Malvern Panalytical
a spectris company

Metals analytical toolbox

Sense - Evaluate - Predict - React

Metals analysis

Analytical monitoring in metals manufacturing is crucial for ensuring product quality, operational efficiency, and environmental compliance. As the industry shifts towards sustainability, energy transition, and the adoption of new technologies, the need for precise monitoring becomes even more critical.

Additionally, the rise of advanced materials and new technologies demands rigorous quality control to meet increasingly stringent standards, making analytical monitoring indispensable in achieving sustainable metal production.

Analytical techniques enable real-time data collection on emissions, waste, and energy consumption, helping manufacturers minimize their environmental footprint. These insights support the development of energy-efficient processes and the integration of alternative energy sources.

Raw material processing | **Process monitoring** | **Recycling**

Raw material quality control 1 → Raw mixture 2 → Metal making and casting 3 → Rolling, coating, and downstream processing 4 → Collection / identification 5 → Sorting 6 → Crushing/ shredding 7 → Separation 8 → Research 9

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

Elemental composition | **Mineralogical composition / Metal properties / Layer thickness**










Product	Epsilon Xline	Epsilon Xflow	Axios FAST	Zetium Metals edition	Revontium	Epsilon 4	CNA range	Aeris Metals edition	Empyrean	On-line XRD	Product
Technology used	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	X-ray fluorescence (XRF)	Pulsed fast thermal neutron activation (PFTNA)	X-ray diffraction (XRD)	X-ray diffraction (XRD)	X-ray diffraction (XRD)	**Technology used**
Where in the process?	4	3	1, 2, 3, 4	1, 2, 3, 4, 9	1, 2, 3, 5, 9	1, 2, 3, 4, 5, 8	1, 2, 6	1, 2, 3	1, 2, 3, 4, 9	4	**Where in the process?**
What is it used for?	• In-line analysis of elemental composition in metal coatings • Product validation • On-line analysis of plating bath solutions	• Real-time elemental analysis and process control of liquids and liquors during metals production (e.g. leaching) • Wastewater monitoring	• High-speed, process-critical elemental analysis during metals making, casting, downstream processing, and recycling • Analysis of metal powders	• 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	• Elemental composition of metals and metal powders • Quantification of elements B-Am with lowest limits of detection for most elements • All materials in solid, powder, or liquid form • Detection and measurement of elements in thin films including film thickness measurement	• Quantification of elements Na-Am • Lowest limits of detection for most elements • Analysis of ores, intermediate products, metals, scrap, and metal powder directly in the production process • Analysis in remote container laboratories • At-line process analysis • Wear metal analysis • Solids (including irregularly shaped objects), powders, and liquids • Environmental checks	• Real-time detection of chemical variation in raw material composition • Real-time basicity check of raw mixtures (e.g. downstream processing of iron ore) • Real-time quality control of processed material streams (e.g. iron sinter)	• Phase / mineral identification and quantification of raw materials (e.g. ores, coal), raw mixtures, intermediate material (e.g. iron sinter, direct reduced iron (DRI), iron ore pellets, matte), slag, metal powders • Prediction of process-relevant parametersr related to mineralogy • Cluster analysis • Analysis of retained austenite in steel (ASTM E975)	• Mineral identification and quantification of raw materials (e.g. ores, coal), raw mixtures, intermediate material, slag, metal powders • Prediction of process-relevant parameters related to mineralogy • Cluster analysis • Analysis of retained austenite in steel (ASTM E975) • Stress and residual strain • Crystallographic texture • Phase mapping • Non-ambient phase changes • In-situ phase changes	• Real-time monitoring of layer thickness and phase composition of galvannealed steel	**What is it used for?**
What's special about this product?	• Non-destructive technology with direct determination of elemental composition on metal surfaces • Continuous measurement in roll-to-roll production processes • Real-time metal coatings analysis for consistent quality throughout the process	• 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	• 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	• 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)	• High sample throughput, speedy analysis, responsive feedback • Can handle a large variety of sample sizes • Small footprint allows placement near, or even next to the production line. • Close coupling of tube: sample detector for optimized sensitivity • Automatic and built-in drift monitor for best accuracy • Unique combination of 32-position sample changer with spinner • Patented X-ray tube with ZETA technology • Power consumption only 200 watts • Supported by expertise and CRMs for all material types • Cutting-edge SuperQ software • Smart Manager connectivity	• 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	• On/off neutron tube • Two designs available depending on material 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	• Compact design, tailored to the metals industry • Minimal infrastructure 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	• 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 • HighScore software	• Process integration • Smooth and simple installation • Highest level of customer service globally • Setup, support, and expertise by our team of specialists • Compatible with all common QC and LIMS software	**What's special about this product?**

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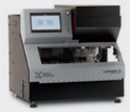
	Particle size and shape			Sample preparation for XRF and ICP				Industry 4.0		
										
Product	**Mastersizer 3000+**	**Insitec**	**Morphologi 4-ID**	**FORJ**	**Eagon 2**	**LeNeo**	**LeDoser-12**	**Automation solutions**	**Digital solutions**	**Product**
Technology used	Laser diffraction	Laser diffraction	Image analysis	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?	1, 2, 3, 7, 9	1, 2, 3	1, 2, 3, 5, 9	1, 2, 3, 4, 9	1, 2, 3, 4, 9	1, 2, 3, 4, 9	1, 2, 3, 4, 9	1, 2, 3, 5	1, 2, 3, 4, 5, 6, 7, 8	**Where in the process?**
What is it used for?	• Size distribution measurement of suspensions, emulsions, and dry metal powders • Controlling powder properties such as wettability, bulk density, powder flow, and solubility • Particle size range 10nm - 3,500 um	• Continuous on-line particle size analysis • Suitable for dry metal powders, hot sticky slurries, sprays, and emulsions • From milligrams to hundreds of tonnes of material per hour • Particle size range 0.1 microns - 2.5 mm	• Size measurement of non-spherical particles in metal powders • Particle shape measurement • Identification of agglomerates, oversized particles, and contaminant particles • Automation of manual methods such as microscopy • Physical characterization of individual components in a metal mixture	• Sample preparation for 10x more accurate XRF measurements • Automated preparation of peroxide and borate solutions for ICP. • Decreasing sample preparation time and ensuring complete dissolution for users' safety	• Sample preparation for 10x more accurate XRF measurements • Automated preparation of peroxide and borate solutions for ICP. • Decreasing sample preparation time and ensuring complete dissolution for users' safety	• Sample preparation for 10x more accurate XRF measurements • Automated preparation of peroxide and borate solutions for ICP. • Decreasing sample preparation time and ensuring complete dissolution for users' safety	• Automated, standardized dosing of reagent for the preparation of glass disks for XRF and solutions for ICP	• Automated process monitoring • High-throughput analysis • Standardized measurements • Sample treatment, transport, and preparation • Results distribution • Container laboratories	• Development of digital solutions for specific metal applications • Data fusion and AI-based prediction of process parameters during metal manufacturing	**What is it used for?**
What's special about this product?	• 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 SelectScience 2023 PLATINUM Seal of Quality * * Select Science 2023 Platinum Seal of Quality awarded to Mastersizer 3000	• 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	• 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 • Automatic selection, targeting, and chemical classification of thousands of individual particles • Powerful, intuitive software interface • Particle size range 0.5 - 1,300 µm	• 6 positions for fusion • Resistance-based heating system • Completely closed furnace • Cold-to-cold operation • Patented handling mechanism transfers crucibles and molds to furnace, improving fusion cycle time and robustness • Heat-drop and heat-ramp functions to enhance oxidation conditions • Sample agitation by swirling to increase sample homogeneity, dissolution speed, and fusion success rate • Optimized chamber design ensuring heat homogeneity • Pre-heat and shut-off timer to program heating periods and ensure power saving • Supercapacitor for safe closure of furnace door and continuation of fusion cycle in case of brief (<30 seconds) power cut	• Two fusion positions • Optional exhaust adapter enables minimal infrastructure requirements • Casting-dish sensors prevent pouring-related damage • Non-wetting agent pill injection • 'Pause and inspect' function • Very safe for operators • Lower sample preparation time	• 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	• 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	• In-house automation knowledge and software • In-house sensor development • In-house application expertise • In-house service and support	• 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?**

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SCIENTISTS' CHOICE AWARDS 22
WINNER

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.

- Local and remote support
- Full and flexible range of support agreements
- Compliance and validation support
- Onsite or classroom-based training courses
- e-Learning training courses and web seminars
- Sample and application consultancy

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