



PANalytical
get insight



Epsilon 1

Flexible and accurate
elemental analysis





plastics

soils

cosmetics

glass

electronics

paper

food &
beverages

ceramics

wood

metals &
coatings

Elemental analysis

Flexible and accurate

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

The Epsilon 1 X-ray fluorescence (XRF) spectrometer is an 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 makes 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.

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.

PANalytical has a strong reputation for safe and high-end X-ray instrumentation. Epsilon 1 is built using PANalytical's market-leading technology with superior quality, worldwide service and application support. Application training courses and expertise are available upon request.



1 H 1.008																	2 He 4.003														
3 Li 6.941	4 Be 9.012																	5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180								
11 Na 22.990	12 Mg 24.31																	13 Al 26.98	14 Si 28.09	15 P 30.974	16 S 32.06	17 Cl 35.453	18 Ar 39.948								
19 K 39.098	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.904	36 Kr 83.80														
37 Rb 85.47	38 Sr 87.62	39 Y 88.906	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.95	46 Pd 106.4	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.29														
55 Cs 132.905	56 Ba 137.33	57 La 138.905	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.02	89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu 244	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)															

Z Possible to analyze with Epsilon 1
Z Not possible to analyze with Epsilon 1

Epsilon 1 spectrometer

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





Measure in your
own language
Ten most common
languages are available
for the operator:

測量
Measure
測定
Mesurer
Messung
Mesure
Zmierzyć
Medida
Измерить
Médir

Top 10 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 10 to 50 kV for light and heavier elements and a highly sensitive SDD detector system contribute to the Epsilon 1's uniqueness.

- 1 Self-contained system**
Built-in computer running Microsoft Windows 7 with powerful CPU and 120 GB hard drive ensures flexibility to store and handle thousands of results.
- 2 Repeatability for years**
A low-drift X-ray tube and a handy drift correction routine give compliant results for years without the need for time-consuming re-calibration.
- 3 Maximum sensitivity**
The thin-window Ag anode X-ray tube, designed and manufactured by 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.
- 4 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.
- 5 Economical footprint**
Compact design with a built-in computer and touch screen reduces the requirement of valuable lab space to less than 0.15 m².
- 6 Easy operation**
High-resolution (1024 x 768), 10.4" LCD touch screen for easy walk-up and operation



Advantages of XRF

- Unmatched analytical precision and accuracy compared to other analytical techniques
- Quick quantification method
- Simple, fast and safe sample preparation
- Non-destructive analysis
- Wide analytical concentration range (ppm – %) reducing the necessity for dilution and associated errors



7

Easy communication / connection

USB and network connections for use of standard computer peripherals enable extended use, application development and seated operator.

8

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 to handle these highly concentrated samples without any loss of accuracy or increased measuring times.

9

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.

10

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.





Robust and flexible quant

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.

- Cement
- Cosmetics
- Environmental
- Food
- Forensics
- Metals and coatings
- Mining and minerals
- Petrochemicals
- Pharmaceuticals
- Polymers

Expertise

PANalytical offers expertise by advising the right sample preparation method and by helping set-up 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.

Ready for any sample

The Epsilon 1 provides a large area for placing irregularly shaped samples, which can be as tall as 10 cm.





ification of any sample

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

Phosphorus, sulfur, calcium and zinc in unused lubricating oils in compliance with ASTM D6481



Epsilon 1 Pharma

Palladium, platinum, rhodium, iridium and ruthenium residues in pharmaceutical material



Epsilon 1 Fuels

Sulfur in diesel, gasoline and kerosene in compliance with ASTM D4294-10 and ISO 20847



Epsilon 1 Milk Powder

Potassium, calcium, iron and zinc in milk powder





Enhance your analysis

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.



Omnian

Advanced standardless analysis

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.



Stratos

The Stratos module 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.



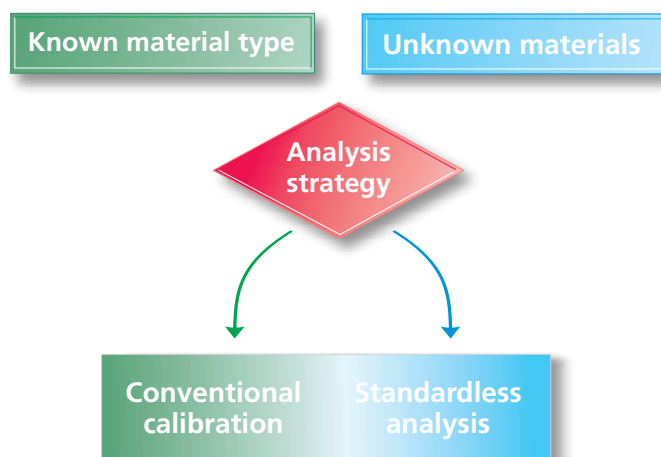
Fingerprint

FingerPrint is a material type confirmation routine that uses a rapid statistical analysis of the spectrum for a simple Yes/No answer. Spectra used for the FingerPrint routine can also be used for conventional compositional determination and for a more complete diagnostic analysis.



Enhanced Data Security

For heavily regulated environments like the pharmaceutical industry, the installation and operation of Epsilon 1 spectrometers are strictly prescribed, and the software handling and data security comply with the requirements of the FDA 21 CFR Part 11 regulations.



About PANalytical

PANalytical's mission is to enable people to get valuable insight into their materials and processes. Our customers can be found in virtually every industry segment, from building materials to pharmaceuticals and from metals and mining to nanomaterials. The combination of our software and instrumentation, based on X-ray diffraction (XRD), X-ray fluorescence (XRF) and near-infrared (NIR) spectroscopy as well as pulsed fast thermal neutron activation (PFTNA), provides our customers with highly reliable and robust elemental and structural information on their materials and is applied in scientific research and industrial process and quality control.

PANalytical employs over 1,000 people worldwide. The company's headquarters are in Almelo, the Netherlands. Fully equipped application laboratories are established in Japan, China, the US, Brazil, and the Netherlands. PANalytical's research activities are based in Almelo (NL) and on the campus of the University of Sussex in Brighton (UK). Supply and competence centers are located on two sites in the Netherlands: Almelo (X-ray instruments) and Eindhoven (X-ray tubes), in Nottingham, UK (XRF applications and standards), in Quebec, Canada (fusion sample preparation) and in Boulder CO, US (near-infrared instruments).

PANalytical is active in all but a few countries of the world. This worldwide sales and service network ensures unrivalled levels of customer support.

The company is certified in accordance with ISO 9001 and ISO 14001.

Visit www.panalytical.com for more information about our activities.

PANalytical is part of Spectris plc, the productivity-enhancing instrumentation and controls company.

Access to expertise

With the largest service network we are able to offer the most comprehensive support package possible.

Expertise:

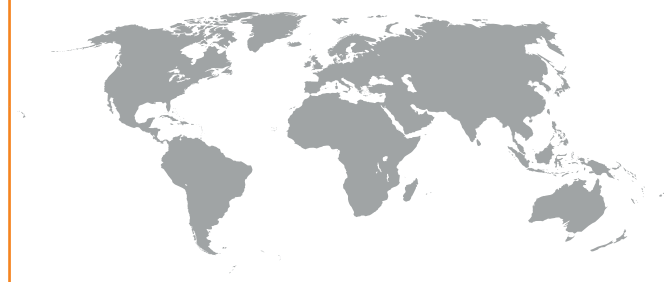
- On-site training available
- XRF training courses
- Performance optimization
- Customizable expertise programs
- Assistance with multi-laboratory standardization

Care Agreements

Our customer support solutions have been developed with your business in mind. They are formulated as a family of four Care Agreements which can be tailored to your specific needs and provide fast, secure and reliable support.

- **ECONOMY:** indispensable coverage for self-sufficient operations
- **ADVANCED:** cost-effective support for routine usage
- **PREMIUM:** flexible package for high equipment usage
- **ELITE:** most comprehensive package for demanding environments

Global and near



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