

XRF

S2 PUMA Series 2

Spectometry Solutions

Innovation with Integrity

S2 PUMA Series 2
Analyze. Everything. Faster.



The S2 PUMA, the most comprehensive and powerful EDXRF spectrometer.

S2 PUMA Series 2 powered by HighSense™ Technology







Analyze.

Measuring material composition is essential for process and quality control in industrial laboratories, but also for research applications in academia. No matter if you need a quick idea of elements present, or accurate concentrations for all elements from carbon (C) to americium (Am), the S2 PUMA is the optimal choice.

Everything.

Samples come in different forms, shapes and sizes, and time and cost savings for sample preparation are always a consideration. Whether you need to analyze solids or liquids, compact pieces or powders, large chunks or very small specimens, the S2 PUMA analyzes all your samples in manual or fully automated mode.

Faster.

Results must be obtained in the shortest possible time since time-to-result is always critical for process control. For optimal process control, large sets of samples are analyzed throughout the day. The S2 PUMA delivers fast, accurate results all day, every day.

The S2 PUMA Series 2 is the most comprehensive and powerful energy-dispersive X-ray fluorescence (EDXRF) solution.

The enhanced hardware and software of the S2 PUMA Series 2 allows you to measure samples up to 3 times faster, and with improved precision and accuracy!

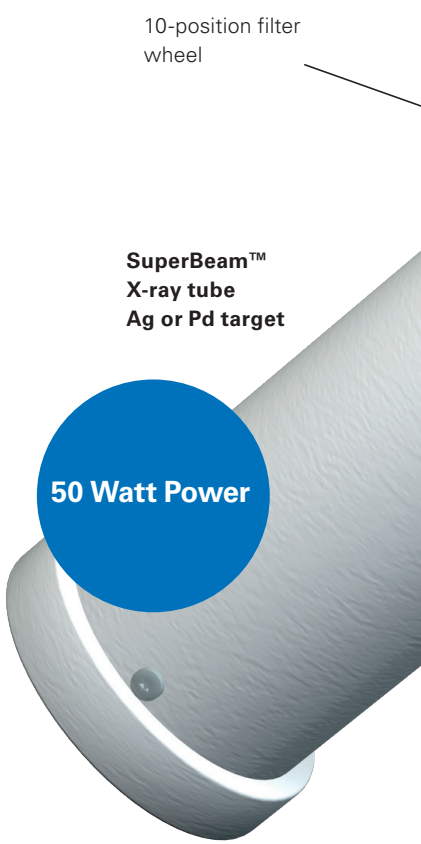
S2 PUMA Series 2 with HighSense™
Speed Meets Performance

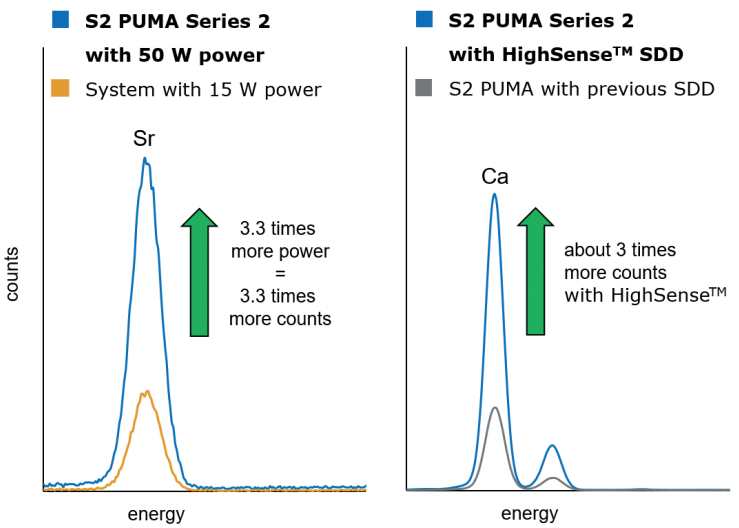
The S2 PUMA Series 2 gives you everything you need to measure and monitor the elemental composition of your samples, regardless of your industry or working environment.

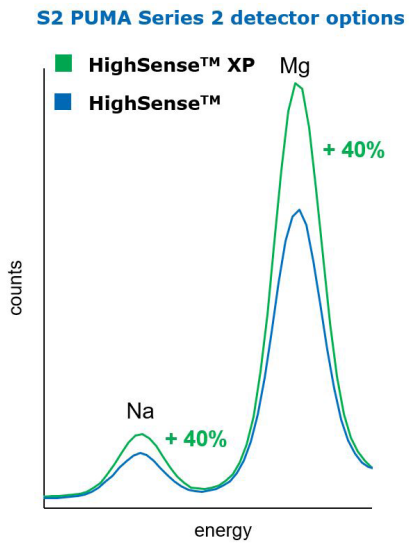
HighSense™ is the key to the unrivaled analytical performance of the S2 PUMA. The instrument's direct-excitation beam path makes full use of the high-power 50 Watt X-ray tube. Optimal excitation of all elements in the sample is guaranteed with up to 50 kV voltage (30 kV optional) and up to 2 mA current. The HighSense silicon drift detectors (SDD) with super high count rate and excellent energy resolution further enhance instrument performance. HighSense provides immediate payback: better detection limits, higher precision and shorter measurement times!

Top performance is the result of perfect teamwork. For the S2 PUMA Series 2, we call this HighSense technology!

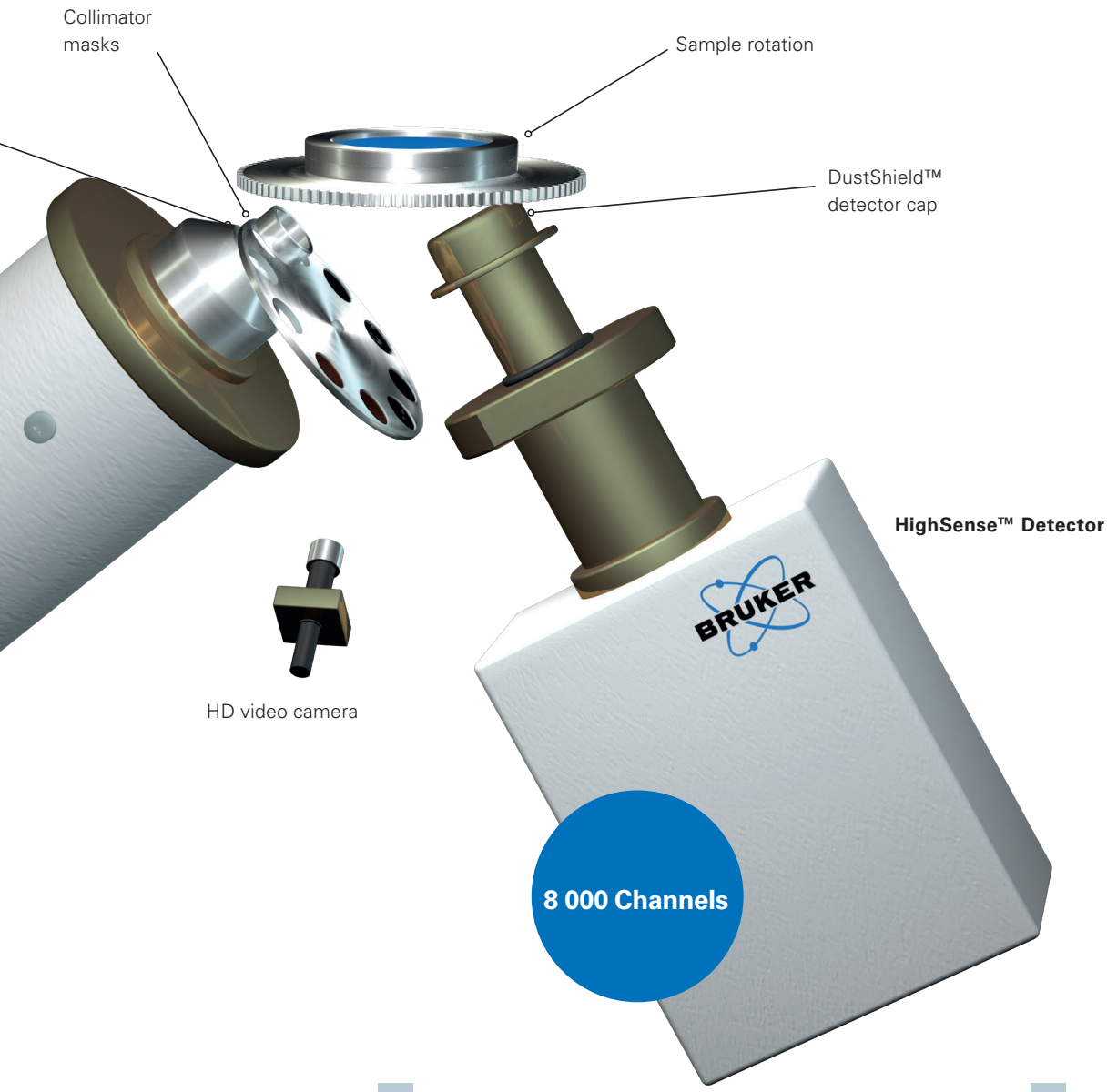
The S2 PUMA uses an end-window X-ray tube to directly excite X-ray fluorescence in a sample. By setting the high voltage and choosing the filter material, the energy range is selected. A fast HighSense or HighSense XP detector with multi-channel analyzer (MCA) detects the X-ray fluorescence radiation and accumulates counts to collect an intensity versus energy spectrum. The HighSense XP comes with an unique Dynamic Detector Profiling features, which allows to boost the input count rate (up to 2.4 Mcps) or enhance the energy resolution.







Unmatched analytical performance thanks to next generation detector technology.



H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac															

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

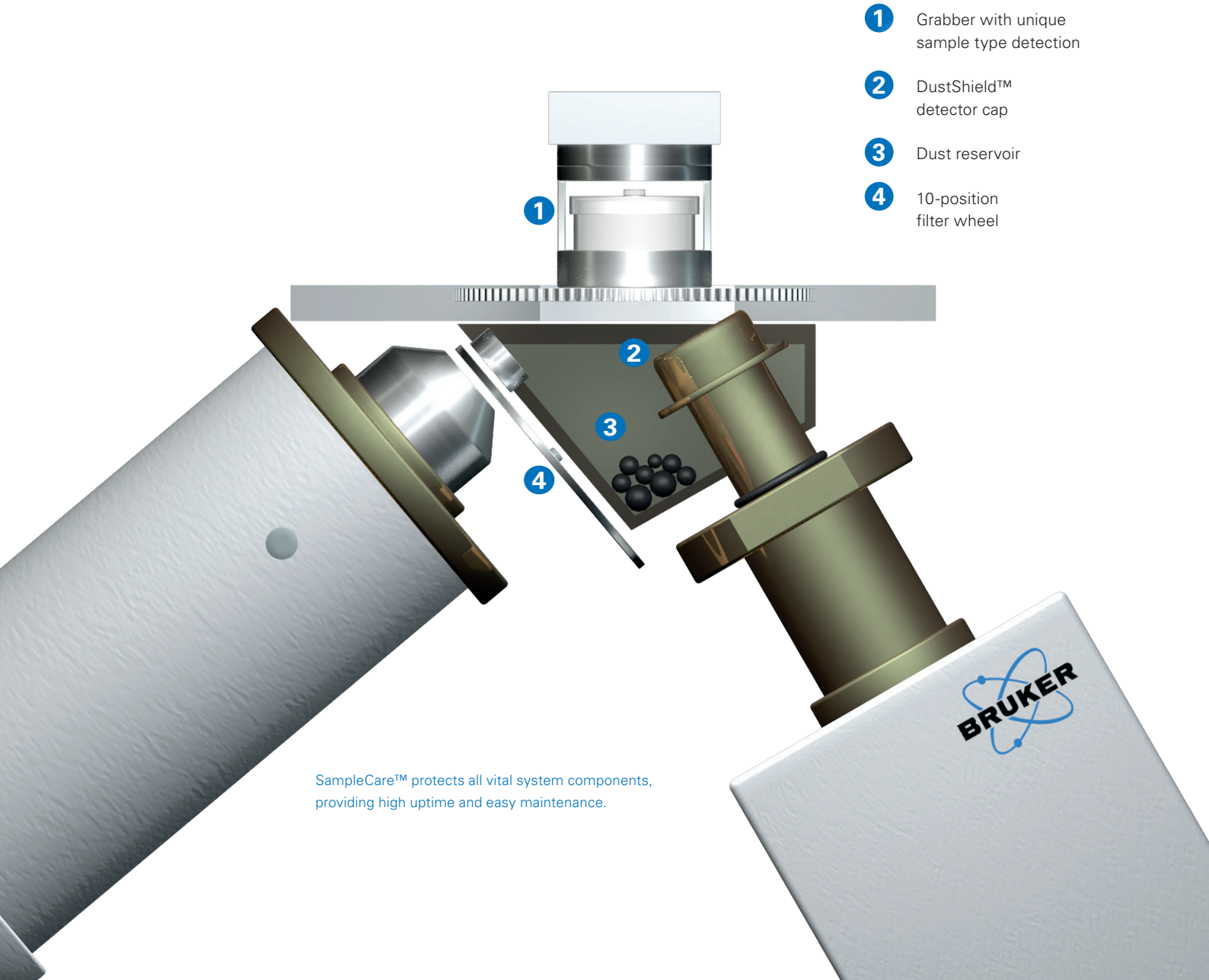
Element range of S2 PUMA Series 2 with HighSense detector
Additional elements with HighSense XP detector

Safe Operation and High Instrument Uptime with SampleCare™

SampleCare™

SampleCare™ is a unique multi-layer system to protect vital instrument components from contamination. It protects the X-ray tube and the detector from spillage of liquid samples, from particles of solid samples, and from dust. The detector head is protected by DustShield™, an easy-to-replace cap with a high-transmission film.

The tube is protected by the filter wheel. A sample type detection (XY Autochanger/Automation only) prevents the analysis of liquid samples, while the system is under vacuum. SampleCare™ means high uptime and easy maintenance.



1. Grabber with unique sample type detection
2. DustShield™ detector cap
3. Dust reservoir
4. 10-position filter wheel

SampleCare™ protects all vital system components, providing high uptime and easy maintenance.

EDXRF Made Easy, with TouchControl™

TouchControl™

TouchControl™ makes the S2 PUMA easy and straightforward to operate. No never-ending training, heavy operator's manuals or complicated procedures required!

With TouchControl, any user can run measurements on the S2 PUMA. First, select the application and key in the sample ID. You can also include additional information, like preparation or sample weight. Then simply start the measurement and view the results on the screen.

The TouchControl user interface enables users with only minimal training to run the instrument for routine operations.

Anyone who can handle a smartphone can operate the S2 PUMA!

The tiles on the TouchControl main screen make important functions easily available while restricting access to instrument configuration and calibrations. This approach combines ease-of-use with high instrument stability and data integrity.

Multilingual TouchControl interface is available in English, German, French, Spanish, Portuguese, Italian, Russian, Chinese and Japanese (additional languages on request).

Remote Operation

In cases where the instrument runs in remote settings, the S2 PUMA Series 2 in standard configuration without TouchControl can do the job. An external PC connected via TCP/IP allows for full instrument control through remote access.



TouchControl™ for ease-of-use

Optimal Configurations for All Types of Applications

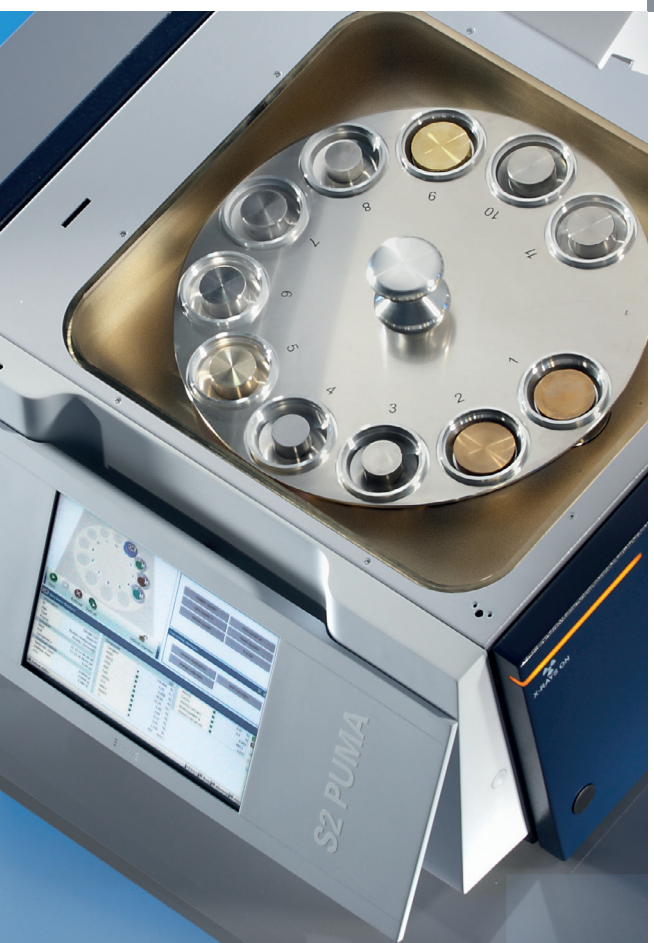
The Single – Results and Best Performance at Your Fingertips

In process control, every minute counts. Whenever you receive a sample, results are needed fast. The S2 PUMA Single is the perfect tool: Load the sample, touch the button and get results within minutes.

Best quality results as easy as 1-2-3, thanks to TouchControl™, the S2 PUMA's intuitive user interface.



Load samples one by one – easily and fast.



The Carousel – Largest Variety of Sample Types

Sometimes you simply need flexibility: First, some large samples you cannot crush. Then, "What is this black spot in the plastic building block?" Next, analyze 12 or even 18 geological samples as pressed pellets! Every job request is different.

No need to worry, the S2 PUMA Carousel is the most adaptable configuration. It handles large samples directly. Place the block sample directly in the measurement position, control it with the integrated video camera, and use the collimator to analyze only the black spot. Place the EasyLoad™ tray in the chamber and the S2 PUMA turns into an autosampler system for large batches.

Flexible loading of sample batches or large specimens.

Unlimited Flexibility

The S2 PUMA Carousel accommodates up to 18 different samples in one tray. Samples can be powders, solids, pressed pellets, fused beads, or liquids with diameters of up to 40 mm (18 position tray) or even 51.5 mm (12 position tray). Different sample types and sizes can be mixed on a single tray.

Large samples

How to measure very large samples if you don't want to trim them?

Nothing could be easier – just remove the tray and the sample chamber provides space for large-sample elemental analysis (up to 450 x 420 mm).

Small spots

Several collimators are available for all S2 PUMA configurations allowing you to trim the spot size from 34 mm down to 1 mm. For exact sample positioning, a video camera is integrated, enabling you to ensure that just the right spot is analyzed.

Automated multi-spot analysis

The S2 PUMA with mapping-stage makes multi-spot quality monitoring an easy task. It lets you quantify the elemental composition of your sample with high accuracy, precision, and spatial resolution (down to 1 mm).

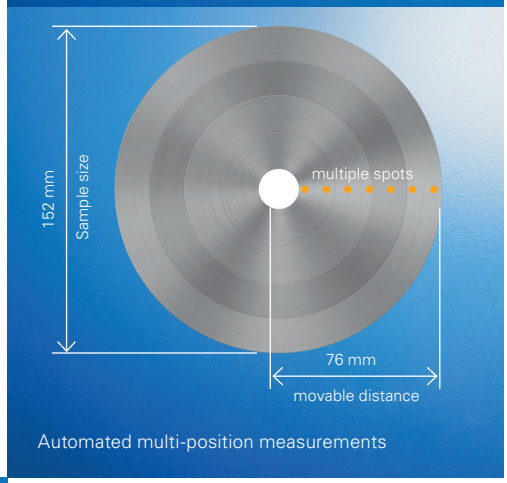
Inserts for various sample sizes are available, ranging from 40 mm to 152 mm in diameter. Customized inserts are available on request.



Small spot masks (1 - 34 mm)



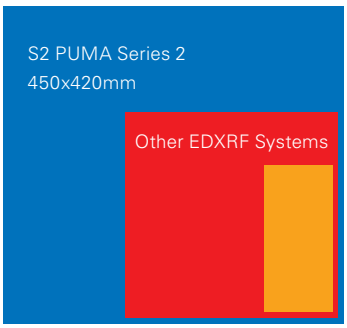
Inserts for different sample sizes



Automated multi-position measurements



Loading of large samples



Largest EDXRF sample chamber

Best Sample Throughput – Largest Number of Samples

The XY Autochanger – Add Efficiency and Flexibility to Your Lab

High sample throughput, low cost of ownership and extreme reliability count in many industries. Here is where the S2 PUMA Series 2 with XY Autochanger shines.

- EasyLoad™ XY tray with 20 sample positions
- Pressed powders, fused beads, and liquid cups with up to 40 mm sample size
- Handling of 51.5 mm sample rings from automated sample preparation
- Mixed batches of liquids and solids for highest flexibility
- New samples can be loaded at any time
- Priority samples can be measured immediately



Removable EasyLoad™ tray



The XY Autochanger for high throughput

Ready for Integration into Automated Process Control

The XY Automation – No Compromise on Productivity

The S2 PUMA is an indispensable tool to enhance productivity in industrial, high throughput laboratories. It is the only benchtop EDXRF instrument that offers you a professional, fully integrated automation solution.

- Samples are fed directly, via robot or belt, from the automated sample preparation system
- AXSCOM communication interface connects to the process control software
- Buffer positions for samples within the instrument compensate for delays in the lab automation
- The EasyLoad™ sample tray can be used for out-of-line samples







Flexible sample feeding: Automated loading via conveyor belt and manual loading with optional priority mode.





Loose Powders

- Use air mode for lowest cost of ownership
- Switch to vacuum-supported helium for best performance while minimizing helium consumption





Pressed Pellets

- Use vacuum mode for best performance and lowest cost of operation





Liquids

- Use helium mode for volatile liquid samples
- Reduce costs with the small chambers of the S2 PUMA Single and S2 PUMA XY Autochanger





Fused Glass Beads and Solids

- Use vacuum for best light element performance and lowest cost of operation
- Use air mode for heavier elements

Measurement Modes – Enhancing Performance, Reducing Cost

Helium Free Operation for Best Light Element Detection in Solid Samples

Lowest Gas Consumption for Lowest Running Costs for Liquids



Optimal performance and lowest cost of operation for all sample types
Example: 10 samples/hour; 24/7 operation; 10 elements, including light elements (F, Na, Mg ...)

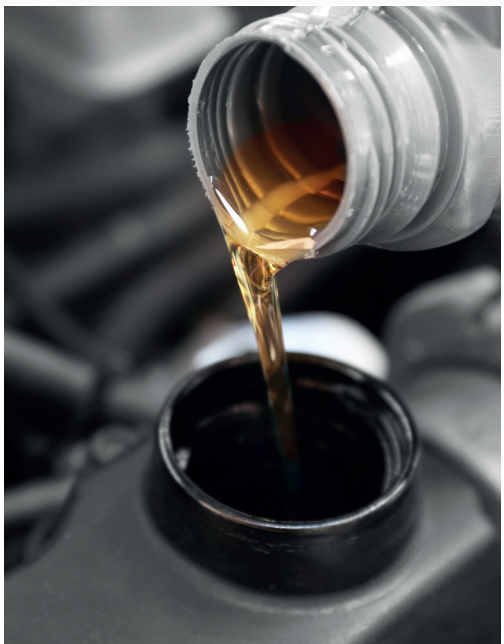
Pressed Pellets, Fused Glass Beads, Solids
For slags, cement, minerals, metals, etc.

0	26
S2 PUMA with vacuum	EDXRF with 0.5 l/min He purge

Liquids (non volatile)
For petrochemical products

5	26	126
S2 PUMA with 0.08 l/min He purge	EDXRF with 0.5 l/min He purge	EDXRF with 2.4 l/min He purge





SPECTRA.ELEMENTS
Easy. Fast.
Smart. Powerful.

Intuitive, Easy, and Fast

An intuitive, fast, and stable user interface is the basis for the smooth operation of analytical equipment and, thus, adds a real benefit to your lab by saving time. At Bruker, we take this seriously. Getting started with SPECTRA.ELEMENTS requires only minimal training and running routine analysis is as easy as 1-2-3.

SPECTRA.ELEMENTS offers all its functionality through one main window. All features are organized on tabs, which can be accessed from anywhere in the software. Contemporary programming results in rapid data processing and an overall smooth user experience. Waiting and watching a spinning hourglass is a thing of the past!

Powerful, Smart, and Versatile

While ease-of-use and speed are important for routine measurements, analytical performance and versatility is a must. With the S2 PUMA Series 2 running on SPECTRA.ELEMENTS, you get both!

- Dynamic Detector Profiling allows to boost the count rate or enhance the energy resolution, e.g., for higher sample throughput (only with HighSense XP)
- Dedicated User Levels ensure smooth operation, compliant with your data management strategy
- A customizable Basic Mode allows you to hide features that are not required for routine analysis
- Blanks, duplicates, and quality checks can be set up for process and quality control
- 21 CFR Part 11 compliance for product quality applications in FDA-regulated industries (optional)
- Optional IQ/OQ procedures are offered with the installation of the instrument
- LIMS-compatible: AXSCOM enables communication with process control units for full integration into automated environments

SMART-QUANT FP Covers It All

SMART-QUANT FP is the standardless solution for elemental analysis of unknown samples and samples without available calibration standards in your lab.

- Sample types: liquids and solids
- Atmospheric modes: air, helium, vacuum
- Elemental range: Na to Am
- Concentration range: ppm to 100%
- Max. generator voltage: 30 or 50 kV

Performance Meets Ease-of-Use

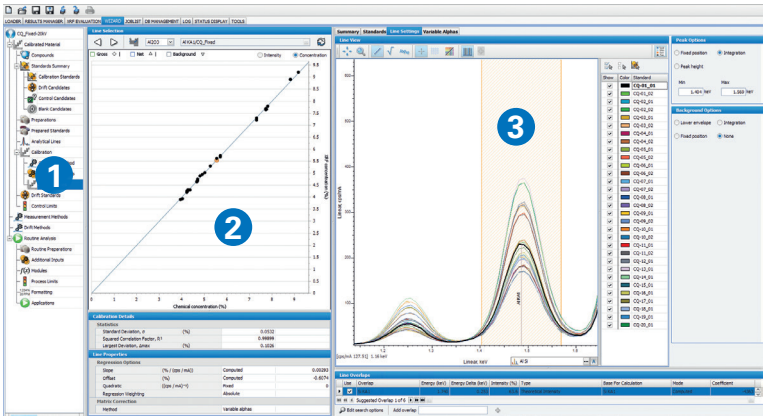
SMART-QUANT FP is set up to work in full Fundamental Parameter (FP) mode – this means no calibrations necessary. The FP algorithm is based on state-of-the-art modeling approaches, delivering accurate results with the push of a button.

SMART-QUANT FP delivers reliable results even with minimal user input: Load a sample, select the solution, press start!

If desired, the Evaluation Plug-In allows you to optimize the algorithm and re-evaluate the measurements.

The WIZARD – Calibrate your system intuitively!

1. The tree structure guides you through the calibration process quickly and efficiently
2. Interactive optimization: On-the-fly calculation and display of calibration curve
3. View spectra, zoom in and out, and select the best peak and background options



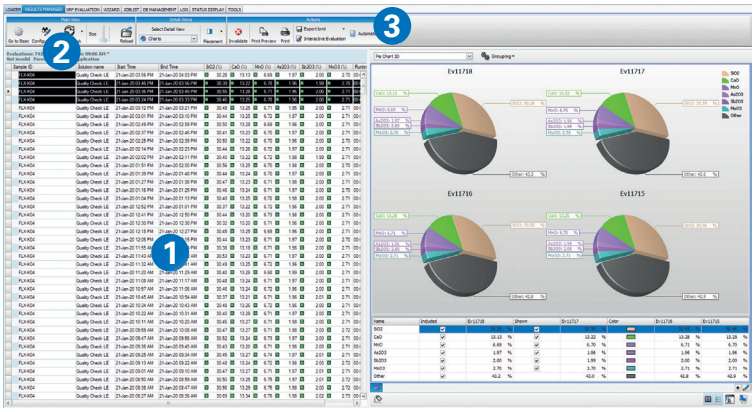
The LOADER – Start your measurements, easily and quickly!

1. Select the method and load the samples
2. Start and schedule your measurements – as easy as pie
3. Quick-view results



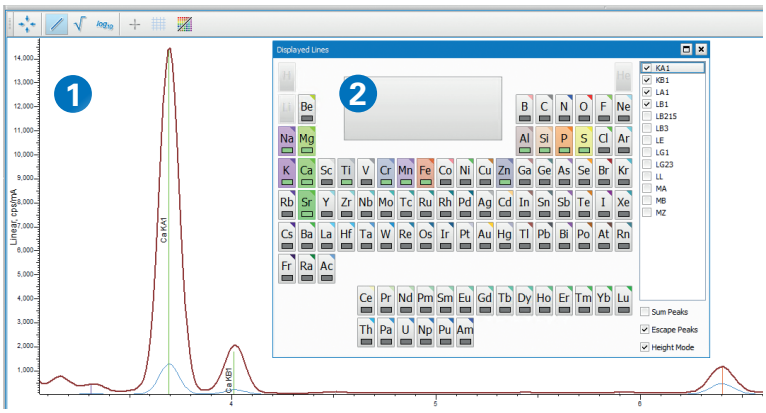
The RESULTS MANAGER – Access your data quickly and get extended reporting

1. Query, display, analyze, print, and export your data
2. Use the Post-Processing tool to automatically export data
3. Use the Evaluation Plug-In for re-evaluation without re-measuring



Customize your Views

1. Define the views and reports you need to make your evaluation procedure faster and easier
2. Various graphical options are available – including global color-coding for the elements of interest



Technical Data

Element Range	Sodium to americium (Na – Am) Carbon to americium (C – Am) with light element configuration			
Concentration Range	From ppm to 100 %			
X-ray Tube	Pd or Ag anode; max. power 50 W; max. voltage 50 kV (low kV version: 30 kV max.)			
Primary Beam Filters	10-position automatic filter changer for wide range elemental analysis			
Detector	Silicon Drift Detector: Peltier cooled (no need for liquid nitrogen) with DustShield™ Available as HighSense™ and HighSense™ XP version, both with super-high count rates and excellent energy resolution			
Collimator Masks*	For small spot analysis: 1, 3, 8, 12, 18, 23 and 28 mm			
Sample Observation*	Integrated HD video camera, for exact sample positioning and documenting the measurement position on a sample			
Atmosphere Mode	**Air mode:** For heavier elements in all sample types			
	Vacuum mode*: Best light element performance for stable samples and lowest cost of operation			
	Helium mode*: For light elements in volatile liquids such as fuels			
	Helium mode with reduced pressure*: For best light element performance with non-volatile liquid and loose powder samples and lowest helium consumption			
	Nitrogen mode*: Cost saving analysis of liquid samples			
TouchControl™*	Integrated 12.1" TFT touchscreen, adjustable, languages: English, German, French, Spanish, Portuguese, Italian, Russian, Chinese and Japanese (otherson request)			
Connectivity	Built-in Ethernet port RJ45, 3x USB ports for mouse, keyboard, printer			
Power Requirements	100-240 V, 50/60 Hz, max. power consumption 600 VA			
Sample Types	Loose powders, granules, solids, pressed pellets, fused beads, and liquids			
Sample Rotation*	Spins all sample types and sizes for better measurement statistics with inhomogeneous samples			
	S2 PUMA Single	**S2 PUMA XY Autochanger**	**S2 PUMA Carousel**	**S2 PUMA Automation**
Sample Sizes	Up to 51.5 mm (2.03") Ø; Liquid cups up to 50 ml	Up to 40 mm (1.56") Ø and 38 mm (1.49") height in sample holders with max. 200 g sample weight, or 51.5 mm Ø as sample ring; Liquid cups up to 20 ml	Up to 51.5 mm (2.03") Ø with max. 200 g (18 positions) or 400 g (12 positions) sample weight; Liquid cups up to 50 ml; Bulk samples (max. width x depth x height): 450 x 420 x 106 mm (17.9 x 16.7 x 4.2")	**XY:** Up to 40 mm (1.56") Ø and 38 mm (1.49") height in sample holders with max. 200 g sample weight, or 51.5 mm Ø as sample ring; Liquid cups up to 20 ml **Mapping-Stage:** Up to 152 mm (6") Ø; customized inserts available on request.
Sample Loader	Single position, manual loading	EasyLoad™ XY sample tray with 20 positions, removable; Grabber with automatic liquid sample detection	EasyLoad™ Carousel sample tray with 12 or 18 positions, removable to make room for bulk samples	EasyLoad™ XY sample tray with 20 positions, removable; Grabber with automatic liquid sample detection; Interface to conveyor belt or robot arm link-up to sample preparation
Dimensions (width x depth x height; weight)	67 x 71 x 37 cm; 87 kg (26.2 x 27.8 x 14.6"; 192 lbs)	67 x 71 x 61 cm; 108 kg (26.2 x 27.8 x 23.8"; 238 lbs)	67 x 71 x 57 cm; 130 kg (26.2 x 27.8 x 22.2"; 287 lbs)	67 x 71 x 61 cm; 110 kg (26.2 x 27.8 x 23.8"; 243 lbs)
Quality & Safety	DIN EN ISO 9001:2015, DIN EN ISO 14001:2015, 2006/42/EC (CE-certified Machinery directive), 2014/35/EC (Electrical equipment), 2014/30/EC (Electromagnetic Compatibility), German Type Approval and Vollschutz according to BfS RöV, Fully radiation-protected system; radiation <1 µSv/h (H*), Compliant to ICRP, IAEA, EURATOM			

* optional packages

Bruker AXS is continually improving its products and reserves the right to change specifications without notice.
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