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PARTICLE SIZE

MASTERSIZER 3000

SMARTER PARTICLE SIZING

MASTERSIZER 3000 – WELCOME TO THE NEXT GENERATION

Rapid, reliable particle size measurements made easy.

The Mastersizer 3000 is the latest generation of the world's most widespread particle sizing instrument, used by many thousands of companies and research institutes across a wide range of industries. Malvern's considerable experience and applications know-how has gone into every stage of the design of the new Mastersizer instrument, from fundamental particle sizing performance right through to user ergonomics and method advice.



THE MASTERSIZER 3000 - AT A GLANCE



Innovative design

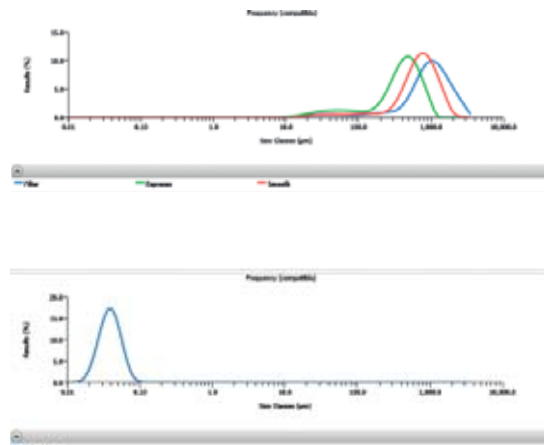
Industry-leading design and ergonomics means the Mastersizer 3000 combines a stylish modern look with practicality in a compact footprint, giving maximum value from both your instrument investment and precious laboratory space.

Impressive particle sizing performance

A completely new optical core design delivers fast measurement times for high sample throughput and a measurement size range from 10nm to 3.5mm. Combined with a new range of wet and dry dispersion accessories this opens up more applications than ever before.

Software that eases your workload

More than ever users want instruments that are easy to use and don't require a high level of expertise to get good results. The Mastersizer 3000 software delivers a modern intuitive interface, streamlined method development and expert advice on your results.



MASTERSIZER 3000 - INNOVATIVE AND PRACTICAL DESIGN

The Mastersizer 3000 combines a stylish and compact design with lots of practical features to help you get the most out of your instrument.



Compact footprint

The footprint of the instrument is only 69cm x 30cm, ensuring efficient use and productivity from your valuable bench space. The equally compact wet and dry dispersion accessories use common sample measurement cells for the same type of dispersion, further reducing the footprint required for multi-accessory systems.



Automatic alignment and cell location

Correct optical alignment is critical to getting accurate and repeatable particle size results. The Mastersizer 3000 ensures this by using an auto-alignment procedure before every measurement. To provide further measurement security, the sample measurement cell has an auto locking mechanism to ensure that the cell is correctly seated every time it is inserted into the instrument.



Easy access for cleaning

The sample measurement cells feature a quick-release window sealing mechanism allowing quick access to the windows without any special tools. This makes cleaning the sample windows extremely easy, improving productivity and ensuring regular maintenance of the instrument for best performance.

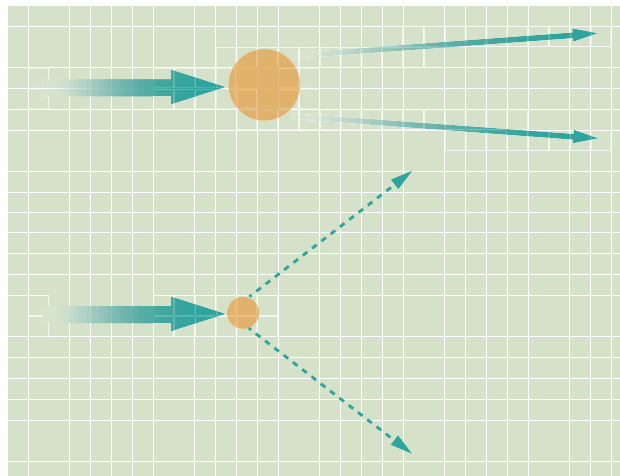


CLASS-LEADING PARTICLE SIZING PERFORMANCE

The Mastersizer 3000 uses the technique of laser diffraction to measure particle size distributions from 0.01µm up to 3.5mm.

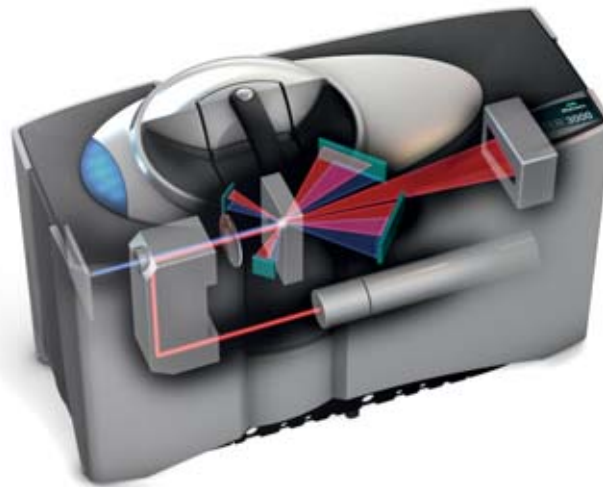
Laser diffraction

In a laser diffraction measurement a laser beam passes through a dispersed particulate sample and the angular variation in intensity of the scattered light is measured. Large particles scatter light at small angles relative to the laser beam and small particles scatter light at large angles. The angular scattering intensity data is then analyzed to calculate the size of the particles that created the scattering pattern using the Mie theory of light scattering. The particle size is reported as a volume equivalent sphere diameter.



Wide dynamic range

The patented folded optical design in the Mastersizer 3000 provides an impressive particle size range from 0.01µm up to 3.5mm using a single optical measurement path. The Mastersizer 3000 uses a sequential combination of measurements with red and blue light sources to measure across the entire particle size range. Measurement of large particulates is provided by an advanced focal plane detector design able to resolve very small diffraction angles. Sensitivity to sub 100nm particles, scattering light at wide angles, is achieved using advanced optics and a powerful 10mW solid state blue light source.

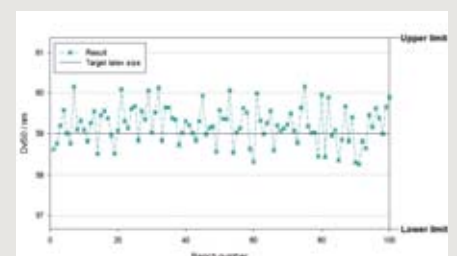


Verifiable accuracy and repeatability

Mastersizer particle size analyzers are used on a daily basis in production critical environments around the world. The Mastersizer 3000 delivers verifiable particle sizing performance that you can rely on:

- Accuracy on polystyrene latex standards better than 1%
- Repeatability on polystyrene latex standards better than 0.5%
- Reproducibility on polydisperse standards better than 1%, exceeding ISO 13320:2009 and USP <429>.

Reproducibility of 100 production instruments on 59nm latex



SOFTWARE THAT EASES YOUR WORKLOAD

With ever more demands placed on both instruments and users, software that is intuitive and easy to use has become an essential requirement in the modern busy laboratory environment.

Some of the key features that make good quality particle size measurements easier than ever before:

- Intuitive look and feel based upon the latest office and laboratory software tools
- Ensure consistent results between users with the SOP comparison tool
- Rapid method development with the measurement manager dashboard
- One click, easily configurable data export.
- Easy configuration and formatting of screen views and printed reports to get your data the way you want it



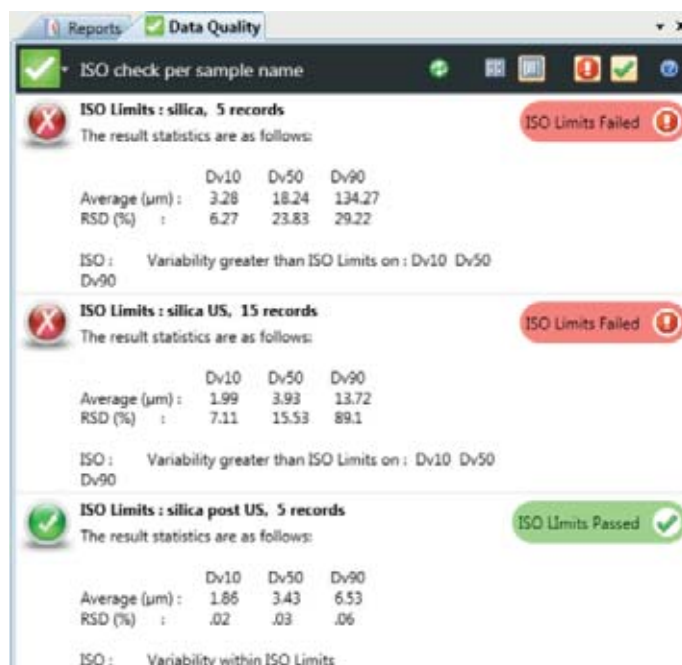
STREAMLINED METHOD DEVELOPMENT

The ability to view how the particle size result changes with dispersion conditions is an essential element to rapid method development within ISO and USP guidelines. With the measurement manager window, the user can observe, control and optimise measurement conditions in real time, making the method development process as efficient and straightforward as possible.



BUILT-IN EXPERTISE

It is good experimental practice to verify the quality of any measurements made in order to ensure the robustness of your results. Recognizing that not everyone can or wants to be an expert in laser diffraction measurements, we have incorporated a data quality expert within the software that will give you an objective assessment of the measurement quality together with practical advice on how to improve the measurement process. This includes ISO 13320:2009 and USP <429> measurement stability criteria as well as individual measurement criteria as developed by our highly experienced in-house laser diffraction applications team.



MASTERSIZER 3000 MAIN SYSTEM SPECIFICATIONS

Parameters measured	Materials
Particle size distribution	Suspensions, emulsions, dry powders
General	
Principle	Laser light scattering
Analysis	Mie and Fraunhofer scattering
Data acquisition rate	10kHz
Typical measurement time	<10 sec
Optics	
Red light source	Max. 4mW He-Ne, 632.8nm
Blue light source	Nominal 10mW LED, 470nm
Lens arrangement	Reverse Fourier (convergent beam)
Effective focal length	300mm
Detector	
Arrangement	Log-spaced array
Angular range	0.015 - 144 degrees
Alignment	Automatic
Size	
Size range	0.01 - 3500µm *
Number of size classes	100 (user adjustable)
Accuracy	Better than 1% **
Repeatability	Better than 0.5% variation *
Reproducibility	Better than 1% variation *
Software	
21 CFR part 11	Enables an operating mode that assists with ER/ES compliance
System compliance	
Laser class	Class 1, IEC 60825-1:2007 and CRF Chapter 1: Sub-chapter J: Part 1040 (CDRH)
Regulatory	Designed to meet RoHS and WEEE requirements CE / FCC compliant. Designed to meet ICES/C-Tick/VCCI
Optics	
Dimensions	690mm x 300mm x 450mm (L x W x H)
Mass	30kg
System	
Supply voltage	100/240v, 50/60Hz
Product storage temperature	-20°C to +50°C
Operational temperature range	+5°C to +40°C
Ingress Protection (IP) Rating	IP41B
Computer specification (recommended)	
Computer interface	At least 1 high speed USB port required
Operating system	Windows 7 Professional (32 bit and 64 bit)
Hardware specification	Intel Core i5 processor, 4GB RAM, 250GB HD, CD-ROM or DVD +/-RW drive, Wide screen monitor.
Notes: *Sample and sample preparation dependent. **Accuracy defined for the recovery of the mean size of a narrow log-normal distribution. Sample and sample preparation dependant.	

MASTERSIZER 3000

SAMPLE DISPERSION OVERVIEW

Sample dispersion is controlled by a range of wet and dry dispersion units. These ensure the particles are delivered to the measurement area of the optical bench at the correct concentration and in a suitable, stable state of dispersion to make accurate and reliable particle size measurements. The Mastersizer 3000 has a range of wet and dry sample dispersion accessories to suit your application needs;

AERO S – REDEFINING DRY POWDER DISPERSION

Setting new standards for dry powder dispersion, the Aero S has been designed from the ground up based upon fundamental powder dispersion theory. The modular design ensures rapid and reproducible dispersion of the widest range of samples from cohesive powders to fragile materials.



HYDRO - RAPID AND EFFECTIVE WET DISPERSION ACCESSORIES

The comprehensive range of Hydro wet dispersion accessories are designed to meet a wide variety of application requirements:



Large sample volume - Hydro LV

A large volume automated dispersion unit suitable for applications where sample availability is not an issue or where larger volumes are required to ensure good sampling.



Medium sample volume - Hydro MV

A medium volume automated dispersion unit specifically designed for applications where sample is in short supply and/or non-aqueous dispersants are necessary.



Exchangeable sample volume - Hydro EV

A unique dip-in wet sample dispersion unit that can be used with standard laboratory glassware. Suitable for a wide variety of dispersant volumes.



Manual small volume – Hydro SM

Entry level small volume sample dispersion accessory, suitable for applications where samples can be readily dispersed in small dispersant volumes.

AERO S DRY POWDER DISPERSER

State-of-the art dry powder dispersion



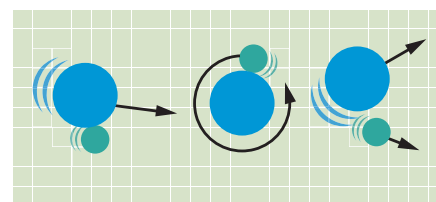
SPECIFICATIONS

Parameter	Specification
Size range (dry powder mode)	0.1 - 3500 μm †
Dispersion Pressure Range	0 - 4 bar
Pressure setting precision	+/- 0.1 bar
Pressure setting accuracy	+/- 0.03 bar
Feed rate range	0 - 58 ms^{-2} (expressed as 0-100%)
Feed rate precision	+/- 0.58 ms^{-2} (1%)
Feed rate accuracy	Better than 1%
Materials in contact with sample	316 stainless 410 hardened stainless Borosilicate glass EPDM PTFE Polyurethane Carbon filled acetal Carbon filled acetal Aluminium Neoprene
Maximum particle size	3500 μm (density 2200 kg/m^3) †
Minimum time between measurements	less than 60 sec †
Dimensions	260mm x 180mm x 380mm (L x W x H)
Mass	10.5kg
† Sample dependent	

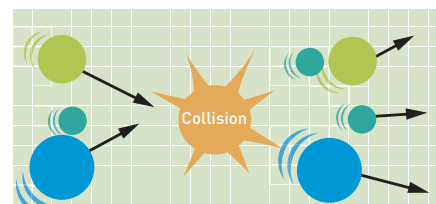
The Aero S is a completely new dry powder disperser developed using state-of-the-art powder dispersion understanding. Modular in design, it is easily configured for different applications, delivering efficient sample dispersion for both robust and fragile materials.

Disperse fragile and cohesive powders with ease

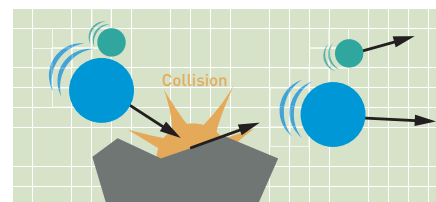
In a dry powder disperser, sample dispersion is achieved using a flowing stream of clean dry air. During the dispersion three different types of dispersion mechanism can act upon the sample:



Velocity gradients caused by shear stress



Particle-to-particle collisions



Particle-to-wall collisions

The dispersion mechanism that is most dominant will depend upon the design of the disperser, with particle-wall impaction providing a more aggressive high energy dispersion than particle-particle collisions or shear stresses. The Aero S can be used with two easily interchangeable dispersers:

- standard disperser for both cohesive and fragile particles
- impaction disperser for robust agglomerated materials.

THE HYDRO LV

Large volume wet sample dispersion



Intended for applications where sample availability is not an issue, The Hydro LV is ideal for measuring larger particles and broad size distributions, which demand larger sample volumes to ensure representative measurement.

- 600mL dispersant volume
- Patented 40W in-line sonication probe, for rapid agglomerate dispersion
- Powerful centrifugal pump system ensures bias-free sampling
- Automated dispersant supply
- Full software control of all measurement functions, including dispersant supply, sample dispersion and cleaning.
- Chemically compatible with a wide choice of organic and inorganic dispersants
- Integral sample tank light.

SPECIFICATIONS

Parameter	Specification
Pump speed range	0-3500 rpm ††
Pump speed resolution	+/- 10 rpm
Pump speed accuracy	+/- 50 rpm
Maximum flow rate	2.0L/min ††
Sonication power & frequency	40W max, 40kHz (nominal) ††
Maximum volume	600mL
Materials in contact with sample	316 stainless Borosilicate glass Tygon Viton (cell seal only - perfluoroelastomer upgrade available) PTFE PEEK FEP
Maximum particle size	2100µm (density 2200kg/m ³) †
Minimum time between measurements	less than 60 sec †
Dimensions	280mm x 180mm x 300mm (L x W x H)
Mass	5kg
† Sample dependent †† Dispersant dependent	



THE HYDRO MV

Medium volume automated dispersion unit



The Hydro MV is medium volume unit for the controlled, automated wet dispersion of samples for particle size analysis. Designed for applications that require smaller sample sizes, the Hydro MV is especially valuable when the supply of test material is limited or when dispersant usage must be minimized.

- 120mL dispersant volume
- Patented 40W in-line sonication probe, for rapid agglomerate dispersion
- Powerful centrifugal pump system ensures bias-free sampling
- Automated dispersant supply
- Chemically compatible with a wide choice of organic and inorganic dispersants
- Full software control of all measurement functions, including dispersant supply, sample dispersion and cleaning
- Integral sample tank light.

SPECIFICATIONS

Parameter	Specification
Pump speed range	0-3500 rpm ††
Pump speed resolution	+/- 10 rpm
Pump speed accuracy	+/- 50 rpm
Maximum flow rate	2.0L/min ††
Sonication power & frequency	40W max, 40kHz (nominal) ††
Maximum volume	120mL
Materials in contact with sample	316 stainless Borosilicate glass Tygon Viton (cell seal only - perfluoroelastomer upgrade available) PTFE PEEK FEP
Maximum particle size	2100µm (density 2200kg/m ³) †
Minimum time between measurements	less than 60 sec †
Dimensions	280mm x 180mm x 300mm (L x W x H)
Mass	5kg
† Sample dependent †† Dispersant dependent	



THE HYDRO EV

Flexible volume wet dispersion



The Hydro EV has a unique dip-in centrifugal pump and stirrer design that achieves full and rapid dispersion in standard laboratory beakers, allowing close matching of the dispersant volume to the application requirements. Following measurement, the dispersion head can be raised out of the beaker, enabling quick cleaning and sample recovery.

- Compatible with 250mL, 600mL and 1000mL laboratory beakers
- Patented 40W in-line sonication probe, for rapid agglomerate dispersion
- Dip-in centrifugal pump and stirrer design
- Sample easily recovered following analysis
- Chemically compatible with a wide choice of organic and inorganic dispersants
- Full software control of pump / stirrer and sonication
- Integral sample tank light.

SPECIFICATIONS

Parameter	Specification
Pump speed range	0-3500 rpm ††
Pump speed resolution	+/- 10 rpm
Pump speed accuracy	+/- 50 rpm
Maximum flow rate	1.7L/min ††
Sonication power & frequency	40W max, 40kHz (nominal) ††
Volume	250mL / 600mL / 1000mL (using lab beaker)
Materials in contact with sample	316 stainless Borosilicate glass Tygon Viton (cell seal only - perfluoroelastomer upgrade available) PTFE PEEK
Maximum particle size	2100µm (density 2200kg/m ³) †
Minimum time between measurements	less than 60 sec †
Dimensions	220mm x 150mm x 300mm (L x W x H)
Mass	4kg
† Sample dependent †† Dispersant dependent	



THE HYDRO SM

Manual entry level wet dispersion unit



The Hydro SM is a cost effective wet sample dispersion unit designed for measuring samples in non-aqueous dispersants where solvent usage needs to be minimized.

- Sample volume from 50mL -120mL
- Continuously variable single shaft pump and stirrer with digital readout
- Software driven SOPs with appropriate user prompts to assist with adherence to GLP and ensure reproducibility of measurements
- Manual fill, drain and cleaning
- High chemical compatibility.

SPECIFICATIONS

Parameter	Specification
Pump speed range	350-3500 rpm ††
Pump speed resolution	+/- 10 rpm
Pump speed accuracy	+/- 20 rpm
Maximum flow rate	2.3L/min ††
Sonication power & frequency	N/A
Maximum volume	50-120mL
Materials in contact with sample	316 stainless steel Borosilicate glass Tygon Viton (cell seal only - perfluoroelastomer upgrade available) Perlast PTFE
Maximum particle size	600µm (density 2200kg/m ³) †
Minimum time between measurements	less than 60 sec †
Dimensions (dispersion unit)	175mm x 140mm x 390mm (L x W x H)
Dimensions (controller unit)	180mm x 225mm x 80mm (L x W x H)
Mass (dispersion unit)	8.75kg
Mass (controller unit)	1.5kg
† Sample dependent †† Dispersant dependent	

VALIDATION AND SUPPORT



Malvern's materials characterization technology and expertise enables scientists and engineers to understand and control properties of dispersed systems. Malvern's instruments are used to measure particle size, particle shape, zeta potential, molecular weight, size and conformation, rheology and for chemical identification. This information helps accelerate R&D, enhance product quality, optimize process efficiency.

Areas we work in:

- BIOPHARMACEUTICALS
- FOOD AND DRINK
- ASPHALT
- PHARMACEUTICAL
- COSMETICS AND PERSONAL CARE
- CHEMICALS
- MINING AND MINERALS
- POWER GENERATION
- CEMENT
- METAL POWDERS
- PLASTICS AND POLYMERS
- SURFACE COATINGS
- ELECTRONICS
- CERAMICS
- ADHESIVES AND SEALANTS

Excellence through experience

Many Malvern systems are used in highly regulated environments and product validation and R&D traceability are priorities for our customers. Operating to ISO9001: 2000 with Tickit accreditation for software development, Malvern is a major supplier to the highly demanding pharmaceutical and chemical industries. Malvern's products play pivotal roles in high quality research and manufacturing throughout the world. As a global supplier we believe we have responsibility to minimise the impact we have on the environment and operate to both ISO14001 and OSHA18001.

Validation

To help our customers comply with the requirements of the Regulatory Authorities, such as the US Food and Drugs Administration (FDA) and the Medicines and Healthcare Products Regulatory Agency (MHRA), Malvern provides a comprehensive range of validation tools.

These aids follow a user's validation process through from Installation and Operational Qualification (IQ/OQ) to the maintenance phase with annual OQ renewals and the provision of standards for Performance Qualification (PQ). For products subject to FDA regulation, we have solutions to help with 21 CFR Part 11 compliance.

World-class service and support

Malvern offers professional support at all levels. Our intention is to increase your laboratory's productivity through the creation of a working relationship for the lifetime of your instrument providing service support, training and information.

- Global network of fully trained service personnel
- World-wide co-ordination for multi-national companies
- Technical support from the Malvern Helpdesk via telephone or email
- Range of maintenance contracts and service agreements to cover all requirements
- Validation support
- Consultancy-based on site training courses
- e-Learning training courses via the internet
- Classroom training courses
- Web Seminars
- Sample and application consultancy.

No other company offers more



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Mastersizer 3000 optical bench protected by; US6,778,271 and related filings; GB2,340,932; together with patents based on applications US61-534,861, US61-534,851 and US61-534,584. Hydro MV and LV protected by EP1167946A2 and related filings.

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