

Advanced Materials characterization toolbox

product – measurement – technology – applications – features



Laser diffraction
Light scattering
Imaging
Near Infra-red
X-ray fluorescence
X-ray diffraction
Sample preparation

Particle size distribution, shape and concentration



Product	Mastersizer	Hydro Insight	Spraytec	Insittec
What does it measure?	Particle size	Particle size, shape, appearance	Particle size	Particle size
Technologies used	Laser Diffraction	Dynamic imaging	Laser Diffraction	Laser Diffraction
What is it used for?	<ul style="list-style-type: none">Measuring the size distribution of suspensions, emulsions and dry powders from 10nm to 3500µmControlling powder properties such as wettability, bulk density, powder flow and solubilityOptimizing suspension and emulsion rheology	<ul style="list-style-type: none">Sits alongside Mastersizer 3000 collecting images of particlesProviding quantitative information about particle size and shape covering the size range from 1µm to 800µmHelps in method design and simplifies troubleshooting	<ul style="list-style-type: none">Measuring the size distribution of sprays and aerosols from 0.1µm to 2000µmDefining the deposition pattern and bioavailability of drug materials delivered using pump sprays and inhalersUnderstanding the environmental impact of spraying in coatingConsumer or agrochemical applicationsResolve the fluctuations in droplet size during the rapid firing of automotive fuel injector systems	<ul style="list-style-type: none">Online continuous particle size analysis needed for efficient, cost-effective monitoring and control of industrial processesSuitable for the widest variety of process streams from dry powders to hot sticky slurries, sprays and emulsions, whether milligrams of material or hundreds of tonnes per hourInsittec systems measure particles in the size range 0.1 micron to 2.5 mm
What is special about this product?	<ul style="list-style-type: none">World's most popular particle sizing instrumentClass-leading particle sizing performance in a compact footprintIntuitive software with built-in expertise to ease your workloadFlexible reporting to display your data the way you wantFast smart swap between wet and dry unitsRapid and effective wet dispersion for dispersions and emulsionsFast, reliable particle size measurement of fragile and cohesive dry powdersMastersizer know-how throughout	<ul style="list-style-type: none">High-speed, high resolution dynamic imaging technology127-frames-per-second digital camera with up to 5 megapixel resolutionImaging of individual particles and liquid particle dispersionsThumbnail images saved for post-run viewingQuantitative data on particle size and shape, including particle width and elongation data	<ul style="list-style-type: none">Measurement across a wide size range without requiring constant optics changesResolve rapid changes in droplet size over time, by measuring up to 10,000 measurements a secondDeliver accurate, concentration-independent results using a patented multiple scattering analysisCharacterize wide spray plumes without risking optical contaminationReveal dynamic changes in spray particle size through the unique size history analysis software	<ul style="list-style-type: none">Industrially robusttechnologically provenmeasures particles in the size range 0.1 to 2500 µmdelivers real-time monitoring and controlBase model hardware manufactured to GAMP5 standards and compatible with CIP/SIP requirements to meet specific manufacturing specificationsEasy to use software and fully automated operation to minimize training requirements and release operator timeIntegration with existing control platforms to simplify development of automated control protocolsHigh reliability of >95% with little downtime, minimal maintenance and maximum ROI

Particle size, shape, chemistry, concentration, molecular weight, Formulation stability and intrinsic viscosity



	Morphologi 4/4-ID	Zetasizer	Nanosight	Product
	Chemical identification, Particle shape, Particle size	Zeta potential, Particle size, Particle concentration, Molecular size, Molecular weight, Protein mobility	Particle concentration, Particle size	What does it measure?
	Image Analysis Raman Spectroscopy	Dynamic Light Scattering, Electrophoretic Light Scattering, Static Light Scattering	Nanoparticle Tracking Analysis	Technologies used
	<ul style="list-style-type: none">Size measurement of non-spherical particles such as needle shaped crystals from 0.5µm to 1000µmMeasurement of shape differences where particle size alone does not allow differentiationDetection and enumeration of agglomerates, oversized particles and contaminant particlesAutomation of manual methods such as microscopyPhysical characterization of individual components within a mixtureCross-validation of particle size measurements such as laser diffraction	<ul style="list-style-type: none">Measuring the size of colloids, nanoparticles and molecules in solution from 0.3nm to 15µmDetermining the molecular weight of polymers and proteinsOptimizing and predicting dispersion stability of colloids and biomoleculesMonitoring molecular aggregation and particle flocculation processes	<ul style="list-style-type: none">Detection and visualization of nanoparticle populations on a particle-by-particle basis from 10nm to 2µmMeasurement of particle size and particle concentrationTracking of aggregation and dissolution processes in real timeApplications include nanotoxicology, biomarker detection and drug delivery researchFluorescence mode to provide differentiation of labeled or naturally fluorescing particles	What is it used for?
	<ul style="list-style-type: none">Measures particle size, shape and chemical identity in one platformIntegrated dry powder dispersion unit automates sample preparation for consistent measurementsVersatile sample presentation accessories for measuring suspended and filtered samplesSimple SOP operation from sample dispersion through to size, shape and chemical analysisAutomatic selection, targeting and chemical classification of thousands of individual particlesPowerful and intuitive software interface making both visual and statistical interpretation of your data easier than ever	<ul style="list-style-type: none">Technologies include NIBS, M3-PALS, DLS, ELSSimplicity of operation means minimal training and robust resultsHigh sensitivity for nanoparticles, proteins, and macromoleculesHigh optical quality and temperature control ensures accuracy and repeatabilityMPT-3 Autotitrator optionAdaptive Correlation to enhance repeatabilityMADLS for angle independent size analysis with improved precision and resolution. Also used for accurate particle concentration measurementsM3-PAL and constant current mode for Zeta potential to reduce errors	<ul style="list-style-type: none">Simultaneous measurement of multiple characteristicsVisual validation of resultsgives extra confidenceUser friendly software with easy set-up of SOPs for routine useMinimal sample preparationAutomated multiple sample analysis when used with a syringe pump or autosamplerMinimal consumables reduce running costs on a day-to-day basisHigh resolution particle sizing technique, ideal for polydisperse systems	What is special about this product?

Focus on semiconductors



Product	Automated X'Pert³ MRD (XL)	2830ZT Wafer analyzer
What does it measure?	Wafer orientation and quality Thin film strain, composition Multilayer thickness Epilayer integrity	Elemental composition layer thickness
Technologies used	High-resolution X-ray diffraction (HR-XRD)	X-ray fluorescence
What is it used for?	<ul style="list-style-type: none"> QC and R&D of thin film layers and substrates Semiconductor single-crystal epitaxial layers Multicrystalline electro ceramics PPM-resolution lattice parameter and lattice parameter strain measurements Monolayer precision thickness measurements epitaxial layers Phase purity and orientation distribution in sputter deposited films 	<ul style="list-style-type: none"> Elemental QC of thin films (including Si and electro ceramics) Alloy composition and film thickness High precision high throughput measurement Elemental composition (for Elements heavier than Be)
What is special about this product?	<ul style="list-style-type: none"> Can be used in both lab and fab versions (upgradable from lab version) Can access coplanar, skew and in-plane geometry 200mm wafer mapping capability GEN series compatible waferloading and automation Clean room ready AMASS analysis software, with 'any orientation – any spacegroup' capability The only platform that has a 180 deg Chi cradle The only platform that can reach extremely high incident angles on 8" wafers Motorized divergence and antiscatter slits for monochromators can automatically vary the X-ray beam height Microbeam collimators can reduce the X-ray beam size to as small as 100 × 100 microns 4 detection modes fully automated 	<ul style="list-style-type: none"> This tool can measure up to 300mm wafer size up to 25 wafers per hour Several channels of the same element can be equipped to boost the element sensitivity



Molecular and crystalline structure, composition, crystalline quality



Product	OMNISEC	Empyrean	X'Pert³ MRD (XL)	Aeris	FieldSpec - LabSpec	Product
What does it measure?	Absolute molecular weight (Mw), molecular size, intrinsic viscosity (IV), branching and other polymer parameters	Crystalline phase crystallographic structure materials microstructure Thin film structure Epitaxial strain	Thin film structure, epitaxial strain, materials microstructure	Crystalline phase	Materials properties, molecular structure, multiple constituents	What does it measure?
Technologies used	Gel Permeation Chromatography, Size Exclusion Chromatography, Static Light Scattering	X-ray diffraction, reflectometry, SAXS, CT	X-ray diffraction, reflectometry	X-ray diffraction, reflectometry	Near-infrared spectroscopy (NIR)	Technologies used
What is it used for?	<ul style="list-style-type: none"> Determining absolute and relative Mw and Mw distribution of synthetic and natural polymers Measuring IV to investigate molecular structure and branching Assessing polymer degradation Controlling mechanical properties of plastics Characterizing and quantifying components in blends Measuring sample concentration e.g., polymer additives in fuel 	<ul style="list-style-type: none"> Phase Identification Phase quantification Thin Film characterization Epitaxial layer analysis Bulk material characterization Non-Ambient phase change Battery in-operando study In-situ phase change Stress and residual strain Crystallographic texture 3D flaw detection Nanoparticle analysis 	<ul style="list-style-type: none"> Measuring Epitaxial film composition and thickness from rocking curves and reciprocal space maps Analyzing full-sized semiconductor wafers Speciality thin films, strain, preferred orientation, stress, texture, requiring large 4-circle goniometer All standard methods to ultra-high resolution 	<ul style="list-style-type: none"> Phase identification and quantification in reflection, transmission or grazing incidence Thin film analysis Stress measurement 	<ul style="list-style-type: none"> Non-destructive analysis of a wide range of materials in the laboratory or in the field Quality control of any type of product and requires no sample preparation Uses statistical analysis to correlate spectra to any number of materials properties 	What is it used for?
What is special about this product?	<ul style="list-style-type: none"> OMNISEC REVEAL – a fully integrated temperature controlled multidetector module with minimized inter-detector volumes for maximum stability and sensitivity Market leading light scattering detector for absolute Mw High sensitivity RI detector, for low concentrations Self-balancing viscometer for accuracy in IV Wide UV/VIS wavelength range for all applications Maximum sensitivity detectors with MALS capability Intuitive, advanced and automated software OMNISEC RESOLVE – an integrated pump, degasser, autosampler and column oven in a single unit 	<ul style="list-style-type: none"> Most versatile and productive XRD system with the highest data and product quality on the market Highest angular resolution of any laboratory powder diffractometer and delivers data closest to synchrotron quality Widest range of non-ambient and in-situ environments All relevant diffraction geometries (reflection, transmission, capillary, microdiffraction, Debye-Scherrer) with batch automation Wide selection of components to match every customer Cost-effective options for SAXS and CT configurations Customizable and special solutions HighScore software 	<ul style="list-style-type: none"> New high resolution goniometer using Heidenhain encoders Improved accuracy and faster positioning Rapid tool-free exchange of tube position from point to line focus Pneumatic shutters and beam attenuators Longer lifetime of incident beam components with CRISP* including a lead-free tube tower. Second generation of PreFIX for even more accurate optics positioning AMASS software 	<ul style="list-style-type: none"> Compact X-ray diffractometer External loading intuitive operation, accessible to non-experts Touch screen user interface lets you proceed effortlessly through the measurement process of your samples Low cost of ownership, limited infrastructure requirements no need for compressed air or external cooling, lowest power consumption X-ray tube has a virtually unlimited lifetime Automation capabilities HighScore software for ease of analysis Upgradable for power, grazing incidence, transmission, non-ambience 	<ul style="list-style-type: none"> Can be calibrated for a large range of materials' properties Highly advanced statistical analysis software to correlate spectra to any number of materials properties Spectral resolution 3nm - 10nm Wavelength range 350nm - 2500nm Non-destructive method requiring little or no sample preparation Wide spectral range can measure multiple properties simultaneously 	What is special about this product?

Ask about specials and automation!

Elemental composition, film thickness

Sample preparation for XRF and ICP

									
Product	Zetium	Epsilon 4	Epsilon 1	Epsilon Xflow	LeNeo	TheOx Advanced	Eagon2	LeDoser 12	Product
What does it measure?	Elemental composition Film thickness	Elemental composition Film thickness	Elemental composition Film thickness	Elemental composition QC of liquids	<ul style="list-style-type: none">Automated fused bead machine, for sample preparation that provides a factor x10 improvement in accuracy for XRF measurementsAutomated preparation of peroxide and borate solutions for ICP. Decrease the sample preparation time, achieves complete dissolution, increase users' safety			Automated sample weighing and borate flux dispensing for sample preparation by fusion	What does it provide?
Technologies used	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	Automated borate fusion and sample oxidation			High precision autonomous weighing	Technologies used
What is it used for?	<ul style="list-style-type: none">Quantification of elements Be-Am with superior lowest limits of detection for most elementsAll materials in solid, powder or liquid formDetection and measurement of elements in thin films including film thickness measurementSmall spot mapping for all elements across the range	<ul style="list-style-type: none">Quantification of elements B-Am with lowest limits of detection for most elementsAll materials in solid, powder or liquid formDetection and measurement of elements in thin films including film thickness measurement	<ul style="list-style-type: none">Quantification of elements from Na to Am with lowest limits of detection for most elementsOnline elemental analysis of solids, powders and liquids	<ul style="list-style-type: none">Online elemental analysis of liquids	<ul style="list-style-type: none">Preparing glass disks for elemental analysis using XRFPreparing peroxide or borate solutions for elemental analysis using ICP	<ul style="list-style-type: none">Preparing glass disks for elemental analysis using XRFPreparing peroxide or borate solutions for elemental analysis using ICP ICP	<ul style="list-style-type: none">Preparing glass discs for elemental analysis using XRF	<ul style="list-style-type: none">Eliminates repetition of operators' tasks, reduces fatigue and errors. Increases productivity	What is it used for?
What is special about this product?	<ul style="list-style-type: none">Combination of ED and WD reduce measurement time up to 50%Batch automationSimple & Intuitive SuperQ software with the Virtual AnalystFastScan Omnia program standardless analysisLargest range of bespoke and in-house certified calibration standardsDust removal device minimizes contamination and maximizes instrument uptimeSST R-mAX tube with CHI-BLUE window coating for increased X-ray tube durability and less driftingSmall-volume airlock design for rapid cycling of samples into vacuum, or low He consumption for liquids analysisSupported by expertise and CRMs for all materials types	<ul style="list-style-type: none">Can handle a large variety of sample sizes, from less than a gram up to larger bulk samples, including irregularly shaped objectsSmall footprint allows it to be sited near to, or even next to, the production line for process controlAutomatableClose coupling of Tube-sample-detector for optimized sensitivityAutomatic and builtin drift monitor for best accuracyUnique combination of 10 position sample changer with spinnerCreating unlimited applicationsAutomatic Program Selection (APS) for easy operationSupported by expertise and CRMs for all materials types	<ul style="list-style-type: none">All measurements in air. No need for helium or vacuum pumpHighest analytical performance in its classCompletely X-ray safe operationBuilt-in drift monitor for best accuracy and easy operationCreating unlimited applicationsAutomatic Program Selection (APS) for easy operationSupported by expertise and CRMs for all materials types	<ul style="list-style-type: none">Instantaneous results for feedback into control systemsSupported by expertise and CRMs for all materials typesAsk about bespoke in-line solutions!	<ul style="list-style-type: none">3 preparation modes in 1 instrument1 fusion positionSmall and compact, fits in limited spaceReady to use right out of the boxSelf-installedAbsolute safety for the operatorQuick and easy replacement of internal refractory plates	<ul style="list-style-type: none">High productivity, 6 fusion positionsWithstands heavy workloads and harsh work environments3 preparation modes in 1 instrument3 different layers of refractory materials for maximal heat retention and energy savingSample monitoring to eliminate the risk of losing track of samples and to measure the fusion success rate	<ul style="list-style-type: none">Absolute safety for the operator2 fusion positionsOptional exhaust adapter for minimum infrastructure requirementsCasting dish sensors: no possible damage of the instrument related to pouring without the platinum moldNon-wetting agent pills injection for optimized fusion method efficiencyPause and inspection function to visualize the fusion process during the fusion cycle	<ul style="list-style-type: none">Synchronizes the sample preparation process and enables the samples to be ready just in time for the subsequent fusion and analysis steps12 positionsSaves 90% of labor time related to the weighing stepFully adaptable to your standard operating procedure (SOP)Eliminates data transfer errors because it is LIMS ready and has sample tracking optionSelf-installed	What is special about this product?
			Ask about smart manager!						

About Malvern Panalytical

We draw on the power of our analytical instruments and services to make the invisible visible and the impossible possible.

Through the chemical, physical and structural analysis of materials, our high precision analytical systems and top-notch services support our customers in creating a better world. We help them improve everything from the energies that power us and the materials we build with, to the medicines that cure us and the foods we enjoy.

We partner with many of the world's biggest companies, universities and research organizations. They value us not only for the power of our solutions, but also for the depth of our expertise, collaboration and integrity.

We are committed to Net Zero in our own operations by 2030 and in our total value chain by 2040. This is woven into the fabric of our business, and we help our employees and customers think about their part in creating a healthier, cleaner, and more productive world.

With over 2300 employees, we serve the world, and we are part of Spectris plc, the world-leading precision measurement group.

Malvern Panalytical. We're BIG on small™

Service & Support

Malvern Panalytical provides the global training, service and support you need to continuously drive your analytical processes at the highest level. We help you increase the return on your investment with us, and ensure that as your laboratory and analytical needs grow, we are there to support you.

Our worldwide team of specialists adds value to your business processes by ensuring applications expertise, rapid response and maximum instrument uptime.

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- Sample and application consultancy



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