# Malvern Panalytical
a **spectris** company

# EPSILON 1

Small and powerful

# FLEXIBLE AND ACCURATE

## Elemental analysis

**Looking for a flexible, yet simple-to-use, analytical instrument for accurate elemental analysis?**

The Epsilon 1 X-ray fluorescence (XRF) spectrometer is the ideal analytical solution. It is capable of simple element identification and quantification up to more sophisticated analysis. It is an easy-to-operate, compact and X-ray safe instrument without the need for additional chemicals or operating gasses. Considerable savings in time and cost are two of the many benefits XRF can bring compared to alternative analytical techniques.

Epsilon 1 can be used for method development in the R&D laboratories and quality control and process control in the production facilities. The small footprint and self-contained design make the Epsilon 1 an ideal analytical solution for process control to be placed close to the production line.

Epsilon 1 allows screening and quantification by XRF for a wide variety of applications for many types of samples. With little to no sample preparation, bulk samples can be quantified, analyzing elements from sodium to americium across the periodic table. Since XRF is a non-destructive technique, the sample can also be measured subsequently by other analytical techniques, if required.

### Dedicated applications

Epsilon 1 can be calibrated using reference materials that match the composition of the routine samples. These dedicated calibrations result in accurate data with high precision. Epsilon 1 can be calibrated for a wide variety of industry applications.

**Advantages of Epsilon 1**
- Low cost of ownership, low infrastructural requirements, small footprint
- Minimum downtime and maintenance
- XRF's unmatched analytical precision and flexibility compared to other analytical techniques
- Non-destructive analysis
- Ready for many sample types: powders, solids, liquids
- Simple, fast and safe sample preparation
- Elemental screening of unknown samples

## MINING / MINERALS

- Direct quantification of rocks, ores and drill cores
- Fast positive material identification using FingerPrint software
- Standardless analysis to quantify a wide variety of minerals without the need of dedicated calibrations

## METALS

- Simple inspection of coatings using Stratos (multi-)layer analysis solution
- Positive material identification package for fast metals sorting and PASS/FAIL reporting
- Elemental quantification of slags
- Quick screening of ferrous and non-ferrous metals

## PETROCHEMICALS

- Epsilon 1 Sulfur in Fuels edition for compliancy with ASTM D4294, ISO 8754, 20847, IP 336, 496, and JIS K2541-4 test methods
- ASTM D6481 compliant performance with ready-to-use Lube Oils edition
- One-stop-shop for spectrometer and certified oil and fuels standards

## FOOD

- Fast quantification of nutrients in food and animal feed products
- Short feedback loop in process control of food and animal feed
- Robust and accurate quantification of milk powder

## BUILDING MATERIALS

- On-site process and quality control of cement, clinker and raw materials
- Screening of a wide variety of alternative fuels and raw materials (AFR) using standardless analysis

## ACADEMIA

- One instrument for any type of sample without the requirement of dedicated calibrations
- Ideal education tool through its safe design and low utility needs
- The ready-to-use Academia solution is pre-calibrated with Omnian standardless analysis solution
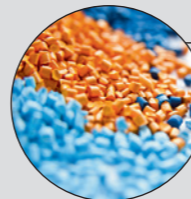
## PHARMACEUTICALS

- Speed up process development using straight-forward analysis of residue elements
- Comply with FDA 21 CFR Part 11 with available Enhanced Data Security software
- Efficient raw materials inspection to quickly identify supply changes
- Optional Installation and Operational Qualification packages (IQ & OQ)

## ENVIRONMENTAL

- In-field identification of contaminated soils
- Analysis of inorganic compounds on air filters at location of the sampler
- Quick analysis of waste water

## PLASTICS & POLYMERS

- RoHS-3 analysis with ASTM F2617 compliant performance
- Detailed and direct analysis of heterogenous samples with Epsilon 1 for small spot analysis
- Unique CRM solutions available for additives, restricted and toxic elements in polyethylene

# OUT-OF-THE-BOX SOLUTIONS

A few out-of-the-box solutions have been created for Epsilon 1 for specific industry applications. Those industry versions are pre-calibrated in the factory and ready to use. No need to worry about method setup or acquiring the right set of reference materials.

**Epsilon 1
Lube Oil**
Quantification of phosphorus, sulfur, calcium and zinc in unused lubricating oils in compliance with ASTM D6481

**Epsilon 1
Sulfur in Fuels**
Determination of sulfur in diesel, gasoline and kerosene in compliance with ASTM D4294-10 and ISO 20847

**Epsilon 1
Academia**
Pre-calibrated with standardless solution Omnian

**Epsilon 1
Small Spot Analysis**
Equipped with a collimated measurement spot (1x1 mm or 3x5 mm) and camera

# READY FOR ANY SAMPLE

## Easy sample preparation

Epsilon 1 can handle a large variety of sample types, weighing a few 100 milligrams, to larger bulk samples: solids, pressed powders, loose powders, liquids, fused beads, slurries, granules, films and coatings.
Also large and irregularly shaped objects with maximum dimensions of 15 x 12 x 10 cm (W x D x H)  can be analyzed.



Liquids, loose powders and solids

## Simple to operate



Place your sample for measurement.



Enter sample name and push 'measure' button.

# CONVENIENT RESULTS VIEWING





## EXPERTISE

Malvern Panalytical offers expertise by advising the right sample preparation method and by helping setup of the whole calibration method. Simply improving existing processes or adding new turnkey applications can make your instrument more efficient and maximize the return on your investment.

# CLOSE-UPS

**The Epsilon 1 is a fully integrated energy dispersive XRF analyzer consisting of a spectrometer, built-in computer and analysis software. Powered by the latest advances in excitation and detection technology, the Epsilon 1 is a star performer in the low-cost benchtop instrument class. A well-designed optical path, a wide range of excitation capabilities ranging from 7 to 50 kV for light and heavier elements and a highly sensitive SDD detector system contribute to the Epsilon 1's uniqueness.**

### Self-contained system
Built-in computer running Microsoft Windows 10 with powerful CPU and 120 GB hard drive ensures flexibility to store and handle thousands of results.

### Repeatability for years
A low-drift 10 W X-ray tube and a handy drift correction routine give compliant results for years without the need for time-consuming re-calibration.

### Maximum sensitivity
The thin-window Ag anode X-ray tube, designed and manufactured by Malvern Panalytical, ensures high quality and sensitivity. The selection of Ag anode material is ideal for the accurate quantification of S and Cl without interference of possible line overlaps in the XRF spectrum, leading to more reliable results. The 50 kV X-ray tube and generator are ideal for exciting heavier elements, resulting in faster analysis times.

### Spillage protection
In order to shield the delicate heart of the system from spillage, a protection foil is in place. In case of spillage, the foil can be replaced easily by the operator.

### Economical footprint
Compact design with a built-in computer and touchscreen reduces the requirement of valuable lab space to less than 0.15 m$^2$.

### Easy operation
High-resolution (1024 x 768), 10.4" LCD touchscreen for easy walk-up and operation.

### Easy communication / connection
USB and network connections for use of standard computer peripherals enable extended use, application development and seated operator.

### Best accuracy
Highly concentrated samples can cause detector saturation resulting in lower accuracy or longer measuring times. Epsilon 1 uses the latest in silicon drift technology in combination with the fastest electronics (1.5 Mcps @ 50% dead time) to handle these highly concentrated samples without any loss of accuracy or increased measuring times.

### Atmospheric variations
Low-energy X-ray photons characteristic of sodium, magnesium, aluminium, silicon, phosphorus and sulfur are sensitive to air-pressure and temperature variations. Built-in temperature and air-pressure sensors compensate for these atmospheric variations, ensuring excellent results whatever the weather.

### Sample positioning
Highly repeatable sample positioning reduces sample-to-sample variations.

### Safety guaranteed
Epsilon 1 complies with the latest Machinery Directive, CSA, IEC, EMC, Vollschutz norms and standards for protection and radiation safety to guarantee a safe instrument for the operator.

# ENHANCE **YOUR ANALYSIS**

Epsilon 1's software has the flexibility to perform basic to more sophisticated analyses. It contains all features needed to obtain accurate results and it can also be augmented to meet advanced analytical requirements while keeping the usability for routine operators simple. Designed for the most stringent analytical protocols, the software also includes a wealth of expandable optional modules.

The Epsilon 1 software consists of two user levels with explicit functionality:
1. Operation mode - for simple operation and convenient results viewing
2. Advanced mode - for full flexibility and access to all features in the software. In this software mode, an unlimited number of applications can be created.

Four software options are available to further enhance the capabilities of the Epsilon 1: Omnian, Stratos, FingerPrint and Enhanced Data Security.

## Standardless analysis
## OMNIAN

Malvern Panalytical's powerful Omnian software is ideal when there is no conventional calibration established for materials that require analysis. When faced with non-routine samples or materials for which there are no certified reference materials, Omnian provides excellent insight into the elemental composition.
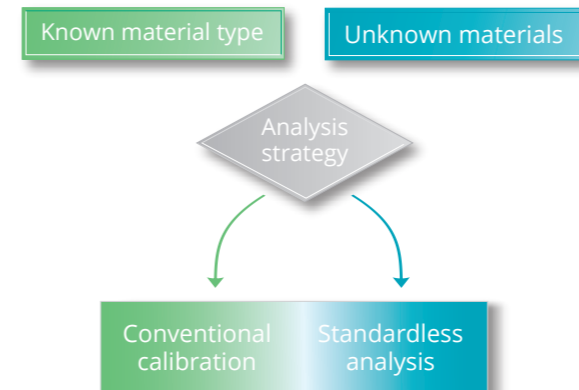
Designed to provide fast and reliable quantification, Omnian's advanced fundamental parameters (FP) algorithm automatically deals with the analytical challenges posed by samples of widely differing types.

## Multi-layer analysis
## STRATOS

Stratos features an algorithm which enables simultaneous determination of chemical composition and thickness of layered materials. The software provides a rapid, simple and non-destructive means of analyzing coatings, surface layers and multi-layered structures.
Accurate results are achieved by using conventional bulk standards, or reference samples whose composition and layer structure differ from those of the unknowns.

| Known material type | Unknown materials |

**Analysis strategy**

| Conventional calibration | Standardless analysis |

## Pass/Fail analysis
## FINGERPRINT

FingerPrint is a material type confirmation routine that uses a rapid statistical analysis of the spectrum for a simple PASS/FAIL answer. Spectra used for the FingerPrint routine can also be used for conventional compositional determination for a more complete diagnostic analysis.

## Enhanced data security
## AUDIT TRAIL SOFTWARE

The enhanced data security software option is designed for GMP and GLP environments, and enables the user to comply with FDA 21 CFR Part 11. The software includes every feature required to satisfy the strict environmental protocols, like multiple security levels, log in with user identification, reporting of date and time, results storing, extensive audit trails and LIMS integration.

**MEASURE IN YOUR OWN LANGUAGE**
Ten most common languages are available for the operator:

测量
Measure
測定
Mesurer
Messung
Mesure
Zmierzyć
Medida
Измерить
Médir

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## WHY CHOOSE
## **MALVERN PANALYTICAL**?

We are global leaders in materials characterization, creating superior, customer-focused solutions and services which supply tangible economic impact through chemical, physical and structural analysis.

Our aim is to help you develop better quality products and get them to market faster. Our solutions support excellence in research, and help maximize productivity and process efficiency.
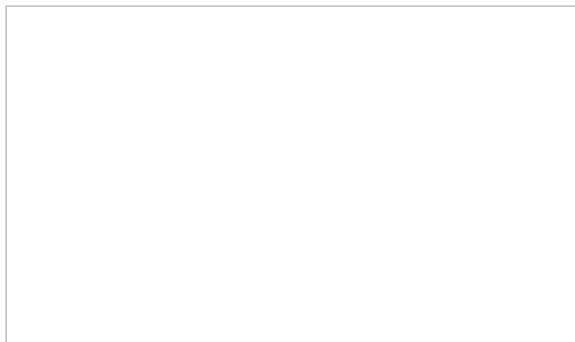
Malvern Panalytical is part of Spectris, the productivity-enhancing instrumentation and controls company.
www.spectris.com

## 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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