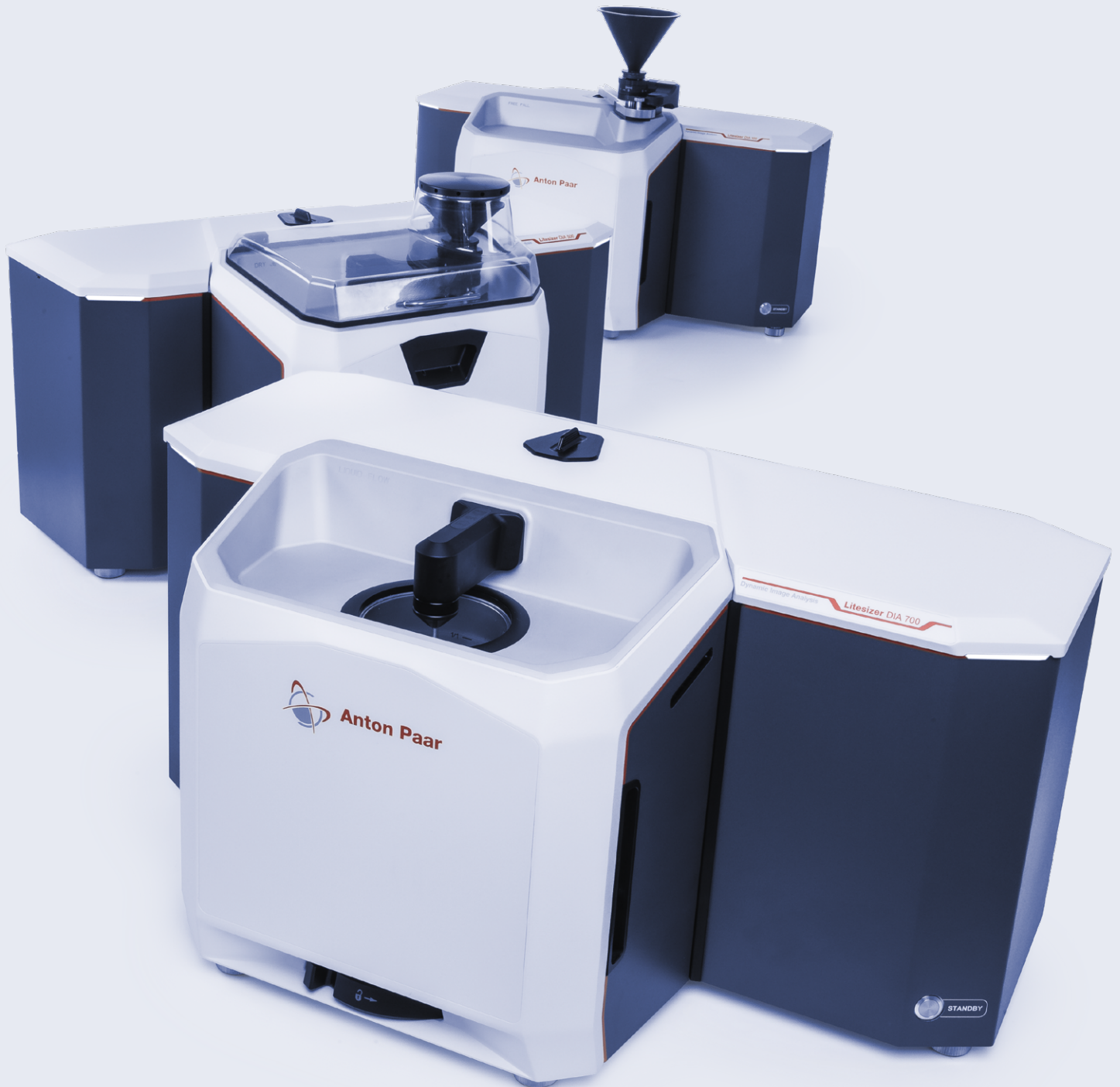# Dynamic Image
Analyzer

Anton Paar

Dynamic Image Analysis at the Touch of a Button

Particle size and shape are crucial in materials science, pharmaceuticals, cosmetics, and food processing. The Litesizer DIA Series lets you easily and reliably characterize particles from 0.5 µm to 16,000 µm through dynamic image analysis.

→ Access all important information at a glance with the Kalliope software's one-page workflow

→ Leverage automated features for liquid filling, draining, rinsing, and dry sample feeding rate

→ Maximize safety with features that protect you from hazardous sample spread and safeguard your instrument from damage

→ Enjoy versatility with three dispersion units - Liquid Flow, Dry Jet, and Free Fall - switchable with just one move without the need to connect hoses and cables.
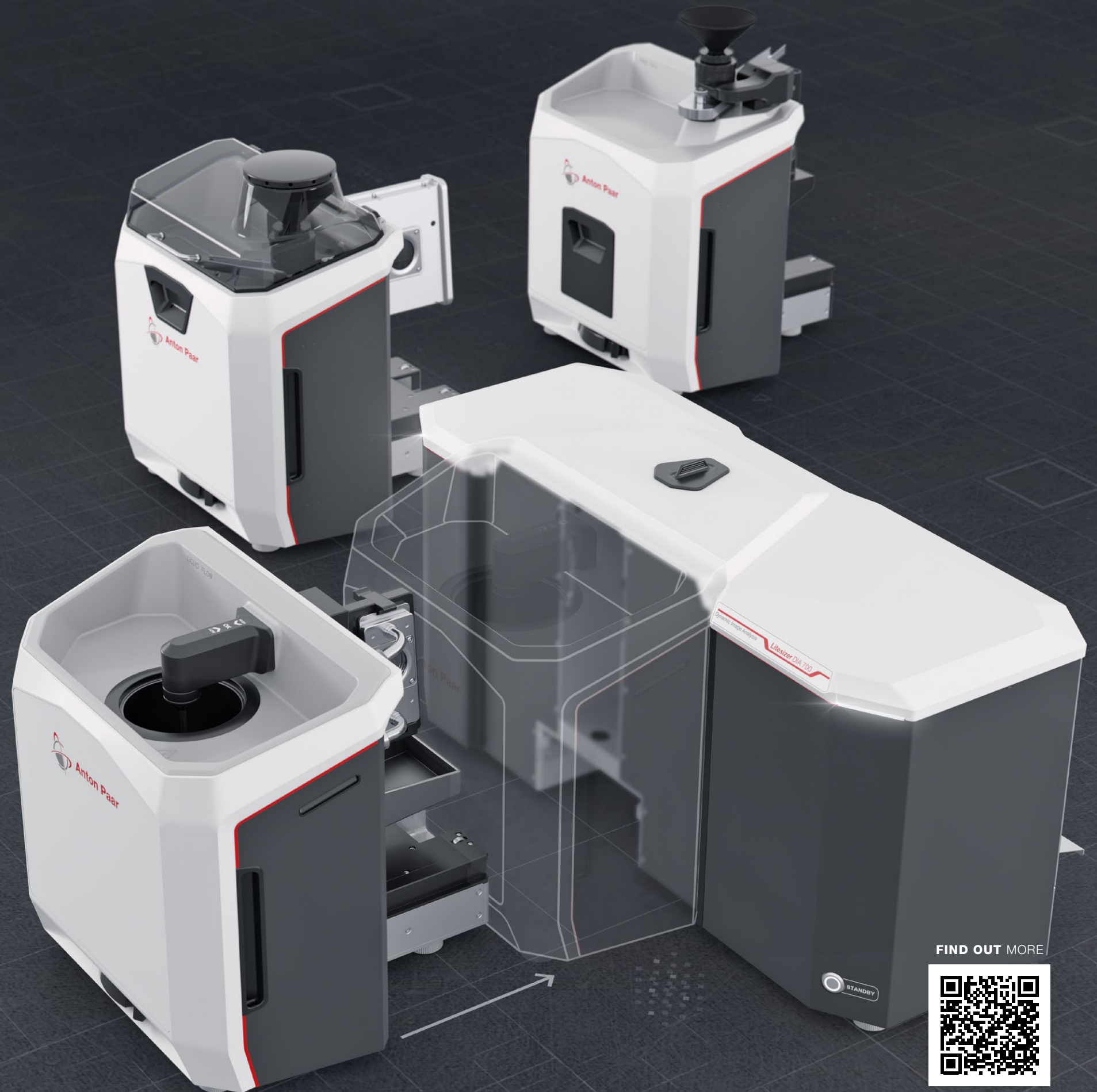
Litesizer DIA 100
The entry-level instrument, measures particles from 10 µm in a single magnification, ideal for routine applications.

Litesizer DIA 500
The mid-range instrument offers two magnification options, covering particles from 0.8 µm up to 16,000 µm for diverse analytical tasks.

Litesizer DIA 700
The top-of-the-line Litesizer DIA 700 provides the highest resolution, measuring particles from 0.5 µm up to 16,000 µm with three objectives.

FIND OUT MORE

www.anton-paar.com/
apb-litesizer-dia

Dynamic Image Analysis
at a Glance

Dynamic image analysis offers unparalleled precision in particle sizing. Unlike other techniques, it measures each particle individually, providing shape information and detecting outliers among millions in seconds. This direct measurement approach eliminates the need for statistical calculations based on physical parameters.

The Litesizer DIA Series streamlines particle size and shape measurement with a straightforward process:

a Dispersion: Particles are dispersed into the measurement cell via compressed air, gravity, or liquid flow

b Illumination: A high-powered LED illuminates the particles in the measurement cell

c Detection: A high-speed camera captures the particle shadows

d Automation: The instrument automatically switches objectives and merges size ranges for comprehensive analysis

1

Spheres
Precise control over the size and uniformity of spherical particles is crucial. Litesizer DIA ensures accurate data for consistent production of these particles in fields like drug delivery, battery technology and additive manufacturing.

2

Agglomerates
Clusters of fused particles can greatly impact material properties. Litesizer DIA helps identify and quantify agglomerates, leading to smoother textures in paints and better flow in powders.

3

Fibers
Fiber length and orientation are vital in textiles and composites. Litesizer DIA accurately measures fiber dimensions, enabling the creation of stronger, lighter materials for clothing, building materials, and aerospace applications.
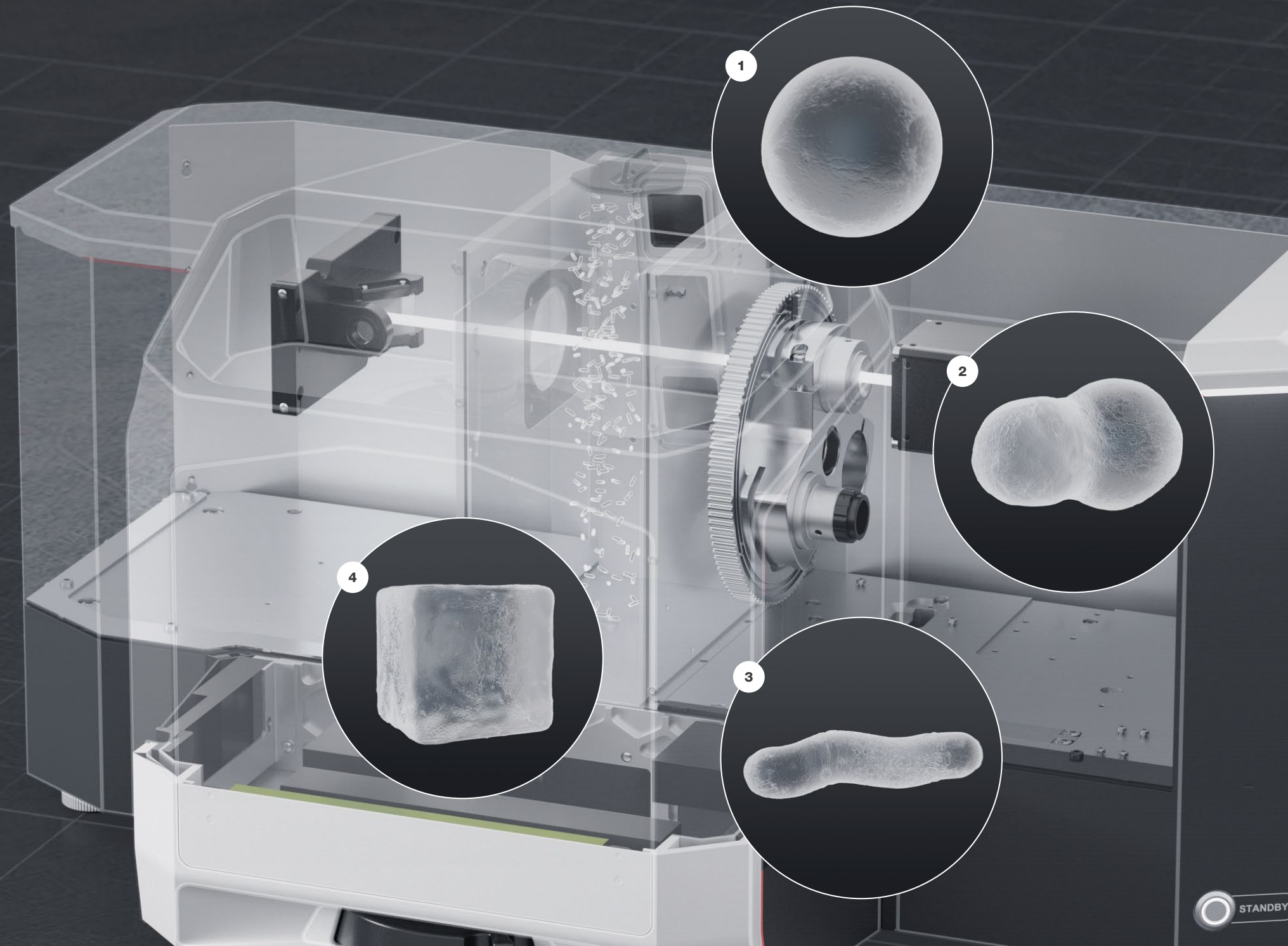
4

Geometrical particles
Precisely shaped particles are key in advanced materials. Litesizer DIA provides accurate data for production and identifies defects, improving performance in battery technology and photonic devices.

STANDBY

Optimal Sample
Dispersion

The Litesizer DIA offers three versatile dispersion units to handle a wide range of materials and applications: Liquid Flow, Dry Jet, and Free Fall. Each unit ensures optimal sample dispersion for precise and reproducible measurements. The Quick Click feature allows for effortless switching between units in less than 10 seconds, without the need to connect or reconnect cables or hoses.

|	Free Fall ↓	Dry Jet ↓	Liquid Flow ↓
Dispersion method	Vibration and gravitational fall	Vibration and compressed air	Stirring and ultrasonication
Measurement Range	0.5 µm to 16,000 µm (restrictions apply for particles >8,000 µm)	0.5 µm to 5,000 µm	0.5 µm to 2,500 µm
Sample Holder	Funnel: 150 mL and 600 mL	Funnel: 150 mL and 600 mL	Tank: 150 mL to 600 mL
Automation	Automatic feed rate adjustment, funnel emptying	Automatic feed rate adjustment, funnel emptying, window cleaning	Automatic feed rate adjustment, funnel emptying
Safety Features	N/A	- Built-in cover limits dust spread - Suction check reduces the risk of powder spread - Sealed sample channel design limits particle escape and particle exposure - Also suitable with flammable powders	- Tank lid mitigates vapor spread - Liquid presence check before sonication

Key features	- Available measurement cells:
	  - Option 1: 4 mm (default)
	  - Option 2: 8 mm
	- Sample recovery using a built-in drawer
		- Available Venturi nozzles:
		  - Option 1: 0.5 µm to 3,500 µm
		  - Option 2: 0.5 µm to 5,000 µm
		- Dispersion pressure adjustment: 0.05 bar to 4.6 bar (0,7 psi to 67 psi)
			- Centrifugal pump (max. 2,400 rpm)
			- Ultrasonic unit (max. 50 W)
			- Frame coverage indicator
			- Tank illumination

1

Free Fall
Tailored for larger, more robust particles, the Free Fall unit uses gravity for gentle dispersion. This method is suitable for for free-flowing or fragile particles that might be damaged by more aggressive techniques, making it effective for granular materials and food products.

2

Dry Jet
Designed for dry powders and granulates, the Dry Jet unit uses a powerful air jet to disperse particles, preventing agglomeration and ensuring a homogeneous distribution. It is ideal for materials that clump in liquids or are moisture-sensitive, such as food powders, pharmaceuticals, and agricultural products.

3

Liquid Flow
Ideal for particles in a liquid medium, the Liquid Flow unit ensures uniform dispersion by continuously circulating the sample. Its controlled flow and coupled sonication minimize aggregation and sedimentation, making it perfect for fine powders, colloids, emulsions, and suspensions
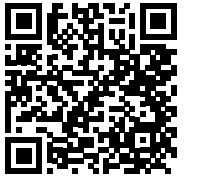
Kalliope
Our Particle Sizing Software

Kalliope is the essential software driving the Litesizer DIA Series, designed to deliver expert-level measurements with just three clicks.
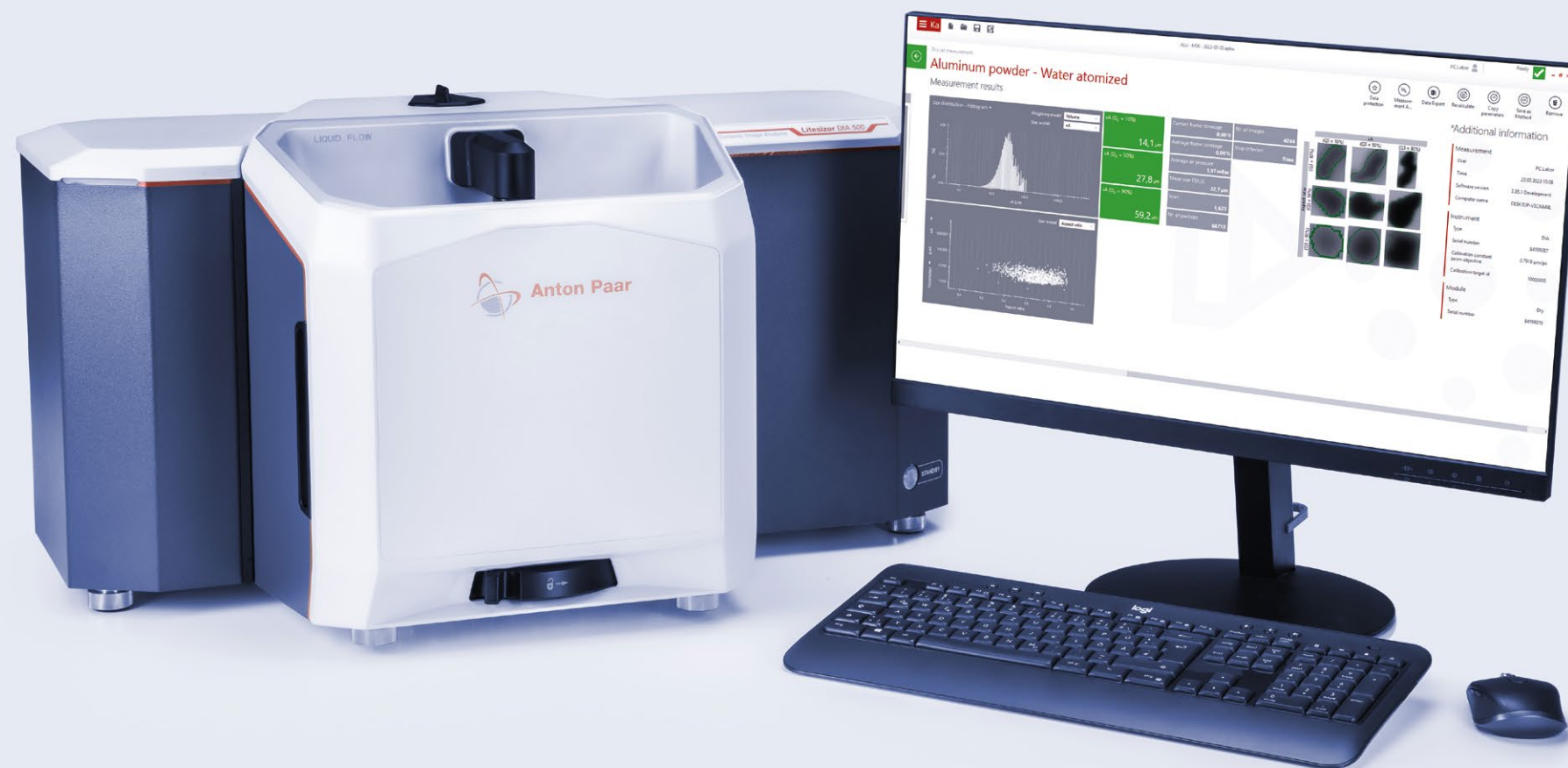
Precision and quality in every measurement

→ Gain deeper insights in your measurement results with our advanced filtering options

→ Streamline your measurements with quality control mode

→ Measure samples of broad size distribution at high resolution using automated size range merging

Easy and simple workflow

→ View input parameters, live measurements, and results in one place for easy access and analysis

→ Access the image database in the same workspace to recalculate results with different filters whenever needed

→ Focus on particles of interest and optimize your data size with our automated screening feature

One software for various instruments

→ Operate all of your Anton Paar particle-sizing instruments seamlessly with Kalliope

21 CFR Part 11 compliant

→ Handle electronic records with confidence, ensuring data integrity

→ Use electronic signatures to provide authenticity and accountability for all actions

→ Generate comprehensive audit trails that log all user actions, changes, and data entries

→ Implement robust user authentication protocols to prevent unauthorized access

Every Single Particle
In Detail

Litesizer DIA goes beyond basic size measurements. It equips you with a comprehensive suite of size and shape descriptors for each detected particle. Explore how some of these descriptors can provide insights into particle behavior, interactions, and suitability for your applications.
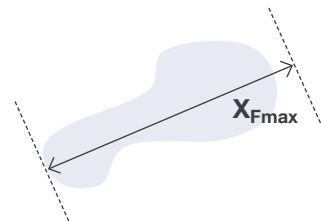
(1)
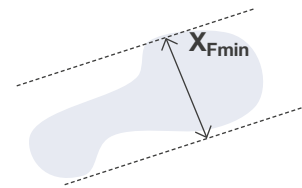
Minimum Feret diameter (xFmin)
This refers to the shortest distance between two parallel lines that completely enclose a particle. It essentially measures the width of the narrowest dimension of a particle. This descriptor is useful for understanding how easily particles can fit through tight spaces or gaps.
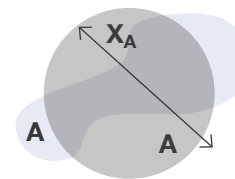
(2)

Maximum Feret diameter (xFmax)
This is the opposite of xFmin, representing the longest distance between two parallel lines that completely enclose the particle. It captures the overall size or extent of a particle. It's valuable for tasks like packing, filtration, or obstruction potential in flows.
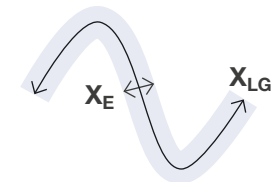
(3)

Projected area equivalent diameter (xA)
Imagine a circle with the same area as the particle's projected image. The xA is the diameter of that circle. This descriptor simplifies complex shapes into a circle, making it easier to compare particle sizes and calculate their total surface area.
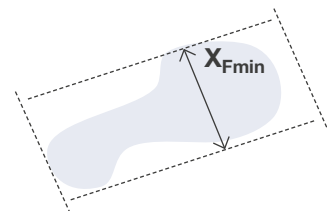
(4)

Geodesic length (xLG) and thickness (xE)
More accurate approximations for very long and concave particles, such as fibers.

(5)

Aspect ratio
This is the ratio of a particle's width (shortest dimension) to its length (longest dimension). It helps quantify how elongated or flattened a particle is compared to a perfect circle. This descriptor is crucial in fields like material science and engineering, where the shape of particles affects properties such as flowability, packing density, and structural strength.
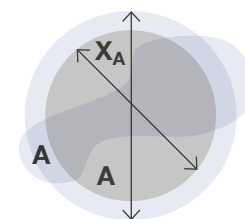
(6)
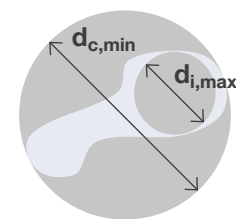
Irregularity
This descriptor compares the size of the largest circle that can perfectly fit inside the particle (di,max) to the smallest circle that can completely enclose it (dc,min). Useful for filtering shapes that have protrusions on the surface.
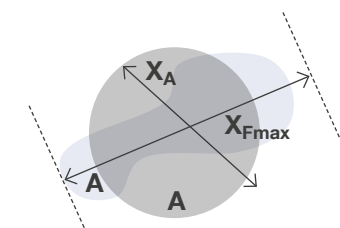
(7)

Circularity and form factor
This descriptor measures the degree to which the particle (or its projection area) is similar to a circle, considering the smoothness of the perimeter (P).

(8)

Compactness
It indicates how closely the shape of the particle approximates a compact shape, like a circle or square. High compactness values mean the particle is more solid and less spiky or hollow. Useful for the identification of particles that have secondary shapes attached to the main shape e.g. satellite on a round particle (additive manufacturing).

Versatility
across Industries

The Litesizer DIA offers versatility across industries and single-particle resolution. Suitable for pharmaceuticals, chemicals, food processing, and materials science, it provides detailed, real-time insights and faster results than traditional methods.

Metal powders: printing perfection, lasting power
In battery production and additive manufacturing, particle size and shape are crucial for performance. The Litesizer DIA optimizes powder flow for efficient 3D printing, ensuring consistent layering and better packing density for durable batteries. Perfectly spherical particles enhance flow, packing density, conductivity, and product quality, resulting in longer-lasting batteries and superior 3D-printed components.

Food: unlocking a world of flavor
A consistent coffee experience starts with consistent grinds. The Litesizer DIA tracks coffee bean quality, fines, dust, and broken beans before extraction. It reveals ground shape distribution, enabling optimal extraction and richer flavor. Tailor grind size and shape for different brewing methods, ensuring a perfect cup every time. The Litesizer DIA helps unlock your coffee beans' full potential for a truly satisfying consumer experience.
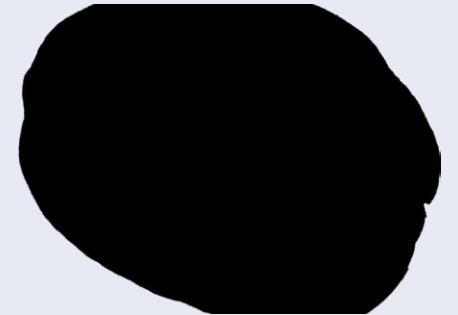
Polymers: designing the future, one particle at a time
Particle shape significantly affects the strength, flexibility, and transparency of polymers. Litesizer DIA provides insights into particle aspect ratio and elongation, allowing you to tailor polymer properties for specific applications. Design a new, strong polymer by optimizing particle entanglement through shape control. By understanding your particles, you can create high-performance polymers for a wide range of applications, from flexible electronics to impact-resistant materials.

Pharma: precision dosing, optimal results
Precise control over particle size and shape is crucial for controlled drug release and targeted delivery. The Litesizer DIA's detailed analysis helps ensure consistent drug delivery profiles and improved bioavailability. Knowing whether excipients are spherical or irregular is vital for formulating supplements that dissolve at specific rates for optimal absorption. The Litesizer DIA enables the creation of more effective medications with consistent dosages, improving patient outcomes and satisfaction.
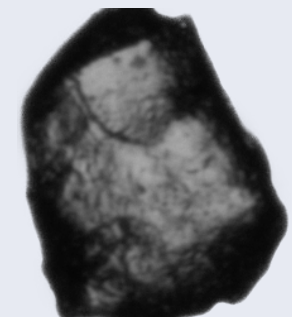
Reliable.
Compliant.
Qualified.

Our well-trained and certified technicians are ready
to keep your instrument running smoothly.

Maximum uptime | Warranty program | Short response times | A global service network

	Litesizer DIA 700	Litesizer DIA 500	Litesizer DIA 100
	↓	↓	↓
Measurement principle	Dynamic Image Analysis		
Camera	5 Mpix (2448 x 2048 pixels)		
Data collection rate	220 fps/camera at 5 Mpix	144 fps/camera at 5 Mpix	20 fps/camera at 5 Mpix
Resolution	0.5 µm per pixel	0.8 µm per pixel	10 µm per pixel
Magnification	0.3x, 1x and 6x	0.3x and 4x	0.3x
Optical Features	Automatic switch between objectives Automatic merge of size ranges All magnifications are included in the standard configuration		
Data Transfer	1x 10 Gigabit Ethernet, 1x USB-A 3.0		
Automation	Automatic adjustment of the image acquisition rate		
Compliance	ISO 13322-1; ISO 13322-2; ISO 9276-1; ISO 9276-2; ISO 9276-6 ASTM E2651-19 USP <1776>, Ph. Eur. 2.9.48		
Accessories	Calibration tool Pre-configured PC Water filter (for Liquid Flow dispersion unit) Air filter (for Dry Jet dispersion unit) Vacuum cleaner: regular or ATEX (for Dry Jet dispersion unit) Air compressor (for Dry Jet dispersion unit)		

MEASUREMENT RANGES

Liquid Flow	0.5 µm to 2,500 µm	0.8 µm to 2,500 µm	10 µm to 2,500 µm
Dry Jet	0.5 µm to 5,000 µm	0.8 µm to 5,000 µm	10 µm to 5,000 µm
Free Fall	0.5 µm to 16,000 µm (restrictions apply for particles >8,000 µm)	0.8 µm to 16,000 µm (restrictions apply for particles >8,000 µm)	10 µm to 16,000 µm (restrictions apply for particles >8,000 µm)

MEASUREMENT OUTPUT

Weighting modes	Number-, surface-, and volume-weighted results
Size and shape descriptors (ISO 9276-compliant)	Minimum and maximum Feret diameters, projected area equivalent diameter, length, geodesic length and thickness (e.g., for fibers), minimum and maximum axes of the Legendre ellipse. Aspect ratio, ellipse ratio, irregularity, elongation or eccentricity, circularity, form factor, compactness, extent or bulkiness, solidity, convexity.
Image parameters	Sharpness and contrast

INSTRUMENT DATA

Dimensions (H x W x D)	400 mm x 790 mm x 290 mm
Weight	41 kg (90 lb)
Power supply	100 V to 240 V ±10 %, 50/60 Hz
Compressed air supply	5 bar to 10 bar (72 psi to 145 psi)
Water supply	max. 8 bar (116 psi)

COMPATIBLE DISPERSION UNITS

Liquid Flow	Dispersion using a liquid carrier, mixing, and ultrasonication
Dry Jet	Dispersion via compressed air
Free Fall	Dispersion via gravitational fall
Exchange of the dispersion unit	Less than 10 seconds via Quick Click
Trademarks	**Kalliope** (EU: 012709391), (UK: UK00912709391) **Litesizer** (EU: 011695491), (UK: UK00911695491)

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