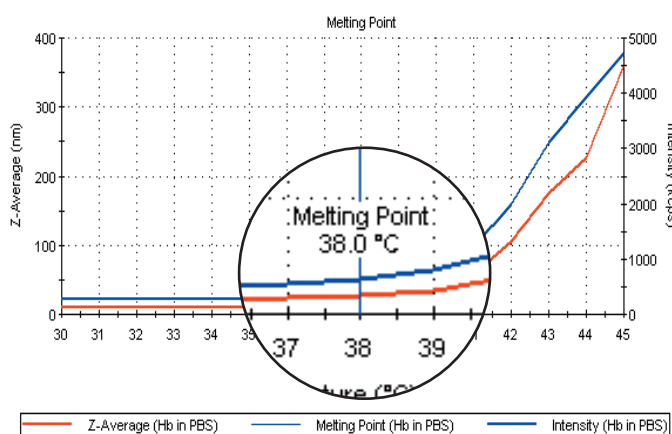
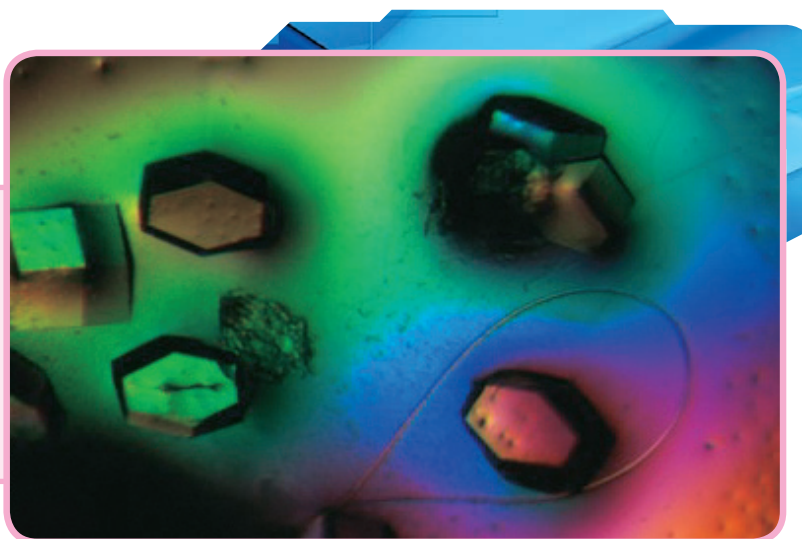
Light scattering can be used to detect aggregates in protein solutions, optimize storage conditions to avoid aggregation, and screen small molecule libraries for aggregated compounds that could act as non-specific inhibitors. The Zetasizer APS can automate these measurements, enabling a higher throughput of samples and freeing up time for other activities.

### Protein solubility screening

The Zetasizer APS can monitor changes in size, scattering intensity and polydispersity over time to optimize conditions for long-term stability and shelf-life.

### Crystal screening

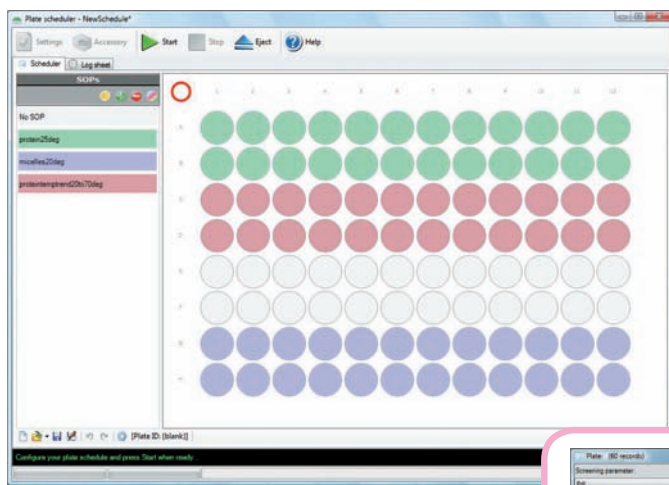
Protein purity is important in the production of crystals for determining the molecular structure by X-ray diffraction. The Zetasizer APS requires only minimal amounts of sample and enables you to automate the screening of a large number of buffers until the ideal conditions for protein crystallization are found.



### Identify thermal characteristics

Stable and accurate temperature control is part of the fundamental design of the Zetasizer APS. Standard procedures facilitate the measurement of protein size and scattering intensity over a user-defined range of temperatures. Any changes in protein structure in response to changes in temperature will be clearly identified giving information on purity and assist with studies to improve shelf-life.

## Software designed for protein specialists

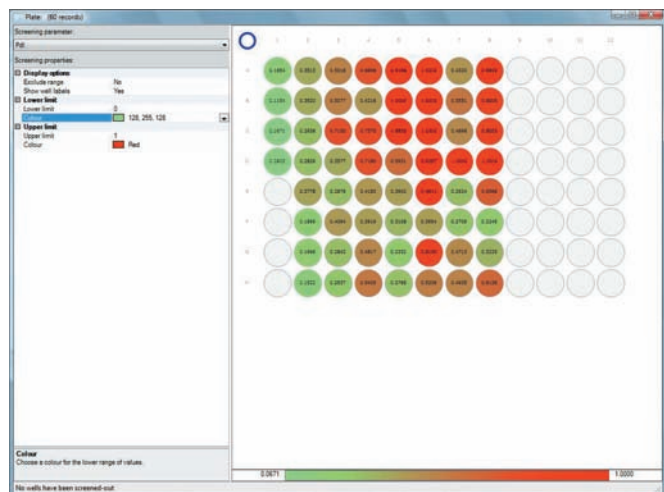


### SOPs

Standard operating procedures (SOPs) simplify the way measurements are performed. Any measurement procedure can be customized to the specific needs of a test or sample. Each SOP can be saved so that experiments can be repeated with identical protocols. The Plate Scheduler allows multiple SOPs to be assigned to a single plate increasing the potential of the Zetasizer APS to accommodate all your measurement needs.

### Plate Navigator

The plate navigator gives an overview of the data from the whole plate. Colour coding allows users to easily distinguish between 'hotspots' and trends according to any selected parameter and wells can be labeled with individual results for detailed inspection. An additional feature enables the software to include or exclude any results according to user-defined limits.



### Protein workspace

The default setup of the software is customized for the analysis of proteins and biomolecules. Everything about this interface, from the parameters reported, the views of the results, the units used and the measurement procedures are geared to support the requirements of the protein specialist.



### Protein utilities

This set of tools is designed to help the user with experimental design and interpretation of the data. Assistance is available for recommended sample concentrations and 'what if' scenarios are available to provide shape estimates such as the Perrin factor, prolate and oblate axial ratios, as well as an estimate of MW from the size measured.



### Protein wizard

This wizard is an expert report in the software that can assess your sample from a number of points of view. It can give an idea of the total proportion of aggregates in a sample, the ratios of possible oligomeric structures, and can also suggest whether a sample might be suitable for crystallization trials.

## Now you can...

- Automate your size measurements using low sample volumes while maintaining the ultimate in DLS sensitivity
- Simply insert your plate and press 'Start'. Walk-away automation does the rest
- Use standard operating procedure (SOP) based software to define the measurement protocol in each well or group of wells
- Analyze small amounts of recoverable sample and accurately and reproducibly measure the size distributions of your proteins
- Transfer methods developed in a Zetasizer batch system to the APS
- Screen for optimal buffer conditions for protein solubility/stability
- Increase your sample throughput
- Control plate and sample measurement temperature separately
- Directly view results and graphs within the user interface of the world's best selling, most user-friendly DLS software
- Customize report pages specific to your needs
- Retrieve your data and export it to third-party analysis packages



...with ease



**Improve accuracy, reliability and ease of use with the most advanced system available – The Zetasizer Auto Plate Sampler.** Designed primarily for protein specialists, the new Zetasizer APS uses Malvern's unique Dynamic Light Scattering (DLS) plate sampling technology™ to simplify measurements and to ensure no compromise in sensitivity due to automation. It's no coincidence that our user-friendly, flexible and intuitive software is also the world's most popular!

## Specifications

## Zetasizer APS

	<i>Parameters measured</i>	<i>Materials</i>
<b>Size</b>	Hydrodynamic size, molecular weight	Molecular solutions, e.g. proteins
	Size range maximum (radius)	0.15nm - 1 micron*
	Minimum sample volume	20µL
	Sensitivity	0.1mg/mL of 15kDa protein
	Measurement angle	90°
	<b>Molecular weight</b>	Molecular weight range (estimated from hydrodynamic diameter)
	Minimum sample volume	20µL
<b>General</b>	Plate types	96, 384 well (SBS standard)††
	Temperature control range (in flow cell)	2°C - 90°C +/- 0.1°C** (Independent of plate type)
	Condensation control	Purge facility using dry air
	Correlator	Min. sample time 480ns, max. 3600s. 264 channels
	Standard laser	60mW, 830nm
<b>Accessories</b>	SV-10 viscometer, viscosity range	0.3 - 10,000mPa.s
	Thermoelectric control unit for independent plate temperature control	4°C to 40°C +/- 0.1°C, 12.2kg, 200mm x 385mm x 310mm, (W,D,H) 100V-240V AC, 50/60 Hz, 228W
<b>Options</b>	21 CFR part 11 software option	Enables an operating mode that assists with ER/ES compliance
<b>System compliance</b>	CE, Product: laser class 1, EN 60825-1:2001 and CDRH	
<b>System</b>	Dimensions, weight, power	500mm x 410mm x 420mm (W,D,H), 20kg, 150W
<b>Notes</b>		* Peak mode range (radius), 0.3nm - 0.5 microns, sample dependent
		** Temperature accuracy, 0.1°C at 25°C, 0.2°C at 2°C and 0.5°C at 90°C
		† Sample dependent
		†† ANSI SBS 1-2004, 2-2004, 3-2004

## Main features

- Compatible with industry standard SBS 96- and 384-well microplates. Expensive plates with quartz or glass bottoms are not required for high quality data
- Simple to operate using graphical user interface
- Dual temperature control for greatest accuracy
- Standard operating procedures for repeatability
- Variety of screen and print data output options
- Expert guidance regarding result quality for added confidence
- Global after sales support network for training and service
- Minimal user input required to obtain high quality results



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**Zetasizer**  
**APS**

## Spotlight on proteins

distributor details

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**spectris**

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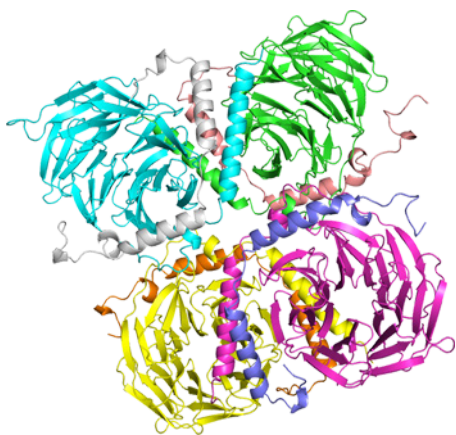
Detailed specifications at [www.malvern.com/zetasizerAPS](http://www.malvern.com/zetasizerAPS)

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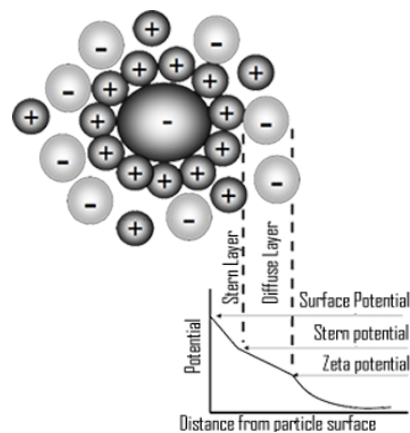
***NanoBrook Omni***  
Particle Sizer and Zeta Potential Analyzer



Proteins: Size, Zeta Potential, Molecular Weight



Nanoparticle Sizing

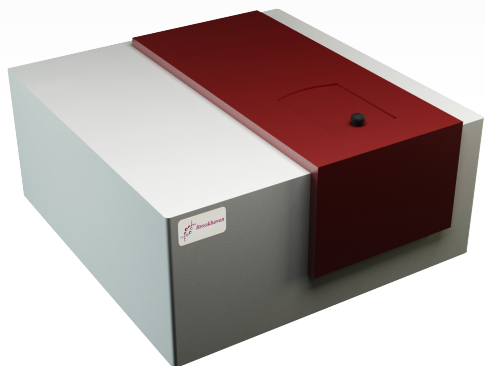


Zeta Potential of Nanoparticles

Protein Sizer | Nanoparticle Sizing | Zeta Potential | Molecular Weight

# NanoBrook Omni

## Particle Sizer and Zeta Potential Analyzer



### SIZING

- Rapid and accurate nanoparticle size distributions
- Multimodal & unimodal size distribution software
- ISO 13321 and ISO 22412 compliant results
- Range: > 0.3 nm to 10  $\mu\text{m}$
- Three measurement angles: 15°, 90°, & 173°
- High power 35 mW diode laser
- Dynamic light scattering at 173° and 90°
- Temperature control, -5 °C to 110 °C
- Compact bench top unit, USB connection
- Molecular weight determination (relative and absolute through Debye plot)

### ZETA POTENTIAL

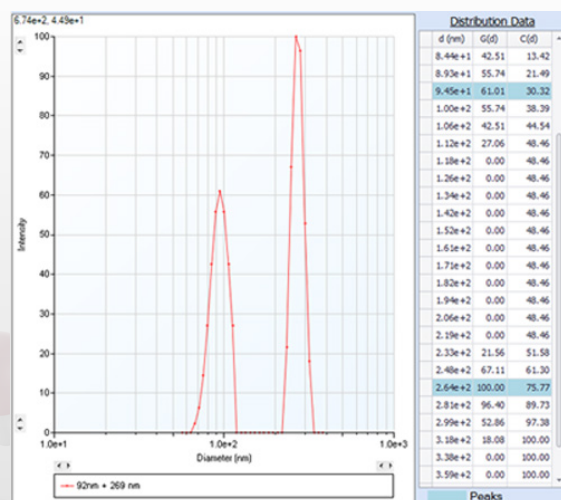
- Zeta potential for the difficult cases
  - For proteins, peptides, mAb, RNA, and other biological samples
  - For zeta potential in organic solvents
  - For oily or viscous media
  - For high-salt suspensions
  - For samples near the I.E.P.
- 1,000 times more sensitive than other techniques
- Disposable cuvettes, no contamination or alignment
- Built in automatic procedures and parameters (SOP)

### Rapid, Reliable, and Accurate Analysis

The new NanoBrook Omni particle size and zeta potential analyzer incorporates all you need for fast, routine, sub-micron measurements of size and zeta potential. Based on the principles of Dynamic Light Scattering (DLS) for particle sizing and distribution, and on Doppler velocimetry (electrophoretic light scattering, ELS) for zeta potential, most measurements only take a minute or two. The instrument also includes Phase Analysis Light Scattering (PALS) measurements for samples with low mobilities (saline, PBS).

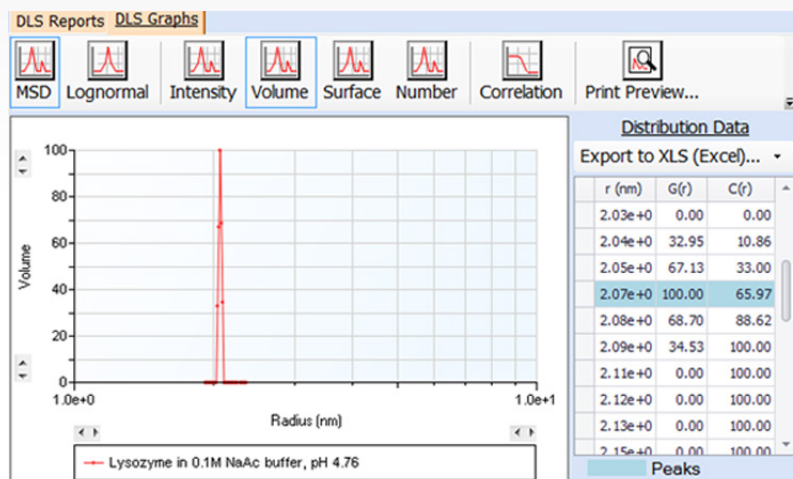
### Three Scattering Angles:

Measurements of traditional colloids are usually made at 90° scattering angle due to the unbiased results measured. For nanoparticles and proteins, IgG and peptides, these < 50 nm samples can be measured using the backscattering angle (173°) for best S/N and reproducibility of measurements. Finally the 15° detection angle can be selected for added sensitivity with aggregation measurements. Zeta potential measurements are always performed using the 15° detection angle to minimize diffusion broadening.



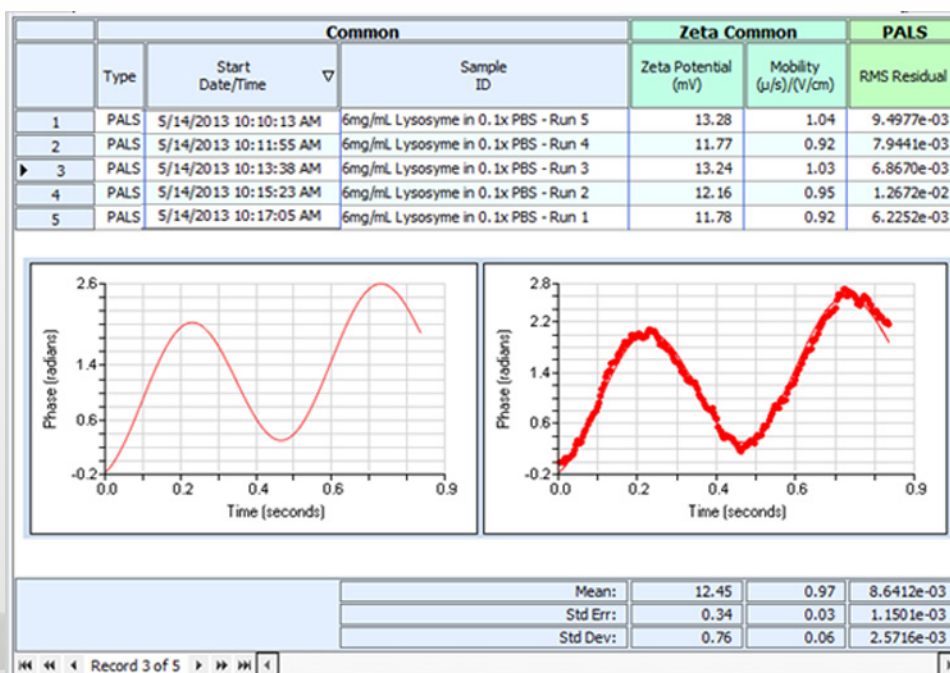
## Principles of Operation - Sizing

Dilute suspensions, on the order of 0.0001 to 1.0% v/v are prepared, using suitable wetting and/or dispersing agents, if required. A small ultrasonicator is sometimes useful in breaking up loosely-held agglomerates. At 173 sample volume may be reduced to 50  $\mu\text{L}$  with a polystyrene, U-shaped, disposable cuvette and the sample is recoverable. At 90° square polystyrene or glass cells (two or three mL) are used, one as small as 10  $\mu\text{L}$  (non-disposable). In addition, disposable, glass round cells with reusable Teflon stoppers are used for aggressive solvent suspensions. In all case, just a few minutes are required for the sample and cell to equilibrate with the actively controlled temperature environment inside the NanoBrook Omni.



## Principles of Operation - Zeta Potential

The NanoBrook Omni utilizes phase analysis light scattering to determine the electrophoretic mobility of charged, colloidal suspensions. Unlike its cousin, Laser Doppler Velocimetry (LDV, [sometimes called Laser Doppler Electrophoresis, LDE]), the PALS technique does not require the application of large fields which may result in thermal problems or denaturation, because in the measurement of phase shift, the particles need only to move a fraction of their own diameter to yield good results. In salt concentrations up to 2 molar and with electric fields as small as 1 or 2 V/cm enough movement is induced to get excellent results. In addition, the Autotracking feature compensates for thermal drift.



# *NanoBrook Omni*

## Particle Sizer and Zeta Potential Analyzer

### Specifications

Sample Type	Sizing: nano particle and colloidal-sized materials, in any non-absorbing liquid. Zeta potential: proteins, nano particle, polymer and colloidal-sized materials, suspended in any non-absorbing liquid, with relative permittivity (dielectric constant) > 1.5 and viscosity < 30cP.
Size Range	Sizing: > 0.3 nm to 10 µm diameter, depending on refractive index and concentration Zeta potential: 1 nm to 100 µm, sample dependent
Mobility Range	10 <sup>-11</sup> to 10 <sup>-7</sup> m <sup>2</sup> /V*s
Zeta potential range	-500 mV to 500 mV, sample dependent
Maximum sample conductivity	Sizing: unlimited Zeta potential: 30 mS/cm
Sample Cells	Sizing: 1 to 3 mL disposable plastic, 50 µL disposable, 40 µL quartz flow cell, 10 µL quartz minimum Zeta potential: 180 µL, 600 µL, 1250 µL
Concentration Range	Sizing: 0.1 ppm to 50 mg/mL, depending on refractive index and concentration Zeta potential: 40% v/v, sample dependent
Signal Processing	Sizing: Dynamic Light Scattering, DLS Zeta potential: Electrophoretic & true Phase Analysis Light Scattering, ELS & PALS
Correlator	Brookhaven's TurboCorr, multitau, research grade with 510 channels, covering the equivalent of 10 <sup>10</sup> linearly-spaced channels, 100% efficiency, real-time operation over the entire delay-time range.
Precision	Sizing: ± 1% typical Zeta potential: plus minus 3% typical
Temperature Control	-5 ° C to 110 ° C, ± 0.1 ° C, active control. No external circulator required.
Condensation Control	Purge facility using dry air, nitrogen preferred
Standard Laser	35 mW red diode laser, nominal 640 nm wavelength
Scattering Angle	173°, 90° & 15°
Data Presentation	Average & width, lognormal fit, and multimodal size distribution for sizing Doppler Frequency Shift, electro-phoretic mobility, zeta potential using Smoluchowski, Hückel, or Henry
Compliance	ISO13321 and ISO22412 compliant results for sizing
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



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