

## S4 T-STAR®

- Benchtop TXRF Spectrometer for Ultra-Trace Element Analysis

# S4 T•STAR® – Rapid and Cost-Efficient Ultra-Trace Element Analysis



Total reflection X-ray fluorescence (TXRF) spectroscopy is a well-established method for trace element analysis of a variety of samples.

The S4 T•STAR® simplifies TXRF for 24/7 routine operation with guaranteed data quality. Significant improvements of detection limits are accompanied by automatic QC procedures, useful software routines and a unique versatility in terms of sample types and carriers.

## S4 T•STAR® – The Star of TXRF

X-ray fluorescence (XRF) spectroscopy has been widely used for element analysis of solid and petrochemical samples in several industries since decades, offering detection limits in the ppm range. TXRF expands the application segment for XRF to ultra trace element analysis in liquid samples, suspensions and thin films.

TXRF is therefore an excellent alternative technique to atomic absorption spectroscopy (AAS) and inductively coupled plasma optical emission spectroscopy (ICP-OES) or mass spectroscopy (ICP-MS), respectively. At this, the S4 T•STAR® sets new standards in performance, automation and quality of benchtop TXRF spectrometry.

## Outstanding Sample Versatility

The S4 T•STAR® is a very versatile tool for the analysis of a great variety of sample types on different reflective carriers. This puts it ahead of ICP, which requires fully dissolved liquid samples:

- 30 mm quartz discs: elemental analysis of liquids, solids and suspensions
- 2" wafer: contamination analysis, depth profiling and material sciences research
- Microscopy slides: clinical and biological samples, direct analysis of cell cultures, smears and thin sections
- Rectangular carriers up to 54 mm: films, filters, nanoparticle layers
- Any customized reflective media

## Your Benefits

- The high performance TXRF spectrometer S4 T•STAR® offers lowest detection limits in the sub-ppb range.
- Automatic quality control routines guarantee consistently highest data quality.
- Maximum versatility for a direct analysis of many types of samples on different carriers.
- Optimized for 24/7 operation in industrial routine analysis.
- Designed for multi-user operation with a high capacity of 90 samples.
- A selection of sample trays and other tools accelerates sample preparation and minimizes errors and contamination risks.
- High quality results for sophisticated research in material sciences.
- A dedicated application team supporting your method development and standardization processes.



# High Performance TXRF in Compliance with Regulatory Demands

## Perfect Fit for Ultra-Trace Element Detection in a Broad Range of Application Fields



### Pharma

- Detection of catalyzer elements in active pharmaceutical ingredients (API): < 0.1/0.5 ppm Pd in liquids or pills.



### Food

- Food safety according to FAO/WHO standards: < 40 ppb for As in rice.



### Environmental Monitoring

- Environmental monitoring: < 10 ppb for contaminants in wastewater, slurries and effluents.

## No Worries About New Pharma, Food and Environmental Regulations

- S4 T•STAR® is a powerful tool for food fraud prevention in globalized supply chains.
- S4 T•STAR® monitors catalyzer elements in pharmaceutical production according to upcoming US and EU Pharmacopeia guidelines.
- S4 T•STAR® provides a versatile solution for water, effluent, air and soil analysis for the recovery of a healthy environment.

## Automatic QC Procedures

S4 T•STAR® is the first TXRF spectrometer that automatically runs QC routines for operational and performance qualification in the background.

- Integrated QA samples allow automatic stability and sensitivity checks.
- The software supports easy-to-use administration of all QC procedures and integrates process-specific validation routines.
- The status of important quality parameters are permanently displayed.



### Dedicated to 24/7 Routine Operation

- Freshly prepared samples can be loaded or unloaded at any time even during running measurements.
- Crucial threshold values or confidence limits can be defined in evaluation methods. The software provides warnings, if critical limits are exceeded.
- S4 T-STAR® is designed for unattended operation, e.g. during night.

### EasyLoad™ Sample Station

- Dedicated sample trays for different sample types are available.
- The trays are automatically recognized when inserted into the spectrometer. This prevents conflicts in case of different carrier types. It also enables the automatic loading and immediate start of any open measurement job.

### High Sample Capacity

- The sample changer offers a high capacity of up to 90 sample discs.
- S4 T-STAR® supports automated batch processing, e.g. for efficient measurements overnight.
- Walk-up operation supports immediate measurements.

### Don't Wait — Just Load

- The S4 T-STAR® is designed for multi-user operation.
- The spectrometer can be loaded with up to 10 different trays. This allows loading and unloading while the instrument is measuring another sample.

### Large Area XFlash® Technology

- Outstanding detection limits due to a new generation of large area XFlash® SD detectors.
- No disturbing artifact peaks for safe identification of target elements.

### 1 System — 3 Excitations

- The S4 T-STAR® offers up to three different excitation modes for optimal detection of all elements from sodium to uranium.
- The excitation change is programmable for automatic execution.

# Excellent Versatility and Usability

## Full Flexibility for a Variety of Reflective Sample Carriers



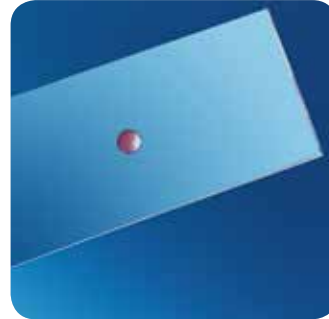
### 30 mm quartz discs

- elemental analysis of liquids, solids and suspensions



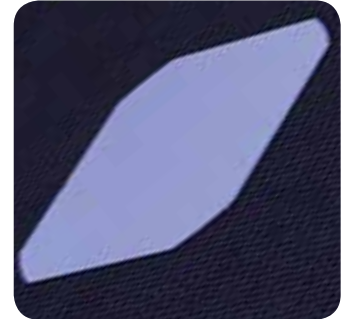
### 2" wafers

- contamination analysis, depth profiling and material sciences research



### Microscopy slides

- clinical and biological samples, direct analysis of cell cultures, smears and thin sections



### Rectangular carriers

- with a size of up to 54 mm for films, filters, and nanoparticle layers
- customized reflective media

## Outstanding Versatility

The S4 T•STAR® provides maximum versatility for the analysis of different kinds of samples on a variety of reflective carriers. For certain applications, even a direct analysis without any sample preparation is possible.

TXRF with S4 T•STAR® does not require any educated operation for daily calibrations. Standard operation protocols and dedicated tools ensure best usability, which saves time and laboratory resources.

## Well-Designed Storage Solution

- Trays can be stored in stackable boxes preventing contamination of the sample carriers.
- The bottom plate includes center markings, which allows direct pipetting of any sample without touching the sample carrier.

## Unique SampleCare™

- SampleCare™ constantly protects your samples and improves the quality of your data.
- The reduced air flow and integrated sample housing prevents sample contamination.
- A slight stream of nitrogen shields the samples. It also removes argon from air for improved detection of palladium and silver.





### Convenient Sample Control and Archiving

- Control the quality of your sample with a magnified image by a CCD camera.
- All sample images are automatically archived for subsequent review.

### Latest Sensor Technology

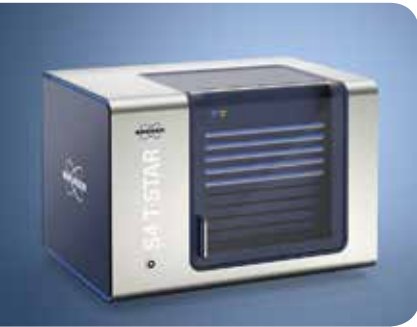
- Sensors for ambient temperature and humidity deliver information about the laboratory condition and assure the instrument stability.
- Tube temperature sensors provide better system stability and data quality.

### Final Results on the Spot

- Typically, samples are prepared multiple times. Right after measurement the software automatically reports statistical data (average, standard deviation etc.).
- The integration of user-defined functions is supported.
- Standard libraries allow the determination of recoveries. Any deviation of the admissible tolerance will be highlighted.



# Technical Specifications



<b>Element range</b>	Mo excitation: Mg to U (with exception of Nb to Ru) W excitation: K to U
<b>Concentration</b>	ppb to 100 %
<b>Detection limit</b>	<1 pg nickel
<b>Sample types</b>	Liquids, suspensions, powders, particles, metals, thin layers, tissues, wafers, filters etc.
<b>Sample volume</b>	Liquids and suspensions from 1 µl to 50 µl Particles up to 100 µm in diameter, powders up to 10 µg
<b>Sample changer</b>	Automatic sample changer for 10 trays Automatic tray detection for sample type identification
<b>Capacity</b>	Sample tray 1: 30 mm discs, max. 90 discs Sample tray 2: microscopy slides, max. 30 slides Sample tray 3: 2" wafers, max. 50 wafers Sample tray 4: rectangular, <54 mm, max. 50 samples Sample tray 5: user defined
<b>X-ray tube</b>	max. 50 W metal-ceramic, max. 50 kV, 1 mA, air-cooled
<b>X-ray optics</b>	Multilayer monochromator
<b>Excitation modes</b>	Mo-K, 17.5 keV W-Brems, 35 keV; W-L, 8.4 keV Cu-K, 8.0 keV Cr-K, 5.4 keV
<b>Detector</b>	Peltier-cooled XFlash® silicon drift detector Liquid nitrogen is not required 60 mm <sup>2</sup> active area, optional: 100 mm <sup>2</sup> active area Energy resolution <149 eV at 100 kcps (Mn Kα)
<b>Interface</b>	Data exchange by TCP/IP (RJ45 cable)
<b>Mains</b>	100/240 V, 50/60 Hz
<b>Size</b>	528 mm x 693 mm x 512 mm (height x width x depth)
<b>Weight</b>	85 kg
<b>Accessories</b>	Washing cassette for sample carriers, storage boxes, Starter set for TXRF (pipettes, tips, tubes, mortar, spatula)

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