



**Malvern
Panalytical**
a spectris company

Mining analytical toolbox

Sense - Evaluate - Predict - React



Mining analysis

The shift towards lower grade ore deposits, sustainable energy and volatile market conditions pushes the mining industry towards predictive, sustainable, and agile analytical solutions to improve safety, increase operational efficiency and develop new services and business models.

Our mining customers value Malvern Panalytical's complete offerings of smart technologies. More than 50 years of experience in creating value for all different segments of the mining industry are essential to

developing tailored solutions for an optimal and efficient prediction during all steps of your mining process - from mineral exploration to the analysis of final products.

Either direct analysis in the field, on-line sensors to predict ore grades, laboratory equipment or complete automation solutions, our specialists develop together with you the optimal solution tailored to your specific needs.





Expertise support: Tailored consultancy and training services with knowledge of in-house experts

Mineralogical composition & crystalline structure | Elemental composition



Product	TerraSpec4	Aeris Minerals edition	Empyrean	CNA range	Epsilon Xflow	Epsilon 1	Epsilon 4	Revontium	Zetium Minerals edition	Axios FAST	Product
Technology used	Near infrared (NIR)	X-ray diffraction (XRD)	X-ray diffraction (XRD), computed tomography (CT)	Pulsed fast thermal neutron activation (PFTNA)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	Technology used
Where in the process?	●●●●●●●●	●●●●●	●	●●	●●	●●●●●●●●	●●●●●●	●●●●●	●●●●●●●	●●	Where in the process?
What is it used for?	<p>Non-destructive mineralogical analysis of ores, rocks, and minerals in the lab or field for:</p> <ul style="list-style-type: none"> Quality control of any type of ore Deposit mapping Alteration mapping Ground truthing Field exploration Mineral identification Drill cuttings analysis Core logging Geochemical gradient determination Clay species delineation Faster vectoring to ore body 	<ul style="list-style-type: none"> Mineral identification and quantification Prediction of process parameters related to mineralogy Cluster analysis 	<ul style="list-style-type: none"> Mineral identification and quantification Mineral mapping 2D and 3D imaging Bulk material characterization Non-ambient phase changes In-situ phase changes Stress and residual strain Crystallographic texture 	<ul style="list-style-type: none"> Real-time detection of chemical variation in ore composition Ore sorting for stockpile management Quality control of processed material streams 	<ul style="list-style-type: none"> Real-time elemental analysis and process control of liquids and liquors Wastewater monitoring 	<ul style="list-style-type: none"> Quantification of elements Na-Am Lowest limits of detection for most elements Analysis of rocks, ores, and drill cores directly in the field or mine Analysis in remote container laboratories At-line process analysis Environmental checks Solids, powders, and liquids 	<ul style="list-style-type: none"> Quantification of elements Na-Am Lowest limits of detection for most elements Analysis of rocks, ores, and drill cores directly in the mine Analysis in remote container laboratories At-line process analysis Wear metal analysis Environmental checks Solids (including irregularly shaped objects), powders, and liquids Sample sizes from <1g to larger bulk samples 	<ul style="list-style-type: none"> Quantification of elements Na-Am Lowest limits of detection for most elements, especially metals and heavy elements Analysis of rocks, ores, and drill cores directly in the mine Achieve the best performance in remote container laboratories At-line process analysis Wear metal analysis Environmental checks Solids, powders, and liquids Sample sizes from <1g to 200g 	<ul style="list-style-type: none"> Quantification of elements Be-Am Lowest limits of detection for most elements All materials in solid, powder, or liquid form Small-spot mapping for all elements across the range 	<ul style="list-style-type: none"> High-speed, process-critical elemental exploration during mining and ore processing High-speed elemental analysis in service laboratories 	What is it used for?
What's special about this product?	<ul style="list-style-type: none"> Can be calibrated to a large range of materials No sample preparation needed Highly advanced statistical analysis software Can measure multiple properties simultaneously Spectral resolution 3 nm - 10 nm Wavelength range 350 nm - 2,500 nm 	<ul style="list-style-type: none"> Compact design, tailored to the mining industry Minimum infrastructural requirements External sample changer Fully automatable Intuitive operation Touch-screen user interface Low cost of ownership Virtually unlimited lifetime of X-ray tube Speed and Sensitivity pack HighScore and/or RoboRiet automated data evaluation software 	<ul style="list-style-type: none"> Most versatile and productive XRD system with highest data and product quality on the market Can be used in widest range of non-ambient and in-situ environments Batch automation for all relevant diffraction geometries Wide selection of components to match every customer Cost-effective CT configurations HighScore software 	<ul style="list-style-type: none"> On/off neutron tube Two designs available depending on ore type On-belt monitoring of full material volume Simple installation and easy maintenance Suitable for various belt loads and widths CNA Manager: intuitive user software and interface 	<ul style="list-style-type: none"> Real-time results Excellent short- and long-term repeatability Low-maintenance, with remote access options Fast multi-element analysis Process monitoring and control via direct interface to manufacturing execution systems Customizable to process conditions Chemical resistance to wide range of liquids Designed for ATEX Zone 1 & 2 requirements 	<ul style="list-style-type: none"> No need for helium or vacuum pump Can be used with car battery in the field Highest analytical performance in its class X-ray-safe operation Built-in drift monitor Potential for unlimited applications Automatic Program Selection (APS) for easy operation Supported by expertise and CRMs for all material types 	<ul style="list-style-type: none"> Small footprint, allowing for placement near or next to production line Automatable Flexible calibration solutions (WROXI) Close coupling X-ray source: sample detector for optimized sensitivity Reduced He consumption Online remote support Multiple software options (e.g., Omnian, FingerPrint) Built-in drift monitor 10-position sample changer with spinner Automatic Program Selection (APS) for easy operation 	<ul style="list-style-type: none"> Compact instrument, allowing for placement near or next to production line 4-detector configuration for high sample throughput X-ray tube with ZETA technology and CHI-BLUE coating for increased tube durability and less drifting Automatable Flexible calibration solutions (WROXI) Smart Manager Omnian screening 32-position sample changer with spinner Intuitive SuperQ software with in-house Virtual Analyst expertise Many features to protect against dust and liquid spillage Small-volume airlock design enables rapid sample cycling and low He consumption 	<ul style="list-style-type: none"> Combination of ED and WD technology (SumXcore) reduces measurement times by up to 50% Batch automation Intuitive SuperQ software with in-house Virtual Analyst expertise FastScan Omnian program for standardless analysis Dust removal device minimizes contamination and maximizes uptime SST R-mAX tube with CHI-BLUE window coating for increased tube durability and less drifting Small-volume airlock design enables rapid sample cycling and low He consumption Expertise and CRMs for all material types (including in-house developed standards like WROXI or Pro-Trace) 	<ul style="list-style-type: none"> Quick, simultaneous analysis with very precise results Up to 28 user-defined elements High-throughput: unattended batch analysis and minimum sample loading time No recalibration needed 4 kW SST-mAX X-ray tube with ZETA technology Easy maintenance, including global support and maintenance network 	What's special about this product?



Expertise support: Tailored consultancy and training services with knowledge of in-house experts

	Particle size and shape				Sample preparation for XRF and ICP				Industry 4.0		
Product	Mastersizer 3000+	Insitac	Morphologi 4-ID	Zetasizer	LeNeo	FORJ	Eagon 2	LeDoser 12	Automation solutions	Digital solutions	Product
Technology used	Laser diffraction	Laser diffraction	Image analysis, Raman spectroscopy	Dynamic light scattering	Automated borate fusion and sample oxidation	Automated borate fusion and sample oxidation	Automated borate fusion and sample oxidation	Automated dosing of reagents	Combination of multiple sensors	Cloud-based software algorithms	Technology used
Where in the process?	● ●	● ●	●	●	● ● ●	● ● ●	● ● ●	● ● ●	● ●	● ● ● ● ● ● ● ●	Where in the process?
What is it used for?	<ul style="list-style-type: none"> Size distribution measurement of suspensions, emulsions, and dry powders Controlling powder properties such as wettability, bulk density, powder flow, and solubility 	<ul style="list-style-type: none"> Continuous on-line particle size analysis Suitable for dry powders, hot sticky slurries, sprays, and emulsions From milligrams to hundreds of tonnes of material per hour 	<ul style="list-style-type: none"> Size measurement of non-spherical particles, including cross-validation Particle shape measurement (where particle size alone does not allow differentiation) Identification of agglomerates, oversized particles, and contaminant particles Automation of manual methods such as microscopy Physical characterization of individual components in a mixture 	<ul style="list-style-type: none"> Size measurement of colloids, nanoparticles, and molecules in solution Monitoring of molecular aggregation and particle flocculation processes 	<ul style="list-style-type: none"> Automated preparation of glass disks for XRF Automated preparation of peroxide or borate solutions for ICP 	<ul style="list-style-type: none"> Automated preparation of glass disks for XRF Automated preparation of peroxide or borate solutions for ICP 	<ul style="list-style-type: none"> Automated preparation of glass disks for XRF 	<ul style="list-style-type: none"> Completely automated dosing of reagents for preparing glass disks or solutions for ICP 	<ul style="list-style-type: none"> Automated process monitoring High-throughput analysis Standardized measurements Sample treatment, transport, and preparation Results distribution Container laboratories 	<ul style="list-style-type: none"> Development of digital solutions for specific applications Data fusion to predict process parameters 	What is it used for?
What's special about this product?	<ul style="list-style-type: none"> World's most popular particle-sizing instrument with class-leading performance Compact footprint Intuitive software with built-in expertise Flexible reporting: display your data the way you want it Rapid, effective wet dispersion Fast, reliable measurement of fragile and cohesive dry powders Particle size range 10 nm - 3,500µm 	<ul style="list-style-type: none"> Industrially robust and technologically proven Real-time, efficient, cost-effective monitoring and control Base model hardware Meets GAMP 5 and CIP/SIP standards Easy-to-use, fully automated software Integrates existing control platforms >95% reliability Particle size range 0.1µm - 2.5 mm 	<ul style="list-style-type: none"> One platform for particle size, shape, and chemical identity measurements Integrated dry powder dispersion unit to automate sample preparation Versatile sample presentation accessories for suspended and filtered samples Simple SOP operation from sample dispersion through to size, shape, and chemical analysis Automatic selection, targeting, and chemical classification of thousands of individual particles Powerful, intuitive software interface for visual and statistical data interpretation Particle size range 0.5 - 1,300 µm 	<ul style="list-style-type: none"> Patented technologies Simple operation, enabling minimal training and robust results High optical quality and temperature control for accuracy and repeatability MPT-3 autotitrator and autosampler options for trend measurements and high-throughput testing Particle size range 0.3 nm - 10 µm 	<ul style="list-style-type: none"> Three preparation modes in one instrument Lower sample preparation time One fusion position Compact: fits in limited space Ready to use immediately Self-installation Very safe for operators Quick, easy replacement of internal refractory plates 	<ul style="list-style-type: none"> Six fusion positions Developed to deliver the highest levels of robustness Innovative handling mechanisms to transfer the samples into the furnace, allowing low operation cost and short fusion cycle Constant and homogenous heating between fusion positions Ergonomic and safe manipulation Sample monitoring to measure fusion success rate LIMS and remote connection 	<ul style="list-style-type: none"> Two fusion positions Optional exhaust adapter enables minimal infrastructure requirements Casting dish sensors: prevents pouring-related damage Non-wetting agent pill injection 'Pause and inspect' function Very safe for operators Lower sample preparation time 	<ul style="list-style-type: none"> Synchronized sample preparation process 12 fusion positions 90% labor time savings from weighing step Fully adaptable to standard operating procedure (SOP) LIMS-ready with sample tracking option, eliminating data transfer errors Self-installation 	<ul style="list-style-type: none"> In-house automation knowledge and software In-house sensor development In-house application expertise In-house service and support 	<ul style="list-style-type: none"> In-house digital experts In-house sensor development In-house application expertise Equipment utilization insights, maintenance notifications, and global systems access via Smart Manager Global support 	What's special about this product?

* Select Science 2023 Platinum Seal of Quality awarded to Mastersizer 3000



About Malvern Panalytical

Malvern Panalytical is a global leader in the analytics of material and life sciences. We unleash the power of small things to make big things happen for our customers.

Our vision is to make the world cleaner, healthier, and more productive.

We partner with our customers to make their solutions possible through the power of precision measurements, our expertise, trusted data, and insights.

Our people are partners in discovery. We collaborate with our customers and with each other to discover new possibilities and achieve breakthroughs.

Our culture is a healthy, high-performance culture shaped by our values: Own it, Aim High and Be True.

We're committed to Net Zero in our own operations by 2030 and in our total value chain by 2040.

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

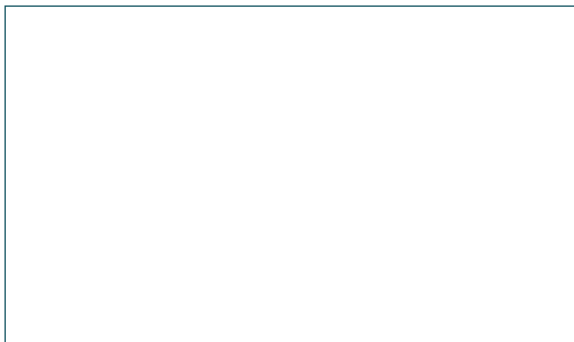
Malvern Panalytical. We're big on small™

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, and ensure that as your analytical requirements grow, we're 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.

- Proactive local and remote support
- Full and flexible range of service agreements
- Compliance and validation support
- Onsite or classroom-based training courses
- e-Learning training courses and web seminars
- Digital services, including MyStore and My Customer Support Portal
- Sample analysis, method development, and applications consultancy



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