














BIOPHYSICAL CHARACTERIZATION SOLUTIONS OVERVIEW

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|  PARTICLE SIZE |  PARTICLE CONCENTRATION |  SOLUTION VISCOSITY |
|  PARTICLE SHAPE |  PARTICLE COUNT |  ZETA POTENTIAL |
|  MOLECULAR WEIGHT |  MASS MEASUREMENT |  LABEL FREE BINDING |
|  MOLECULAR SIZE |  MOLECULAR STRUCTURE |  MICROCALORIMETRY |
|  PARTICLE MASS |  PROTEIN AGGREGATION |  CHEMICAL IDENTIFICATION |



BIOPHYSICAL CHARACTERIZATION TOOLSET



Measurement	Particle size Molecular weight Molecular size Zeta potential Protein mobility Microrheology Protein aggregation	Microcalorimetry Binding affinity (K_D) Reaction stoichiometry (n) Reaction enthalpy (ΔH) Reaction entropy (ΔS)	Thermal transition midpoint (T_m) Enthalpy of unfolding (ΔH) Heat capacity change (ΔC_p) of denaturation	Absolute molecular weight Molecular size Molecular structure Concentration Protein aggregation Intrinsic viscosity
Technology	Dynamic Light Scattering (DLS) Electrophoretic Light Scattering (ELS) Static Light Scattering (SLS)	Isothermal Titration Calorimetry (ITC)	Differential Scanning Calorimetry (DSC)	Size Exclusion Chromatography (SEC)
Product	Zetasizer Range RESEARCH PERFORMANCE, OPERATIONAL SIMPLICITY, APPLICATION VERSATILITY	MicroCal PEAQ-ITC GOLD STANDARD FOR BIOMOLECULAR INTERACTION ANALYSIS	MicroCal PEAQ-DSC GOLD STANDARD PROTEIN STABILITY ANALYSIS FOR THE REGULATED ENVIRONMENT	OMNISEC RESOLVE, REVEAL, REALIZE – A NEW STANDARD IN GPC/SEC
Applications	<ul style="list-style-type: none"> • Measure the size (0.3 nm – 10 μm) of nanoparticles and biomolecules in solution • Monitor, predict and optimize bioformulation stability • Characterize the viscoelastic properties of solutions • Understand propensity to aggregate • Measure product purity and oligomeric state 	<ul style="list-style-type: none"> • Study small molecule:biomolecule and biomolecule:biomolecule interactions • Confirm binding affinity and activity • Determine reaction stoichiometry and thermodynamic parameters • Understand structure-activity relationships • Use in drug discovery for hit validation, lead optimization & understanding mechanisms of action 	<ul style="list-style-type: none"> • Analyze protein folding and unfolding mechanisms • Understand product stability, predict developability and maximize shelf-life • Optimize purification strategies • Reliably assess product biosimilarity and batch:batch comparability • Characterize protein targets for small molecule drugs 	<ul style="list-style-type: none"> • Assess and predict oligomeric state and stability • Predict and understand activity and immunogenicity • Control half-life, cell permeability and understand crystallization of protein conjugates • Measure solute concentrations • Understand molecular structure by analyzing intrinsic viscosity
Features and benefits	<ul style="list-style-type: none"> • Simplicity of operation means minimal training & robust results • Choice of technologies for exceptional versatility • Autotitrator option for automated trend measurements • Excellent sensitivity (NIBS) for nanoparticles & proteins • Accuracy & repeatability assured by high optical quality & temperature control • Zetasizer APS offers 96 or 384 multiwell plate format 	<ul style="list-style-type: none"> • Low sample consumption • Direct, label-free, in-solution analysis • Measures multiple parameters in a single experiment • Provides complete thermodynamic profile of molecular interactions • High throughput with walk-away automation • Wide affinity range & broad dynamic range • Simple operation and high quality data 	<ul style="list-style-type: none"> • Simple SOP-based operation and high quality automated data analysis for non-subjective, highly reproducible thermal stability data • Low sample consumption • Direct, label-free, in-solution analysis • High throughput with walk-away automation • 21 CFR Part 11 and Annex 11 compliance-ready 	<ul style="list-style-type: none"> • Completely integrated solution for managing the separation in one advanced unit • Unrivalled temperature control, baseline stability and advanced detectors mean high sensitivity, resolution and reproducibility even at low concentrations • RI, UV/Vis PDA, light scattering, & viscosity detectors for a wide range of applications • Simple, automated operation increases productivity



<p>Molecular size Protein aggregation Relative viscosity</p>	<p>Particle size Protein aggregation Particle mass Particle concentration</p>	<p>Particle size Particle shape Particle count Component-specific chemical identification</p>	<p>Particle size Particle concentration Protein aggregation</p>	<p>Measurement</p>
<p>Taylor Dispersion Analysis (TDA) with UV Area Imaging</p>	<p>Resonant Mass Measurement (RMM)</p>	<p>Static Automated Imaging and Raman Spectroscopy Morphologically-Directed Raman Spectroscopy (MDRS®)</p>	<p>Nanoparticle Tracking Analysis (NTA)</p>	<p>Technology</p>
<p>Viscosizer TD AUTOMATED ULTRA-LOW VOLUME BIOPHYSICAL CHARACTERIZATION</p>	<p>Archimedes MASS MEASUREMENT ON A DIFFERENT SCALE</p>	<p>Morphologi range AUTOMATED IMAGING-ADVANCED PARTICLE CHARACTERIZATION</p>	<p>NanoSight range VISUALIZE AND MEASURE NANOPARTICLE SIZE AND CONCENTRATION</p>	<p>Product</p>
<ul style="list-style-type: none"> Analyze stability of small molecules, peptides and proteins, plus mixtures of these species, even in complex formulations Perform analysis at low concentration and ultra-low volume Screen for molecule developability earlier in the pipeline Simultaneously measure relative viscosity of samples Orthogonally assess protein stability and solubility from candidate validation to early formulation development 	<ul style="list-style-type: none"> Measure the size (50 nm – 5 µm) and concentration of nanoparticles and biomolecules in solution Monitor, predict and optimize bioformulation stability Understand propensity to aggregate Discriminate between particle types (e.g. silicone oil droplets and protein aggregates) Use for particle coating studies 	<ul style="list-style-type: none"> Physically characterize components within a mixture Measure particle shape differences, where size alone does not differentiate Detect, count and identify aggregates and contaminant particles Troubleshoot and perform root cause analysis for manufacturing Validate QC particle sizing methods 	<ul style="list-style-type: none"> Detect and visualize particle populations, one particle at a time (10 nm to 2 µm) Track protein aggregation in real-time Characterize extracellular vesicles for disease-state studies Drug delivery systems development Viral vaccine research Nanotoxicology & biomarker detection 	<p>Applications</p>
<ul style="list-style-type: none"> Unique and label-free technology Fully automated methodology Unique dual-pass relative viscosity analysis gives high resolution and reproducibility Changeable UV wavelength to accommodate multiple target molecule types Use of matched buffer renders excipients and surfactants invisible 	<ul style="list-style-type: none"> Suitable for use with a wide range of sample concentrations without dilution Fast, NIST-traceable calibration Low sample consumption Highly reproducible results 	<ul style="list-style-type: none"> Multiple parameters in one measurement: shape, size, transparency, count, and chemical ID Fully automated system removes operator subjectivity and speeds throughput Range of sample presentation options: dry powders, wet suspensions, particulates on membranes Easy and reproducible sample dispersion 	<ul style="list-style-type: none"> Simultaneous measurement of multiple characteristics – saves time and sample Visual validation of results SOP-driven for routine use Minimal sample preparation or consumables needed Fully temperature-controlled Fluorescence mode for detection and differentiation of labeled particles 	<p>Features and benefits</p>

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