Bettersize

BETTER PARTICLE SIZE SOLUTIONS

PARTICLE SIZE

PARTICLE SHAPE

BeVision D3 Series

Bring Every Particle Into Focus



BeVision D3 Series
Particle Size and Shape Analyzer

The BeVision D3 Series Particle Size and Shape Analyzer is an advanced, fully automated analyzer based on Dynamic Image Analysis (DIA) technology. It delivers highly accurate particle size and shape characterization, making it an ideal solution for both research and quality control applications.



Wide Measurement Range

The BeVision D3 Series covers a broad measurement range from 0.5 µm to 26 mm. Its innovative dual-CMOS camera system simultaneously captures coarse and fine particles, enabling complete characterization of wide particle size distributions in a single measurement.

Seamless Replacement for Sieve Analysis

The built-in sieve correlation function produces results that are highly consistent with traditional sieve analysis. This allows the BeVision D3 Series to seamlessly replace mechanical sieving, significantly improving efficiency while maintaining trusted comparability.

Comprehensive Particle Morphology Analysis

With more than 37 size and shape parameters, the BeVision D3 Series delivers in-depth insight into particle morphology. It accurately measures key characteristics including length and width, aspect ratio, circularity, compactness and many more. This enables detailed and reliable analysis across all particle types, from granular to elongated and flaky materials.

Fully Automated Workflow

Powered by intuitive and robust BeVision DIA Software, the analyzer features a fully automated workflow that minimizes operator involvement and eliminates human error. Its ease of use and high throughput make it ideal for R&D laboratories and quality control environments in powder and particle-based industries.

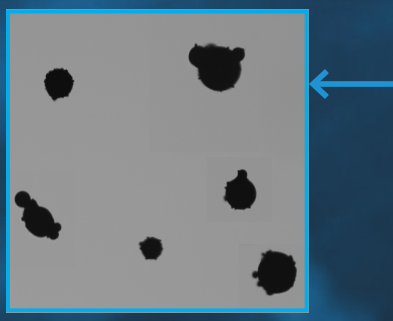
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Features & Benefits

- Wide measuring range: **0.5 µm - 26 mm**
- **37+** parameters for comprehensive size and morphology characterization
- Compliance with **ISO 13322-2** and **ISO 9276**
- Verified by NIST traceable standard
- **Ultra-high** resolution for narrow particle size distributions
- Accurate detection of oversize and undersize particles
- **Special applications**, including mixture analysis, thickness measurement of flaky particles, length and width measurement of elongated particles
- Results fully comparable with sieve analysis
- Standardized test procedure eliminates deviations caused by human error
- **Fully automated**, easy-to-use operation
- High efficiency with a typical test time of **~3 minutes**
- Almost **maintenance-free** operation

Dynamic Image Analysis (DIA) **Technology**



The BeVision D3 Series employs advanced Dynamic Image Analysis (DIA) technology to deliver fast, accurate, and reproducible particle size and shape measurements.

During analysis, dispersed particles pass through a precisely defined detection zone. Uniform background illumination across the entire field of view creates high-contrast particle projections, which are captured in real time by a dual high-speed camera system. One camera focuses on coarse particles, while the other simultaneously captures fine particles, enabling complete size and shape distribution analysis across a wide measurement range in a single run.

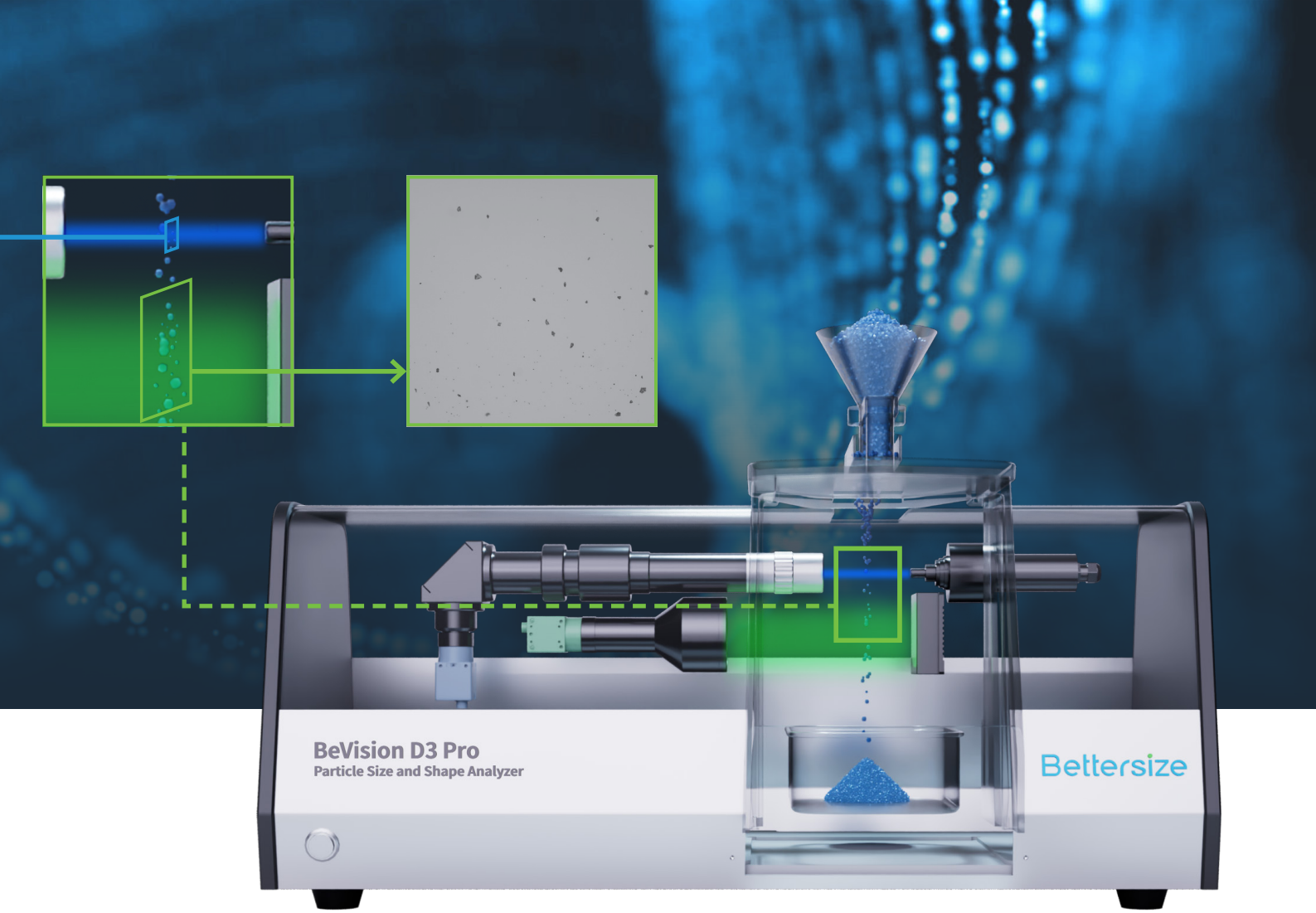
Why DIA Method?

Dynamic Image Analysis (DIA) combines the strengths of traditional and modern particle characterization techniques while eliminating their limitations. By analyzing individual particles in motion, DIA delivers accurate, representative, and reproducible results for both particle size and shape—across a wide measurement range.

Dynamic Image Analysis vs Traditional Methods

Features	Dynamic Image Analysis	Sieve Analysis	Static Image Analysis
Wide measurement range	●●●	●●	●●
Repeatability & Reproducibility	●●●	●●	●●
High-resolution for narrow distributions	●●●	●	●●●
Accuracy for broad distribution	●●●	●	●
Representative results	●●●	●●●	●
Particle morphology analysis	●●●	●	●●●
Comparable with other technologies	●●	●	●
Oversize particle detection	●●	●●●	●
Individual particle analysis	●●	●	●●●
Ease and speed of measurement	●●●	●	●

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Dual-CMOS Camera System

The dual-camera design allows simultaneous measurement of coarse and fine particles. This unique configuration provides comprehensive distribution information for wide-range samples with a single measurement, significantly improving efficiency and data integrity.

5-Megapixel CMOS Camera

Each camera is equipped with a global shutter, enabling sharp, blur-free imaging of fast-moving particles. High pixel resolution ensures precise contour detection and accurate size and shape analysis.

Green Parallel Planar Light Source

A uniform green planar light source ensures stable illumination across the entire field of view and consistent gray values in particle images. This simplifies image binarization and enhances measurement accuracy and repeatability.

High-Precision Optical Lens

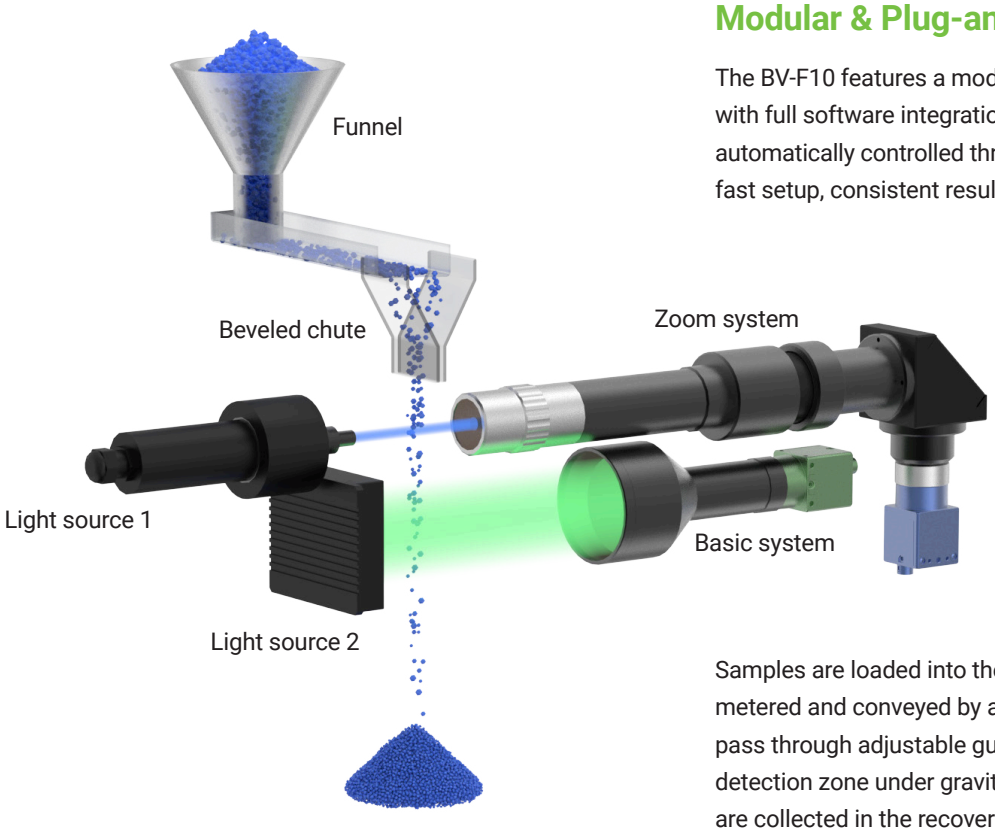
The high-precision lens system is engineered with zero perspective distortion, faithfully restores the true size and shape of particles for reliable and reproducible results.

Blue Light Source for Fine Particles

A dedicated blue light source delivers higher-resolution imaging for fine particles, enhancing edge definition and ensuring clear capture of fine particle characteristics.

BV-F10
Free Fall Dispersion Unit

The BV-F10 Free Fall Dispersion Unit features patented dispersion technology designed for uniform and gentle dispersion of free-flowing powders and granules. By leveraging gravity-driven free fall, it ensures highly representative particle presentation without mechanical stress or particle damage.



Modular & Plug-and-Play Design

The BV-F10 features a modular, plug-and-play architecture with full software integration. All dispersion parameters are automatically controlled through the system software, enabling fast setup, consistent results, and excellent repeatability.

Samples are loaded into the funnel, where particles are metered and conveyed by a vibrating chute. The particles then pass through adjustable guide slots and fall freely through the detection zone under gravity. After measurement, all particles are collected in the recovery tray, ensuring complete sample recovery.

Features & Benefits

- **Fully software-controlled adjustments**

  Funnel height, chute feeding rate and guide slot spacing are adjustable automatically via software.

- **Optimized particle dispersion**

  The beveled chute end redirects particles for uniform dispersion across the detection zone.

- **Controlled particle flow thickness**

  Adjustable guide slots control particle flow thickness, minimizing out-of-focus and particle overlap.

- **Intelligent feeding rate control**

  The software dynamically regulates the feeding rate during measurement to ensure optimal dispersion, efficiency and repeatability.

- **100% sample recovery**

  All particles are collected after measurement, making the system ideal for valuable or limited samples.

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Accessories of the BV-F10



Low-friction chute

Designed for non-spherical and irregular powders



High-friction chute

Optimized for spherical granules such as glass beads



150 ml funnel

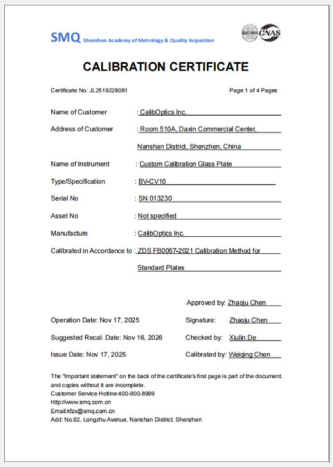


450 ml funnel

Expansion cylinder

Specialized **Calibration Unit**

The Specialized Calibration Unit is designed for accurate calibration and verification of the DIA imaging system, ensuring long-term measurement reliability and compliance.



SMQ Shenzhen Academy of Metrology & Quality Inspection

CALIBRATION CERTIFICATE

Certificate No: JL2519228081 Page 1 of 4 Pages

Name of Customer : CalibOptics Inc.
Address of Customer : Room 510A, Daxin Commercial Center, Nanshan District, Shenzhen, China
Name of Instrument : Custom Calibration Glass Plate
Type/Specification : BV-CV10
Serial No : SN 013230
Asset No : Not specified
Manufacture : CalibOptics Inc.
Calibrated in Accordance to : ZDS FB0067-2021 Calibration Method for Standard Plates

Approved by: Zhaoju Chen
Operation Date: Nov 17, 2025 Signature: Zhaoju Chen
Suggested Recal. Date: Nov 16, 2026 Checked by: Xiulin De
Issue Date: Nov 17, 2025 Calibrated by: Weiqing Chen

The "Important statement" on the back of the certificate's first page is part of the document, and copies without it are incomplete.
Customer Service Hotline:400-900-8989
http://www.smq.com.cn
Email:kfzx@smq.com.cn
Add: No.92, Longzhu Avenue, Nanshan District, Shenzhen



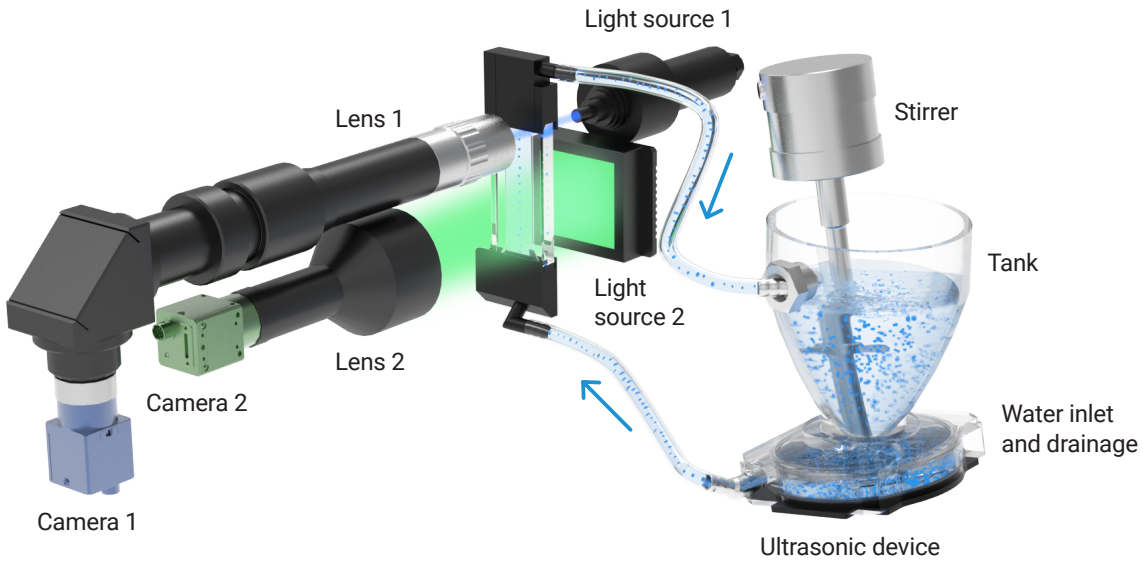
Features & Benefits

- **2-in-1 functionality**
  Used for both system calibration and performance verification.
- **Metrology-certified accuracy**
  Certified by the National Institute of Metrology, ensuring traceable and reliable results.
- **High precision**
  Measurement accuracy up to 1μm.
- **Simple and user-friendly operation**
  Quick setup and intuitive use for routine verification.
- **Automatic report generation**
  Software-generated calibration and verification reports support convenient annual verification and audit readiness.

BV-H10
Hydro Dispersion Unit



The BV-H10 Hydro Dispersion Unit is a water-based sample dispersion system designed for the preparation and measurement of water-insoluble powders, aqueous suspensions and slurries. Utilizing a combination of integrated stirring and ultrasonic dispersion technologies, the system effectively disperses particles that are prone to agglomeration, ensuring consistent and reliable measurement results.



Samples are introduced to the water-filled reservoir and continuously circulated through the glass flow cell for analysis. The built-in stirring and ultrasonic functions help remove entrained air bubbles and break apart particle agglomerates, providing optimal sample dispersion. After measurement, the system automatically initiates a cleaning cycle, minimizing operator intervention and maximizing efficiency.

Features & Benefits

- Fully automated operation with one-click measurement, cleaning and maintenance workflows.
- Intelligent background contamination detection ensures accurate and reliable results while reducing cleaning frequency and extending sample cell service life.
- Dual water-level monitoring system with an intelligent interlock mechanism for precise liquid-level control and enhanced operational safety.
- Integrated stirring and ultrasonic dispersion effectively eliminate air bubbles and disperse agglomerated particles for improved measurement accuracy.
- Automatic draining and cleaning functions streamline operation and increase laboratory productivity.

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BV-F10
BeVision D3
Particle Size and Shape Analyzer

User-Friendly
BeVision DIA Software

Multiple Measurement Modes

The BeVision DIA Software supports manual testing, automatic testing, and offline image analysis modes, providing maximum flexibility for a wide range of applications including R&D, routine quality control, and method development.



Comprehensive Measurement Results

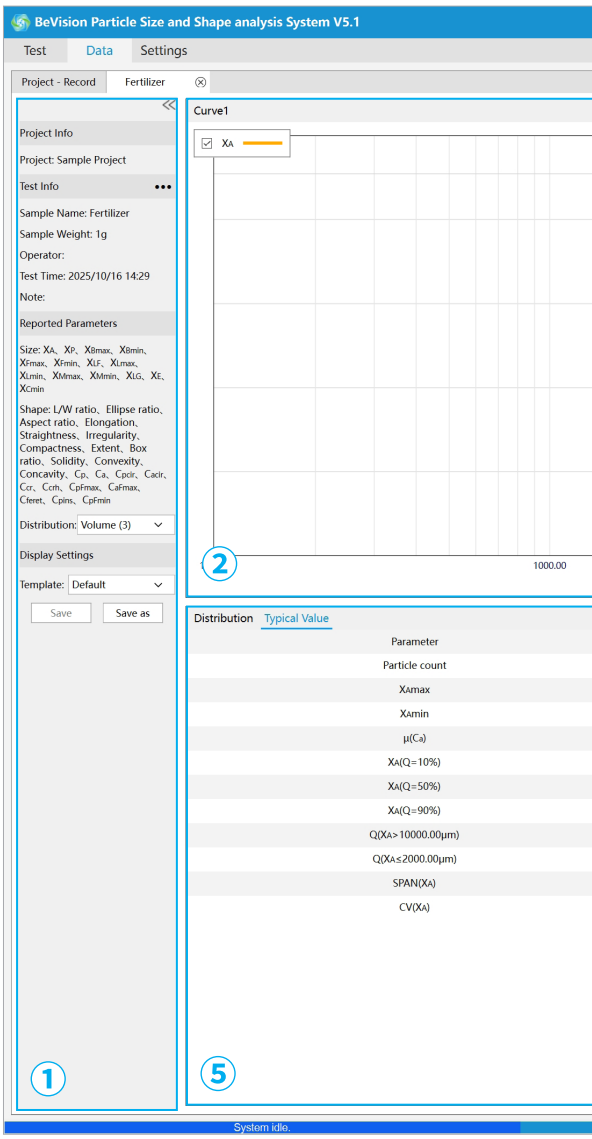
With 37+ size and shape parameters and multiple data visualization options, the software delivers deep insight into particle characteristics. Users can perform detailed statistics, compare multiple distributions, and achieve high-precision classification of particle populations for thorough and reliable evaluation.

Powerful Data Analysis Tools

The BeVision DIA Software is a robust data analysis platform offering advanced capabilities such as: particle screening and filtering, re-analysis without remeasuring, multi-parameter and multi-result comparison, flexible data export for further analysis.

Flexible Customization

Output formats, calculation parameters and reporting layouts can be customized to match specific application and quality control requirements. Customized settings can be saved as user-defined templates, ensuring consistency and efficiency across routine measurements with different users.



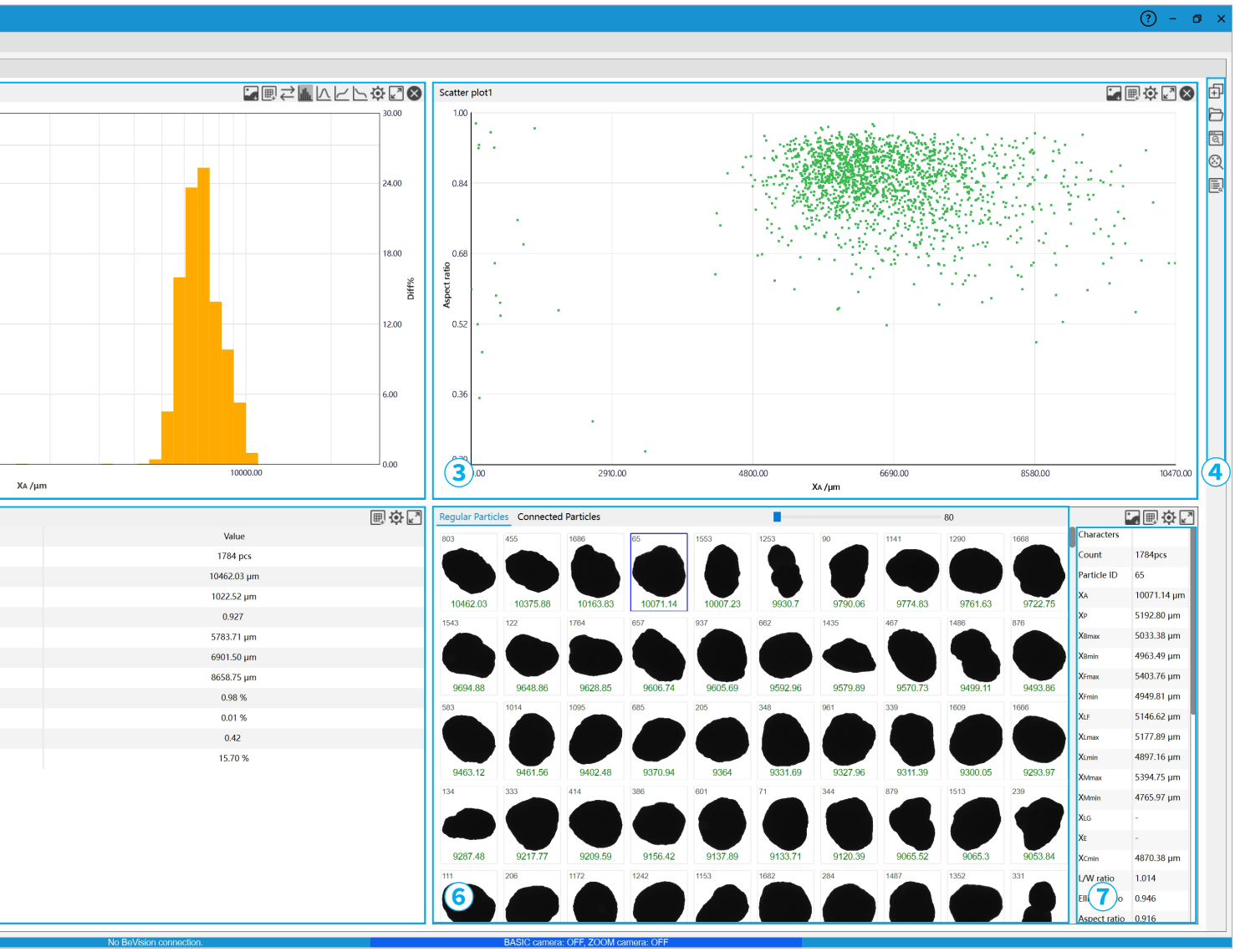
① Information Bar

Displays essential sample and test information at a glance. Users can freely switch between volume-based, area-based and number-based distributions.

⑤ Key Statistics

Customized key statistics of both size and shape distributions, including mean value, span, D10, D50, D90 and more.

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② Distribution Chart

Size or shape distributions are displayed as graphs or histograms. Distribution classification and parameters are fully customizable.

③ Scatter Plot

Evaluate particle populations across two dimensions, typically particle size and shape. This enables intuitive identification of trends, clusters and mixed particle populations.

④ Function Bar

Provides quick access to essential tools, including: add a chart, view raw particle images, re-analyze data, screening and filtering particles, view and export reports.

⑥ Particle Gallery

Displays all captured particle images, sortable in ascending or descending order by size or shape parameter.

⑦ Particle Details

Click on any individual particle image to view complete size and shape details for that specific particle.

Particle Size and Shape **Parameters**

Size Parameters

Equivalent Diameters
Area-equivalent diameter
Perimeter-equivalent diameter

Feret Diameters
Maximum Feret diameter
Minimum Feret diameter
X_{LF} ("Length")

Martin Diameters
Maximum Martin diameter
Minimum Martin diameter

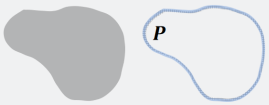
Legendre Ellipse Parameters
Major axis
Minor axis

Additional Size-Related Parameters
Geodesic length
Thickness
Minimum chord length

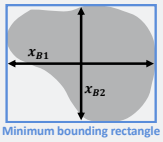
Minimum Bounding Rectangle Diameters
Long diameter
Short diameter



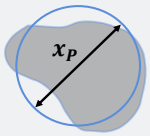
A: projected area of the particle



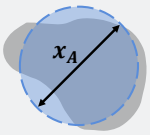
P: length of the projected contour



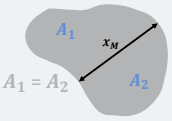
x_{B1} , x_{B2}: long and short diameters



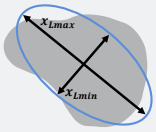
x_P: perimeter- equivalent diameter



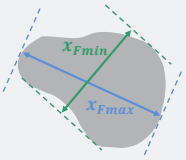
x_A: area- equivalent diameter



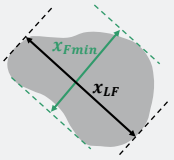
x_M : Martin diameter



x_{Lmax} , x_{Lmin}:
lengths of the major and minor axes



x_{Fmax} , x_{Fmin}:
maximum and minimum Feret diameters



x_{LF} : Feret diameter perpendicular to the minimum Feret diameter

Typical **Applications**



Plastics
Resin particles
Composite fillers
Recycled plastics



Agriculture
Fertilizers
Pesticide granules
Beans and grains



Powder Metallurgy & Additive Manufacturing
Metal powders
Ceramic powders



Chemicals
Laundry powders
Additive particles
Glass beads
Activated carbon
Molecular sieves



Building Materials
Aggregates
Sand
Fly ash

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Shape Parameters

Size Ratio Parameters (Two-Direction Comparison)
Aspect ratio
Length-to-width (L/W) ratio
Ellipse axis ratio

Roundness and Rectangularity
Circularity (11 algorithms)
Irregularity
Compactness
Extent
Box ratio

Contour Concavity Parameters
Concavity
Convexity
Solidity

Elongated Particle Parameters
Elongation
Straightness

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

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

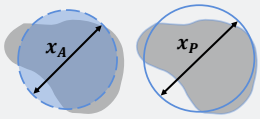
$$Ellipse\ ratio = \frac{x_{Lmin}}{x_{Lmax}}$$

$$Compactness = \frac{x_A}{x_{Fmax}}$$

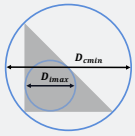
$$Extent = \frac{A}{x_{Fmax} \times x_{Fmin}}$$

$$Concavity = \frac{A_C - A}{A_C}$$

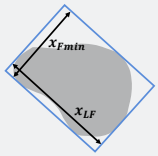
$$Solidity = \frac{A}{A_C}$$



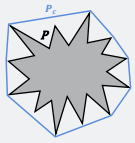
$$Circularity = \frac{x_A}{x_P}$$



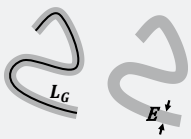
$$Irregularity = \frac{D_{imax}}{D_{cmin}}$$



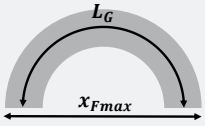
$$Box\ ratio = \frac{A}{A_{box}} = \frac{A}{x_{LF} \times x_{Fmin}}$$



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



$$Elongation = \frac{E}{L_G}$$



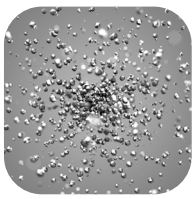
$$Straightness = \frac{x_{Fmax}}{L_G}$$



Mineral
Crushed ore
Slag
Sand



Foods & Beverage
Coffee beans
Sugar
Pet food



Abrasives
Diamond
Silicon carbide
Corundum
Silicon dioxide
Boron nitride



Pharma & Nutraceutical
Tablets
Granules
Pills



Batteries
Electrode Materials
Graphite

Application **Cases**

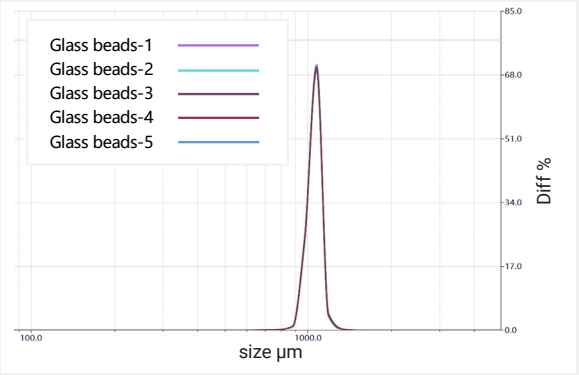
Based on its wide measuring range, direct measurement principle, and broad compatibility with diverse sample types, the BeVision D3 Series can be widely used in many industries ranging from research to quality control, providing in-depth insights into particle analysis.

01 Excellent Repeatability

Example: Glass beads

Glass bead particles are characterized in terms of length, diameter, and curvature. The measurement results closely align with intuitive visual assessments, confirming the accuracy and relevance of DIA-based morphology analysis.

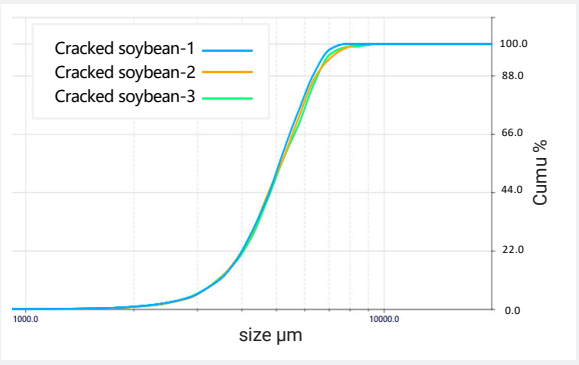
	D10	D50	D90
Mean /μm	994.74	1056.32	1112.13
Std. Dev /μm	0.39	0.43	0.76
Repeatability	0.04%	0.04%	0.07%



Example: Cracked soybeans

Even for cracked soybean particles with wide size distributions and highly irregular shapes, the repeatability of D50 remains better than 0.5%, confirming reliable performance for real-world samples.

	D10	D50	D90
Mean /μm	3531.49	5251.22	6856.61
Std. Dev /μm	25.08	23.89	87.72
Repeatability	0.71%	0.45%	1.28%



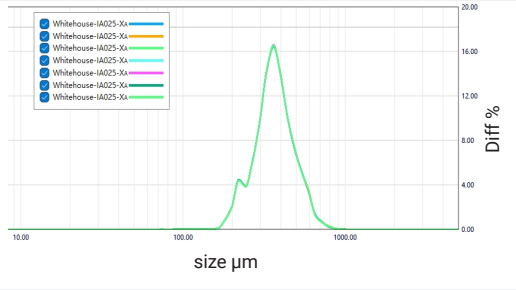
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02 Accurate Measurement Results

Example: Whitehouse IA025 standard

BeVision D3, equipped with the Free Fall Dispersion Unit, delivers highly accurate and repeatable particle size measurements. Performance is verified using NIST-traceable standards, demonstrating excellent measurement consistency with repeatability better than 0.5%.

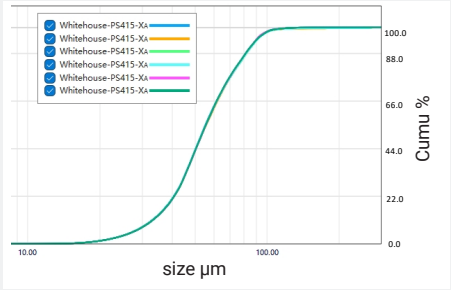
	D10	D50	D90
Mean /μm	250.04	361.17	521.12
Std.Dev /μm	0.27	0.25	0.83
Repeatability	0.11%	0.06%	0.16%



Example: Whitehouse PS415 standard

BeVision D3 paired with the BV-H10 Hydro Dispersion Unit, provides precise measurement of smaller and more complex particles. Accuracy is validated using NIST-traceable standards, achieving repeatability better than 0.5%.

	D10	D50	D90
Mean /μm	32.41	53.21	84.29
Std.Dev /μm	0.08	0.10	0.33
Repeatability	0.25%	0.18%	0.39%

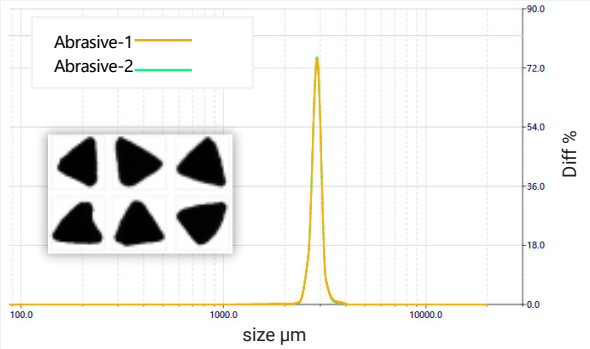


03 Ultra-High Resolution for Narrow Distributions

The BeVision D3 Series analyzes every individual particle captured during measurement and performs statistical analysis across the full particle population, achieving single-particle resolution.

Example: Abrasives

In abrasive materials, both oversize and undersize particles can negatively affect grinding performance. The BeVision D3 Series precisely quantifies the content of oversize and undersize particles, while also providing particle shape analysis to evaluate abrasive sharpness.



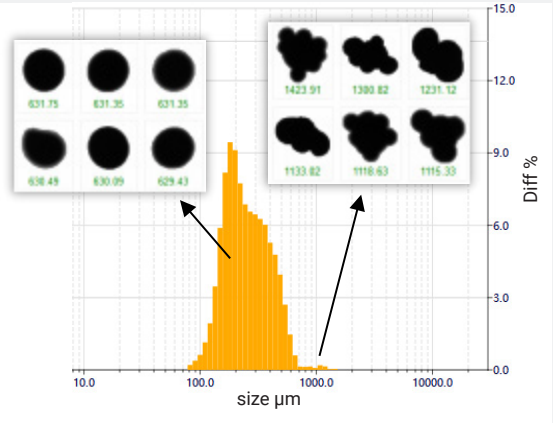
04

Accurate Determination of Low-Content Oversize Particles

By leveraging advanced digital imaging technology and high-speed image capture, BeVision D3 Series achieves ultra-high detection efficiency. Even oversize particles present at extremely low concentrations can be accurately identified and quantified.

Example: Colorants

Over 1 million colorant particles were analyzed within 6 minutes. The resulting size distribution revealed a small fraction of oversize particles, and captured images confirmed that each oversize particle was an agglomerate composed of multiple smaller colorant particles.

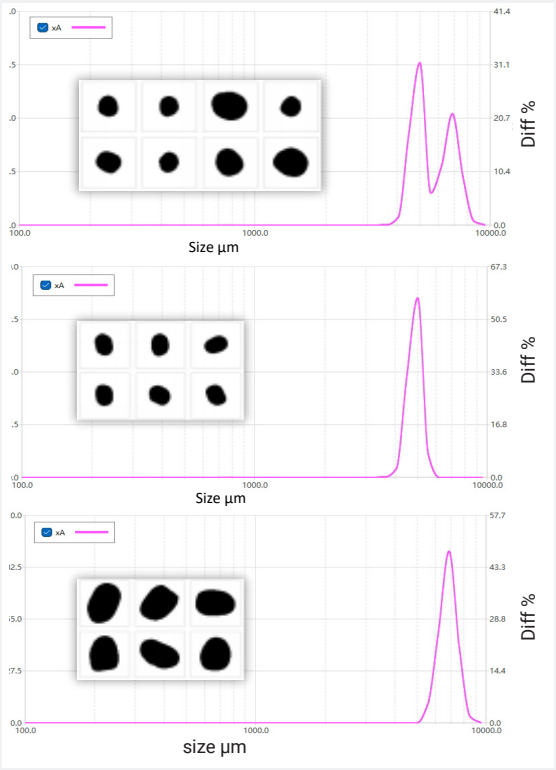


05

Mixture Analysis

The BeVision DIA Software is a powerful data analysis platform that enables separation and analysis of mixed particle systems. Particle mixtures can be classified and filtered based on size, shape, or multiple parameters, allowing each fraction to be analyzed independently within a single dataset.

Example: Beans



Direct measurement of mixed beans produces a bimodal particle size distribution (PSD). The smaller peak corresponds to mung beans, while the larger peak represents red beans. By applying size-based filtration, the software separates red beans and mung beans from the mixed dataset, enabling independent analysis of each component without additional measurements.

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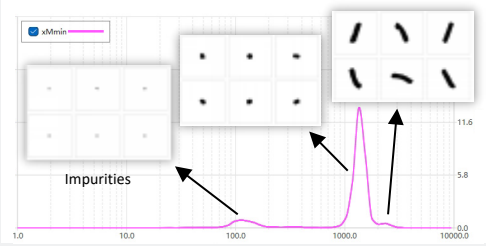
06

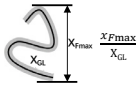
Comprehensive Particle Size & Shape Analysis

The BeVision DIA Software provides 37+ particle size and shape parameters, enabling thorough characterization and objective evaluation of diverse particle morphologies.

Example: Petroleum catalyst

Rod-like catalyst particles are characterized in terms of length, diameter, and curvature. The measurement results closely align with intuitive visual assessments, confirming the accuracy and relevance of DIA-based morphology analysis.



Parameter	"Length" (X_{GL})	"Diameter" (X_E)	"Curvature" (Straightness)	Features
Definition				/
	10447.92	1946.86	0.883	short, thick, curved
	13151.88	1039.90	0.957	long, thin, curved
	12797.27	1074.98	0.992	long, thin, straight

07

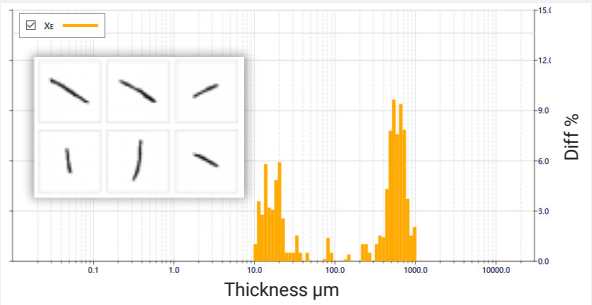
Thickness Measurement of Flaky Particles

The BeVision D3 Series is capable of capturing cross-sectional images of flaky particles during measurement, enabling automatic and direct thickness measurement.

Example: Soybean meal

The thickness of the flaky soybean meal residue after pressing directly reflects the residual oil content. Conventional thickness measurement relies on manual caliper measurements of individual particles, resulting in extremely low efficiency and poor representativeness.

The BeVision D3 system automatically measures and outputs the thickness distribution and mean thickness, significantly improving measurement efficiency, repeatability, and statistical reliability.



• Mean thickness µ(X_E): 365 µm

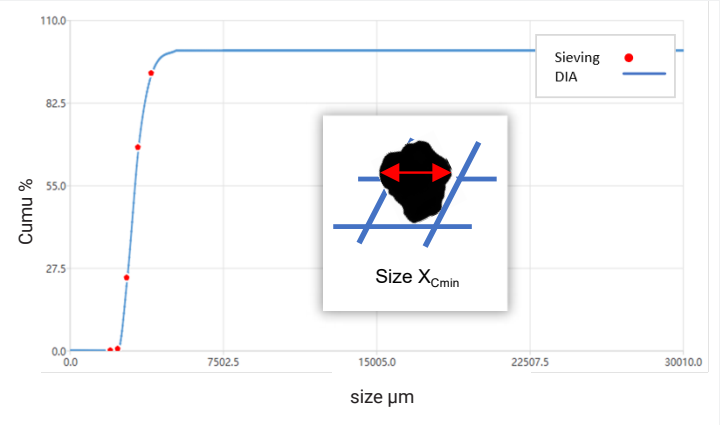
08

Fully Comparable with Sieving Results

The BeVision D3 Series uses a sieve-equivalent diameter aligned with the fundamental principles of sieving, delivering particle size distributions (PSD) that are highly consistent with traditional sieve analysis. Its dedicated sieve correlation function automatically compensates for systematic differences related to measurement principles, particle shape and statistical effects, and directly outputs sieving-correlated PSD results.

Example: Fertilizer

PSDs measured by the BeVision D3 show excellent agreement with sieve analysis results. Users can switch seamlessly from mechanical sieving to the BeVision D3 system, significantly improving testing efficiency while reducing labor costs.



09

Fibrous Contaminant Analysis

Example: Graphite

Flocculent and fibrous contaminants in lithium-ion anode graphite can affect slurry processing, electrode yield, and cell safety. Coupled with the BV-H10 Hydro Dispersion Unit, BeVision D3 simultaneously analyzes particle size of graphitic particles and quantitative detection and characterization of fibrous contaminant.

Leveraging a proprietary high-resolution circularity analysis algorithm, the system automatically distinguishes spherical graphite particles from fibrous contaminants. This automated classification enables standardized QC, helping manufactures improve process consistency and product reliability for battery materials.

Circularity analysis of graphite powder

Circularity	1.000	0.950	0.900	0.850	0.801	0.750	0.701	0.650	0.600	0.550
Graphite particle										
Circularity	0.500	0.450	0.400	0.350	0.300	0.250	0.200	0.149	0.102	
Graphite particle										

Graphite Powder Shape Classification

Circularity Classification	Volume-Based Content	Number-Based Content
Circularity < 0.75: Spherical Graphite	84.10%	40.98%
0.50 < Circularity ≤0.75: Fibrous Flocculates	11.00%	21.02%
Circularity ≤0.50: Fibers	4.90%	38.00%

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Parameter	BeVision D3	BeVision D3 Zoom	BeVision D3 Macro	BeVision D3 Pro
Measurement Principle	DIA	DIA	DIA	DIA
Optical System	Single-lens system	Single-lens system	Single-lens system	Dual-lens system
Dry Measurement Range	11.5 µm - 16 mm	0.5 µm - 500 µm	20 µm - 26 mm	0.5 µm - 16 mm
Wet Measurement Range	11.5 µm - 2.5 mm	0.5 µm - 500 µm	20 µm - 2.5 mm	0.5 µm - 2.5 mm
CMOS Camera	5 megapixels	5 megapixels	5 megapixels	5 megapixels per camera
Light Source	Green parallel planar light	Blue light	Green parallel planar light	Green parallel planar light (Basic) + blue light (Zoom)
Repeatability (D50 of standard reference materials)	≤ 0.5 %	≤ 0.5 %	≤ 0.5 %	≤ 0.5 %
Result Formats	Charts: Excel / TXT / JPG / BMP / CSV Reports: PDF / Excel			
Dimension (L×W×H)	686 mm × 300 mm × 325 mm			
Weight	24 kg			
Power Supply	100-240 VAC, 50/60 Hz			
Conformity	ISO 13322-2, ISO 9276			
Computer Configuration	Intel ® Core™ i9 (14th gen), 32 GB RAM, 64-bit Windows 11, 1 TB SSD			
BV-F10 Free Fall Dispersion Unit				
Typical Test Time	~3 min (sample dependent)			
Funnels	150 ml stainless steel funnel, 450 ml stainless steel expansion cylinder			
Chutes	High-friction stainless steel chute, low-friction stainless steel chute			
Recommended Sample Amount	< 20 mg - 200 g (sample dependent)			
Dimension (L×W×H)	385 mm × 201 mm × 352 mm			
Weight	9.2 kg			
BV-H10 Hydro Dispersion Unit				
Medium	Water			
Water Volume	150 - 450 mL			
Stirring Speed	300 - 1500 rpm			
Ultrasonic Power	0 - 50 W			
Sample Cell	3.5 mm (standard), 1 mm cell (optional)			
Recommended Sample Amount	< 20 mg - 1 g (sample dependent)			
Dimension (L×W×H)	301 mm × 201 mm × 374 mm			
Weight	12.3 kg			

Bettersize

BETTER PARTICLE SIZE SOLUTIONS

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