Multiplelabs
Turnkey Laboratories Solutions

Analytical®
Technologies Limited

NSZA 3000 series

Laser Particle Size Analyzer

EPCC / PRODUCTS / APPLICATION / SOFTWARE / ACCESSORIES / CONSUMABLES / SERVICES

Analytical Technologies Limited

An ISO 9001 Certified Company

www.analyticalgroup.net

The NSZA 3000 series employs a well-established particle measurement technology—Laser Diffraction Technology, covering a particle size range of 0.02 - 2,600 μm.There are 92 photoelectric detectors to convert light signals from the scattering spectrum to electrical signals, which are transmitted into an intelligent software. By implementing the Mie scattering theory to the data and performing mathematical conversion, the accurate and reliable particle size distribution can be derived.

The modular design of the NSZA 3000 series endows it with versatile capabilities.The dynamic imaging module enables combined laser and imaging tests, extending the measurement range up to 3,500 μm and providing both particle size and shape analysis. The diverse dispersion system modules support a wide range of testing needs, including both dry and wet dispersion methods to meet various testing requirements.

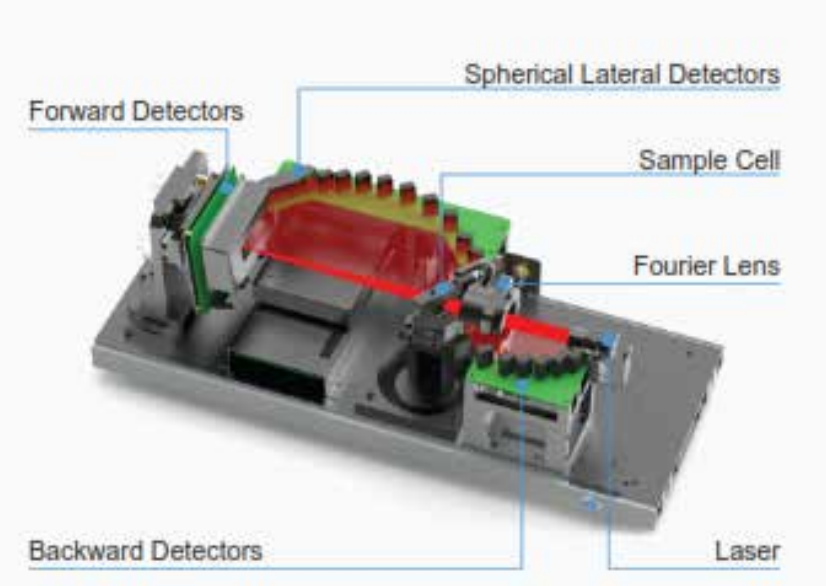
The NSZA 3000 series excels in particle analysis through its dual optical systems:laser diffraction and dynamic imaging. The combination of dual optical systems allows for comprehensive particle characterization,making the NSZA 3000 series a versatile and indispensable tool for advanced particle analysis.

Laser Diffraction System:

Technologies Driving Instrument Excellence

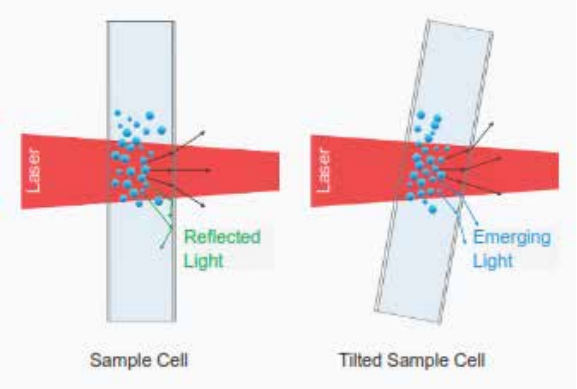
• Combination of Fourier and Inverse Fourier Design:

The NSZA 3000 series is superior in the combination of Fourier and inverse Fourier design. Its laser system structure features 92 detectors in total,including forward,lateral, and backward detectors. Equipped with a widely distributed spherical detector array, the NSZA 3000 series can detect light signals across a broad angular range from 0.016° to 165°, enabling precise measurement of both small and large particles.



Total internal reflection occurs when the light transitions from a denser medium (glass) to a rarer one (air) and the incidence angle exceeds the critical angle, limiting the angles at which light can escape.

The NSZA 3000 series innovative sample cell,with its tilted design effectively minimizes total internal reflection.This allows more light signals to reach the detectors,enhancing measurement reliability and ensuring the acquisition of more comprehensive sample information.



Refraction Index Measurement:

Under Mie theory,measurements by laser diffraction can be particularly challenging for samples due to a variety of factors, including the following:

- Samples with completely unknown complex refractive index;
- Samples with heterogeneous chemical composition;
- Samples with significantly different particulate optical properties compared to the bulk material;
- Samples having a distinctly strong optical dispersion (small Abbe number).

Material	Refractive index (literature)	Refractive index (measured)
$CaCO_3$	(1.53 - 1.65) - 0.1i	1.62 - 0.1i
$BaSO_4$	1.65 - 0.1i	1.68 - 0.1i
ZnO	2.008 - 0.1i	2.02 - 0.1i
Carbon black	1.88 - 0.55i	2.02 - 0.1i
Al Powder	1.4 - 3.9i	1.42 - 3.0i
SiO_2 – Quartz	1.54 - 0.00i	1.54 - 0.01i

To address these challenges, determining the refractive index is one of the most effective solutions. The NSZA 3000 series offers the following capabilities:

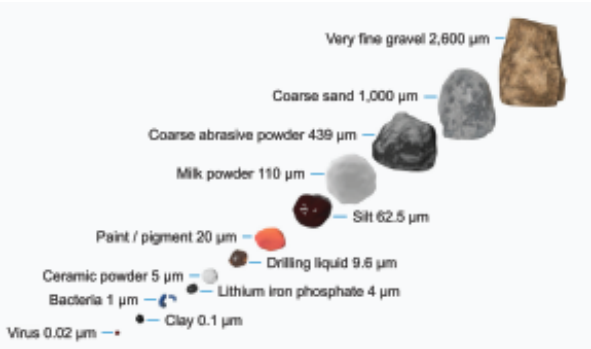
- Determine refractive index for samples with unknown refractive index;
- Measure samples with unknown properties;
- Verify the known data of a material at a specific light wavelength;
- Provide key parameters to calculate particle size distribution in real-time.

Laser Diffraction System:

Superior Performance in Particle Size Analysis:

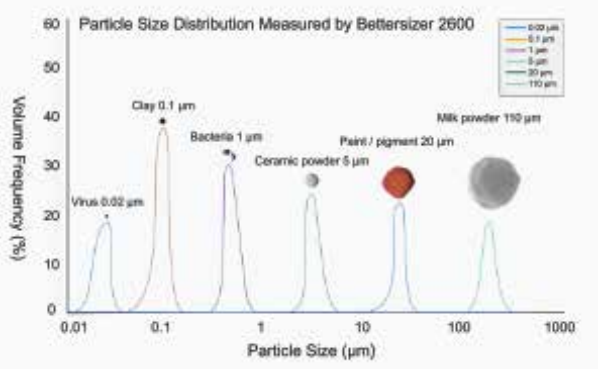
Wide Measurement Range:

Due to the instrument's excellent laser system design with 92 detectors and a very wide angular range from 0.016° to 165°, it achieves a measurement range from 0.02 μm to 2,600 μm, covering both nano and millimeter scales.



High Resolution:

The NSZA 3000 series is capable of distinguishing different samples with varying particle sizes within a single measurement due to its highresolution analysis ability.



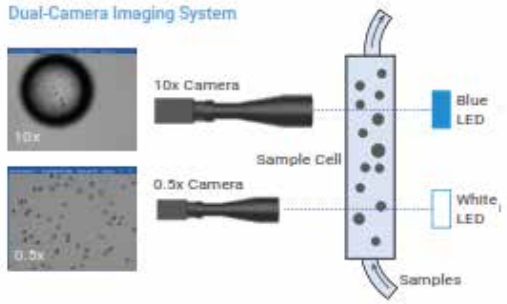
High Sensitivity:

When gradually adding one sample to the other, the NSZA 3000 series displays the change of particle sizdistributions in the curve, verifying its excellent sensitivity.

Dynamic Imaging System:

PIC-1: Modular Dual-Camera Imaging System Design:

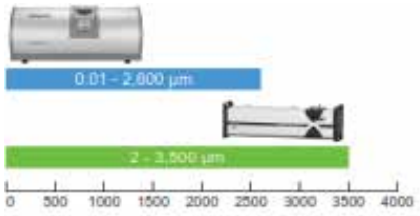
The PIC-1 features a dual-camera dynamic imaging system, making it a leading dynamic imaging module that seamlessly integrates with the NSZA 3000 series. As the dispersion system transports particles through the sample cell, the high-speed cameras capture and convert images to digital format for real-time analysis. Going beyond mere particle size distribution, this capability allows scientists, researchers, and engineers to utilize particle shape characteristics for a deeper understanding of particles.



Broadened Insight with Modular Imaging Expertise:

Extended Measurement Range

The seamless combination of laser diffraction and image analysis broadens the measurement range of NSZA 3000 series to an impressive 3,500 µm. Samples with extremely broad distributions are now possible to measure, such as river sediment.

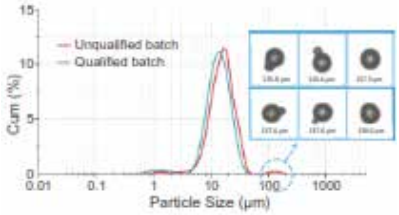


24 Detailed Particle Parameters

The PIC-1 offers comprehensive data by capturing real-time particle images, allowing customers to study individual particles in detail. With the ability to analyze 24 particle size and shape parameters, the PIC-1 provides an in-depth understanding of particle characteristics.

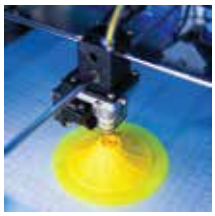
Oversized Particle Detection for Powder Consistency:

The combination of laser diffraction and image analysis can sensitively detect oversized particles that are statistically underrepresented within a wide-distributed sample,such as oversized grain, agglomerates, air bubbles, etc.



Applications and Industries:

Industries	Samples	Significance
Pharmaceuticals 	Lactose, powder inhalers, magnesium stearate, microcrystalline cellulose, etc.	The particle size and size distribution of pharmaceuticals could affect the dissolution, body absorption, efficacy, and safety of drugs. The NSZA 3000 series is capable of closel monitoring the particle sizes during the processes of pharmaceuticals development.
Abrasives 	Silicon carbide, diamond, corundum, garnet, boron nitride, etc.	Optimizing particle size and size distribution in abrasive materials maximize final products' performances while minimizing material waste. Monitoring particle size and identifying agglomerations in raw material could be achieved via the dynamic image analysis technology in NSZA 3000 series.
Batteries 	Lithium iron phosphate, lithium cobalt oxide, lithium manganate, modified graphite powder, etc.	The NSZA 3000 series monitors the particle size distributions of the lithium-ion battery materials, which are critical in affecting the performances of a battery, including energy storage, stability, and safety. It is essential to strictly control the particle size distributions of lithium-ion battery materials.
Building Materials 	Cement, rock, clay, sand, wood, gravel, synthetic polymers, etc.	The particle size distribution of cement directly affects the hardening rate, strength, and fluidity of the final set concrete, which is the primary application of cement. Accurate and repeatable measurements of the cement particle size provided by the NSZA 3000 series reduce costs and provide an optimized distribution in the concrete manufacturing process.
Paints, Inks & Coatings 	Titanium dioxide, organic pigments, iron oxides, ceramic inks, etc.	The NSZA 3000 series characterizes particle size and size distribution of pigment-based inks.It is a crucial process in ensuring the ink remains stable over long periods of storage to prevent aggregation, color inconsistencies, and blockages in the channels or nozzles.

Industries	Samples	Significance
Mining & Minerals 	Calcium carbonate, kaolin, talc,quartz powder, graphite, barite, wollastonite,hydromagnesite, diatomite,mica, zirconium silicate, etc.	Minerals are used in many industries, including construction, fracking and abrasives. The perfo-rmance of these minerals strongly depends on the size and distribution of the particles, which can be accurately measured and characterized by the NSZA 3000 series.
Food & Beverages 	Sugar, milk, chocolate, coffee, mayonnaise, flour, etc.	Many important characteristics of food products, such as taste,dissolution,and extraction behavior, are affected by the particle size and shape of particulate ingredients. Equipped with dynamic image analysis technology,the NSZA 3000 series is an ideal particle analyzer for the food and beverage industry.
3D Printing Materials 	Cement, rock, clay, sand, wood, gravel, synthetic polymers, etc.	The particle size distribution and particle shape of 3D-printing raw materials determine the degree of surface smoothness of the final printed product. Using the NSZA 3000 series with the PIC-1, the particle size distribution and particle shape could be optimized, thereby controlling the quality and spreadability of the powders for additive manufacturing
Ceramics 	Aluminum oxide, zirconium oxide, iron oxide, etc.	Particle size analysis by the NSZA 3000 series can help the manufacturers to determine the optimum time and temperature required for the green body, as a ceramic powder with a proporti-on of smaller particles reduces the sintering time due to its larger surface area. The dual camera optical system in PIC-1 effectively captures the images of agglomerated oversized particles during the R&D process.
Paints, Inks & Coatings 	Lipstick, mascara, eye shadow, moisturizer, skin cream, etc.	For cosmetics, the NSZA 3000 series aids in monitoring subtle differences in color and shine controlled by differences in the particle size distribution. The smoothness or UV light-blocking properties of creams also vary depending on the particle size distribution.

NSZA 3000 series Family

Wet Dispersion Modules:

Parameter	3804	3080N	3080N Pro	3802
Liquid volume	≤ 8 mL	50 - 80 mL	80 - 200 mL	≤ 600 mL
Automation	Semi-automated	Semi-automated	Fully automated	Fully automated
Anti-corrosive	Yes	Yes	Yes	No

Dry Dispersion Modules:

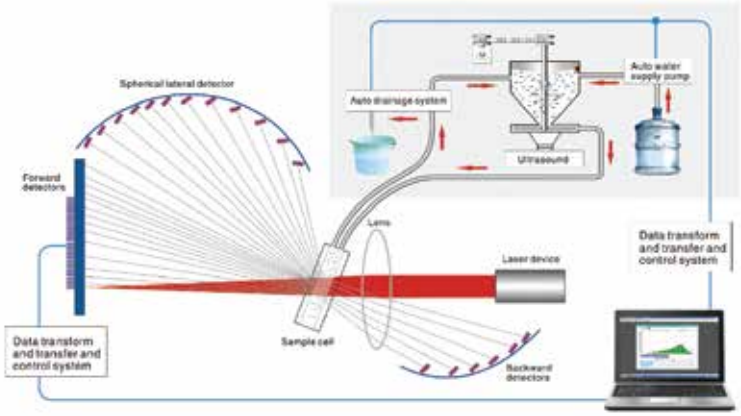
Parameter	3902	3903
Powder mass	0.2 - 10 g	0.02 - 1 g
Automation	Fully automated	Fully automated

Imaging Module

Parameter	3001
Principle	Dynamic image analysis
Application	Particle shape analysis

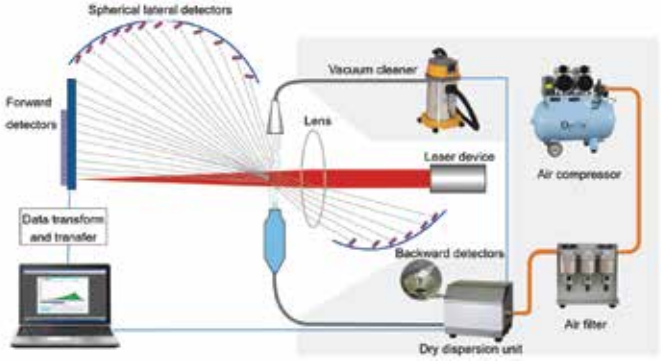
Wet Dispersion System

The wet dispersion process begins with adding water or an organic solvent as the dispersing medium. A stirrer prevents settling, and an ultrasonic transducer aids dispersion and removes bubbles.The dispersed particles then flow into the optical systems for measurement and are recirculated to ensure continuous analysis.



Dry Dispersion System

Dry powder samples are loaded into a sample container, which feeds them into the main disperser through vibration or high-pressure air produced by an air compressor. Inside the disperser, the particles are separated and any clumps are broken up. The dispersed particles then pass through the laser diffraction system for measurement before being collected by a vacuum cleaner.



Wet Dispersion Modules:

3802 Automatic Wet Dispersion Unit

Parameter	Specification
Measurement range	0.02 - 2,600 µm
Stirring speed	300 - 2,500 rpm
Ultrasonic powder	50 W max
Volume	600 mL max
Medium	Water
SOP	Yes

3802 is designed for particle dispersion with water as the medium. It is made up of ABS shells. The components of it include centrifugal pump, peristaltic pump,ultrasonic disperser, pinch valve, control circuit, etc.

3080N and 3080N Pro - Anti-corrosive Wet Dispersion Unit

3080N Pro is an automatic particle dispersion unit with organic solvents.The manual 3080N is a basic entrylevel model.Both models include stainless steel shells,centrifugal pump, ultrasonic disperser, PTFE pipeline,etc.

Parameter	Specification	
	3080N	3080N Pro
Measurement range	0.02 - 2,600 µm	
Stirring speed	300 - 3,000 rpm	300 - 2,500 rpm
Ultrasonic powder	50 W max	
Volume	50 - 80 mL	80 - 200 mL
Medium	Ethanol, Methanol, Isopropanol, Ether, Toluene, Xylene, Acetone, Octane, NMP solvents, etc.	
SOP	No	Yes

3804 - Small Volume Wet Dispersion Module

3804 is designed for valuable or small-volume sample measurements, where the medium is water or organic solvent.

Parameter	Specification
Measurement range	0.02 - 2,600 µm
Stirring	Semi-automated
Volume	8 mL max
Medium	Water or organic solvent
SOP	No

Dry Dispersion Modules:

3902 - Automatic Dry Dispersion Unit

3902 is suitable for the dispersion of dry powder particles with compressed gas.3902 is made up of electromagnetic vibration feeder, venturi pipe, gas circuit, electric circuit, pressure sensor, etc.

Parameter	Specification
Measurement range	0.1 - 2,600 µm
Powder mass	0.2 - 10 g
Air pressure	0.1 - 0.8 MPa
Funnel height	0.7 - 2.9 mm
Medium	Air, nitrogen or noble gases
SOP	Yes

3903 - Small Volume Dry Dispersion Unit

3903 is designed for the dispersion of small amount dry powders with a minimum sample volume of 20 mg, using compressed gas. 3903 is composed of venturi pipe,gas circuit, electric circuit, sample tube, etc.

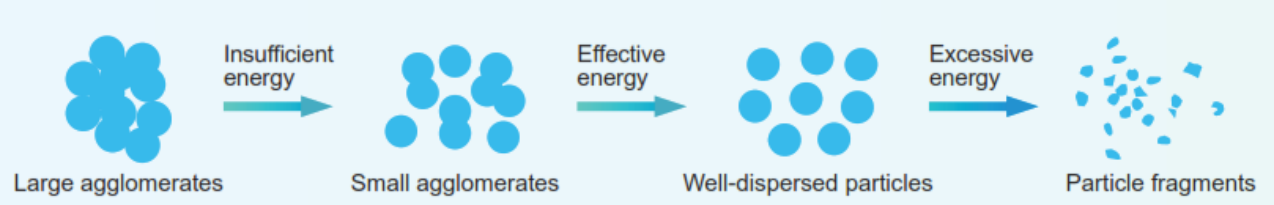
Parameter	Specification
Measurement range	0.1 - 2,600 µm
Powder mass	0.02 - 1 g
Volume	5 mL max
Air pressure	0.1 - 0.8 MPa
Medium	Air, nitrogen or noble gases
SOP	Yes

Effective Particle Dispersion:

The NSZA 3000 series advanced wet and dry dispersion systems are engineered to optimize dispersion energy and ensure effective dispersion without fragmentation.

Wet Dispersion: Precisely controls and monitors ultrasonication and mechanical stirring in liquid media.

Dry Dispersion: Provides exact air pressure for effective dispersion of dry powders.



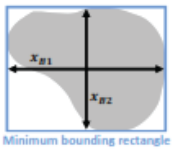
Imaging Module:

Dynamic Imaging Module:

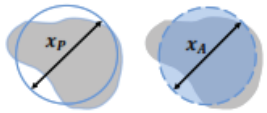
The dynamic imaging module is a versatile and comprehensive dynamic image analysis instrument,designed for seamless integration with the NSZA 3000 series laser particle size analyzer and the wet dispersion system. It primarily comprises two high-speed cameras, white and blue LED lights, and a sample cell, among other components. Utilizing dynamic image analysis, the precisely captures high-resolution images of particles in real time as they flow through the sample cell, allowing for detailed analysis of both particle size distribution and shape characteristics.

Parameter	Specification
Particle size range	2 – 3,500 µm*
Size and shape parameters	24
Camera type	CCD sensor, 1.5 Megapixels
Magnification	0.5x and 10x
Imaging rate	120 fps
Illumination	White and blue LED
Image recognition	Up to 10,000 particles per minute
Compliance	ISO 13322-2
Number of size and shape classes	≤100 (adjustable)
Voltage	AC 110 – 240 V, 50/60 Hz
Dimensions (L × W × H)	56 × 137 × 124 mm
Computer configuration	
Processor	Inter Core i3 or a higher
Memory	8 GB or higher
Hard disk space	1 T or higher
Motherboard	with PCI-E X16 interface
Computer system	Windows 7 or higher

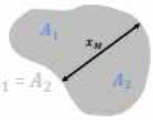
Typical Size Parameters:



x_{B1}, x_{B2}: long and short diameter



x_P: perimeter-equivalent diameter
x_A: area-equivalent diameter



x_M: Martin diameter

$x_{F\max}$, $x_{F\min}$ maximum and minimum Feret diameters

Typical Shape Parameters:

$$Aspect\ ratio = \frac{x_{Fmin}}{x_{Fmax}}$$

$$L/D\ ratio = \frac{x_{B1}}{x_{B2}}$$

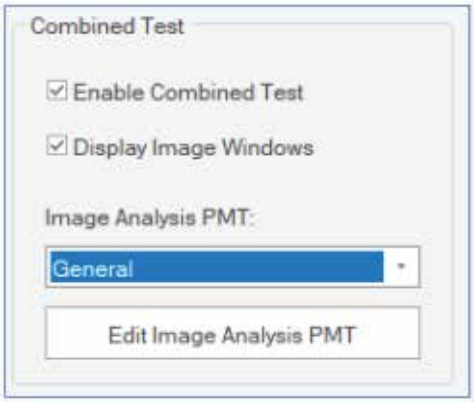
$$Circularity = \frac{x_A}{x_P}$$

$$Convexity = \frac{P_C}{P}$$

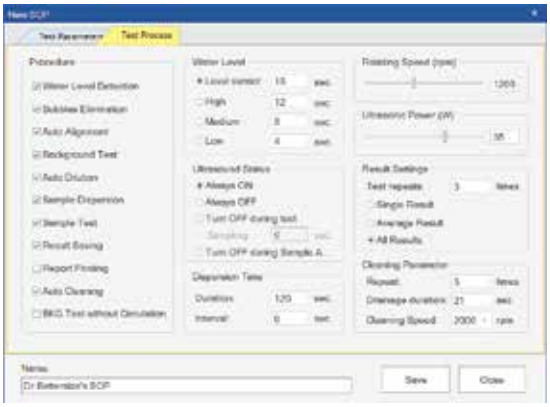
Versatile Test Setup:

Users can easily create new tests based on laser diffraction and dynamic image analysis methods. The software supports both automated and manual operations, providing flexibility for various sample types and testing conditions. The Standard Operating Procedure (SOP) offers a streamlined solution for standardized and automatic testing, ensuring operator-independent results that are objective and reliable.

Combined test



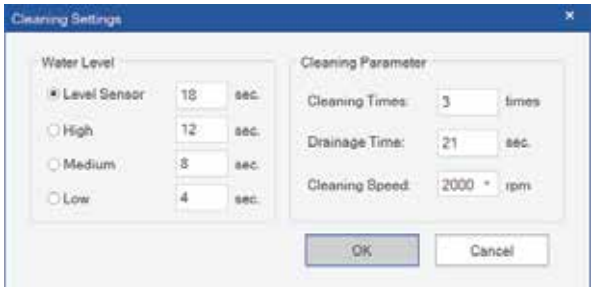
New SOP screen



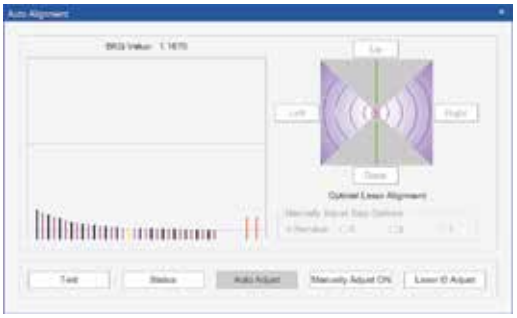
Automatic Pre-processing

The NSZA 3000 series software significantly enhances data quality by automating critical instrument functions like system cleaning,optical alignment,and sample dispersion. These automated processes ensure optimal instrument performance, leading to increased precision, accuracy, and reproducibility of results.

Cleaning setting:



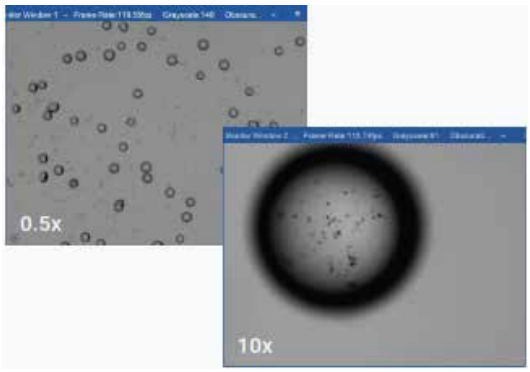
Auto alignment:



Real-time Testing:

During the testing process, NSZA 3000 series software delivers real-time insights into particle size distribution and shape.These immediate results provide valuable information on test progress and outcomes,enabling precise adjustments to achieve optimal results.

Imaging windows:

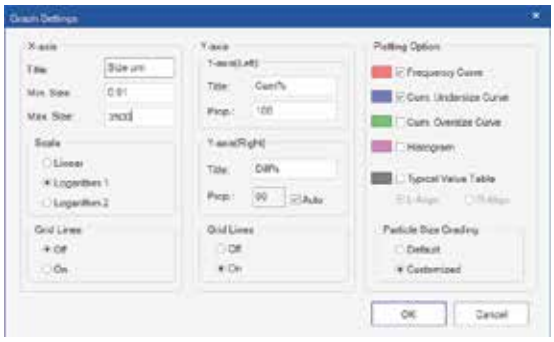


Laser diffraction test:

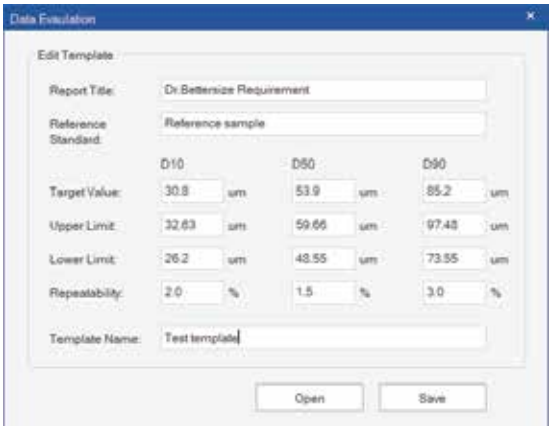
Comprehensive Data Analysis

The NSZA 3000 series software excels in delivering comprehensive data analysis and report generation capabilities.The software allows users to customize and edit reports to meet specific requirements, including various data points, charts, and graphical representations,to create clear and informative reports.The data evaluation tools can help in assessing the result quality.

Graphical editing:

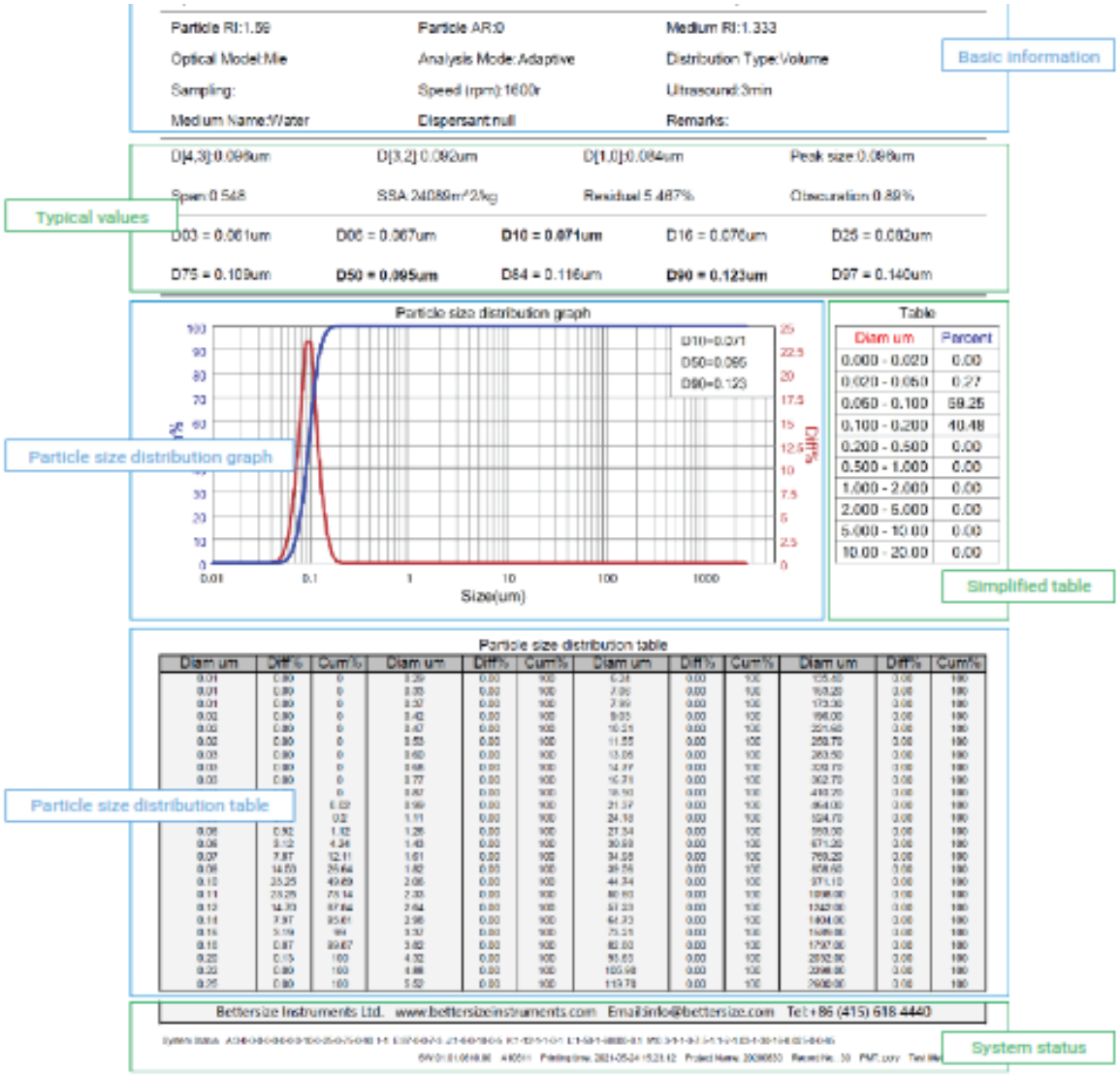


Data evaluation:



Highly Customizable Report:

• Complete and detailed data: Frequency and cumulative distribution curves, simplified and complete distribution table, etc.
• Editability: Users can easily edit the reports and change the font, layout, format, etc.



Specifications:

General	
Principle	Laser diffraction technology; Dynamic image analysis
Analysis	Mie scattering theory and Fraunhofer diffraction theory; Image analysis
Typical measurement time	Less than 10 seconds
Measurement performance	
Measuring range	0.02 - 2,600 µm (wet)*; 0.1 - 2,600 µm (dry)*; 2 - 3,500 µm (dynamic image)*
Accuracy	≤ 0.5% *
Repeatability	≤ 0.5% *
Number of size classes	100 (adjustable)
Feeding mode	Automatic circulation or micro cuvette (wet), Gas transportation (dry)
Special functions	SOP settings, refractive index measurement, sample ratio calculation
Main device	
Optical system	Laser diffraction system
Laser	10 mW, 635 nm, Class 1 laser
Detector	92 detectors
Measuring angle	0.016 - 165°
Dynamic imaging module	
Optical system	Dynamic imaging system
CCD camera	0.5x and 10x
Measuring range	2 - 3,500 µm
Frame rate	120 fps
Wet dispersion module	
Dispersion medium	Water or organic solvents
Stirring speed	300 - 2,500 rpm (BT-802, BT-80N Pro); 500 - 3,000 rpm (BT-80N)
Ultrasonication	Dry burning prevention, 50 W
Dry dispersion module	
Dispersion medium	Air / Nitrogen / Noble gas
Air pressure	0.1 - 0.8 MPa
Compliance	
System	RoHS, CE, ISO 13320, USP <429>, ISO 13322-2
Software	21 CFR Part 11
System parameters	
Dimensions (L x W x H)	70.5 x 31.8 x 29.5 cm
Weight	23 kg
Supply voltage	100 / 240 V, 50 / 60 Hz
Computer configuration (recommended)	
Computer interface	At least one high-speed USB 2.0 or USB 3.0 port required
Operating system	Windows 7 or higher
Hardware specification	Intel Core i5 Processor, 4GB RAM, 250GB HD, Widescreen monitor

Analytical®
Technologies Limited

HPLC Servicing, Validation, Trainings and Preventive Maintenance :

HPLC Servicing :HPLC Servicing : We have team of service engineers who can attend to any make of HPLC promptly @the most affordable cost.

Trainings :We also take up preventive Maintenace to reduce downtime of HPLC's Trainings.

AMC's/CMC :AMC's/CMC :We offer user training both in-House and at customer sites on HPLC principles, operations, trouble-shooting.

Validations :Validations :We have protocols for carrying out periodic Validations as per GLP/GMP/USFDA norms.

Instruments :Instruments :We offer instruments/Renting Services Modules like pumps,detector etc. on Rent.

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Analytical Technologies is synonymous for offering technologies for doing analysis and is the Fastest Growing Global Brand having presence in at least 96 countries across the global. Analytical Technologies Limited is an ISO:9001 Certified Company engaged in Designing, Manufaturing, Marketing & providing Services for the Analytical, Chromatography, Spectroscopy, Bio Technology, Bio Medical, Clinical Diagnostics, Material Science & General Laboratory Instrumentation. Analytical Technologies, India has across the Country operations with at least 4 Regional Offices, 6 Branch Offices & Service Centers. Distributors & Channel partners worldwide.

Our Products & Technologies

LCMS

Maldi TOF

Optima Gas Chromatograph

Flash Chromatograph

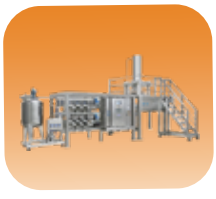
DAC Column

GCMS 3068

UHPLC

HPTLC

Ion Chromatograph



Production HPLC

HPLC

Column

DLS

Water purification system

Regulatory compliances

Corporate Social Responsibility

ANALYTICAL FOUNDATION is a Nonprofit Organization (NGO) for the purpose of:

1. Research & Innovation **Scientist's awards & International Conferance visit sponsership / QC Professional Awards**: Quality life is possible by innovation only and the innovation is possible by research only, hence **ANALYTICAL FOUNDATION** is committed to identify such personallities for their contributions across various field of Science and Technology and awarding them yearly. To participate for award, send us your details of research /testing/ publication at info@analyticalfoundation.org

Analytical Foundation

2. Improving quality of life by offering **YOGA Training courses, Work shops / Seminars** etc.

3.**ANALYTICAL FOUNDATION** aims to DETOXIFY human minds, souls and body by means of Yoga, Meditation, Ayurveda,Naturecure, Health Care, Ara, Events, Camps etc.

- A portion of profit of **ANALYTICAL GROUP** Company's goes into **ANALYTICAL FOUNDATION** for the aboce noble cause.

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