



**Fully
compliant**

ASTM D6481:
P, S, Ca, Zn



ASTM D7751:
Mg, P, S, Cl, Ca, Zn, Mo



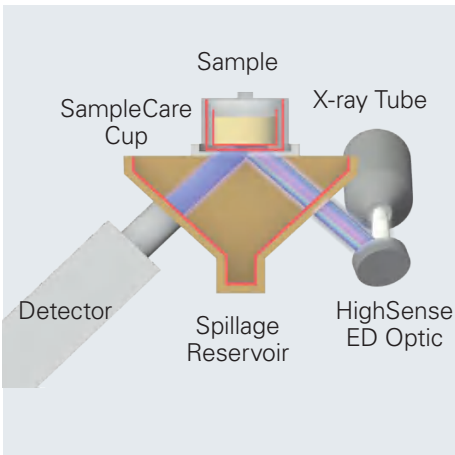
S2 POLAR Oil Analyzer

● Spectrometry Solutions

Additives in Oil with S2 POLAR: Performance Guaranteed



S2 POLAR for intuitive, easy-to-use oil analysis



SampleCare with HighSense beam path



Multi-element analysis of lubricating oils

Additives in base oils are used to optimize engine performance and its lifetime. It is crucial to follow the tight specifications when blending lubricating oils. Analytical accuracy and precision count to ensure high product quality in combination with low production cost.

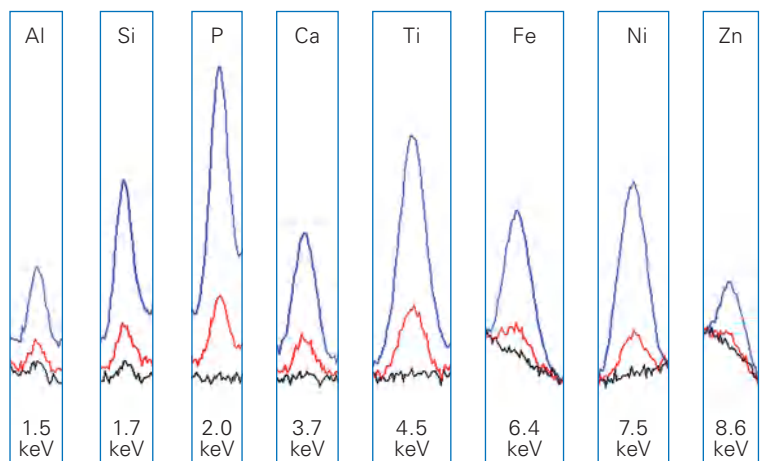
X-ray fluorescence (XRF) is the method of choice due to its ease of use and straightforward sample preparation. And the S2 POLAR is perfectly designed to master even challenging applications.

Based on the HighSense™ beam path with the HighSense ULS detector, the S2 POLAR provides high sensitivity for excellent analytical precision, lowest detection limits and optimum spectral resolution.

Norm-Compliant Multi-Element Oil Analysis

This enables S2 POLAR to perform fully norm-compliant multi-element oil analysis according to newest international regulations such as ASTM D6481-14 and ASTM D7751-16.

But that's not all, the S2 POLAR is ideal for quality control in base oil production, blending operations of lubricants and polymers as well as oil analysis in automotive industry. The S2 POLAR Ready-to-analyze solutions minimize instrument set-up time and provide 'One Button' multi-elemental analysis. This leads to an economic and cost-effective oil analysis and pays back immediately.



Selected elements of overlaid multi-element oil standards
(Black: blank sample, red: 10 ppm, blue: 100 ppm)

Top-performing Oil Analysis:

S2 POLAR with

- HighSense™
- SampleCare™
- TouchControl™

Ease-of-use With One-Button TouchControl™

The S2 POLAR compact XRF benchtop analyzer with an intuitive, easy-to-use TouchControl™ enables users with minimal training to run routine samples:

1. Fill 7 g lubricating oil into a liquid cup
2. Select the method with one click
3. Enter the sample ID.

That's it – easy and straight forward. Neither time-consuming sample preparation nor sample dilution is required. Results are displayed within minutes. The compact instrument with its integrated touchscreen allows installations even in rough environments, e.g. at base oil production, blending facilities or additive dosing stations. This allows immediate on-site process control and ensures cost-effective process optimization.

Safe Liquid Sample Handling with SampleCare™ Technology

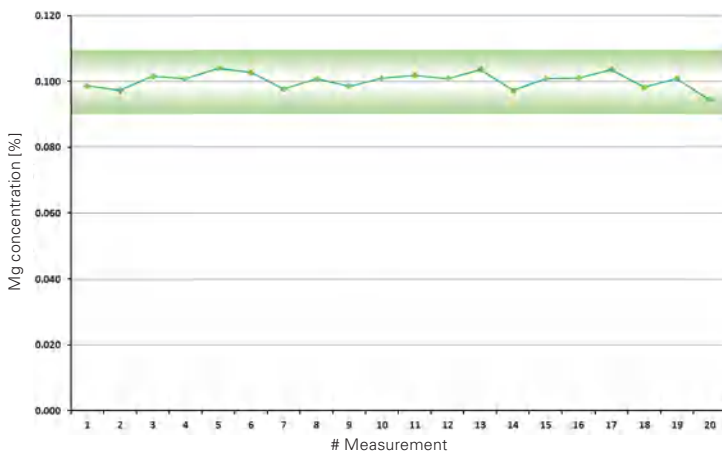
High instrument uptime is crucial for your operation. This is ensured with Bruker's SampleCare technology. SampleCare cups prevent sample leakages of your liquid samples and protect important system components. This guarantees utmost instrument availability, even with high throughput of lubricating oil samples.



TouchControl operation of S2 POLAR



S2 POLAR measurement chamber



Repeatability test of fresh lubricating oil for Mg according to ASTM D7751. The shaded area denotes the allowed limits by the norm.

Norm-compliant with:

ASTM D6481:
P, S, Ca, Zn

ASTM D7751:
Mg, P, S, Cl, Ca, Zn, Mo

Features and Benefits

	Specification	Benefits
Applications	Elemental analysis of additives in oils and polymers	Elemental analysis optimized for petrochemical products
Norms	ASTM D6481-14: P, S, Ca, Zn, ASTM D7751-16: Mg, P, S, Cl, Ca, Zn, Mo Ready-to-analyze solutions* for ASTM D6481 and D7751 including blanks, set of standards, QC and DC samples Further elements and norms on request	Norm-compliant analysis, internationally accepted Dedicated, optional pre-installed push button methods to fit for purpose
Atmosphere Modes*	Helium mode Vacuum mode	Optimal light element analysis of liquids Low cost of operation
Sample Preparation*	Liquid cups, SampleCare cups, Prolene and Mylar® foils, pipettes, balance	Accessories ensure high throughput of liquid samples. Low-cost per sample due to standardized liquid cups
Further Options*	Emergency Machine Off (EMO) Uninterruptible Power Supply (UPS) Sample rotation	Compliant with safety requirements Enables removing of liquid samples Enhanced precision for inhomogenous samples, such as polymer pucks
X-ray Tube	50 W, high-power X-ray tube, max. voltage 50 kV, with polarizing HighSense™ beam path Optionally: 30 kV max.	Max. power for short measurement times and high sample throughput, beam path optimized for petrochemical materials Simplify regulatory efforts (e.g. Austria, France, Italy, Taiwan)
Detector	HighSense™ ULS Silicon Drift Detector	Highest count rates for fast analysis, low LLD
TouchControl™	Integrated 12.1" TFT touchscreen, multilingual user interface: English, German, French, Spanish, Portuguese, Italian, Russian, Chinese, Japanese	IslandMode™ without external PC Intuitive and easy-to-use, in your own language
Connectivity	Ethernet port RJ45, 3x USB ports for mouse, keyboard, and printer; HDMI/VGA ports for external display, remote access via TCP/IP	IslandMode™ but not isolated, various options for printing and network data transfer, even fully remotely
Power Supply	100-240 V, 50/60 Hz, max. 600 VA	Standard wall plug
Dimensions; width x depth x height, weight	46.6 x 74.5 x 37.0 cm, 55 kg 18.3" x 29.3" x 14.6", 121 lbs	Small and compact for installations with limited space, e.g. in plant labs, at blending facilities or close to dosing stations
Safety	DIN EN ISO 9001:2008, 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 pending, Fully radiation-protected system; radiation <1 µSv/h (H*), Compliant to ICRP, IAEA, EURATOM	

* Optional packages



**Fully
compliant**

ASTM D7220, D4294



ISO 13032, 20847, 8754



IP 336, 496, 532



JIS K2541-4



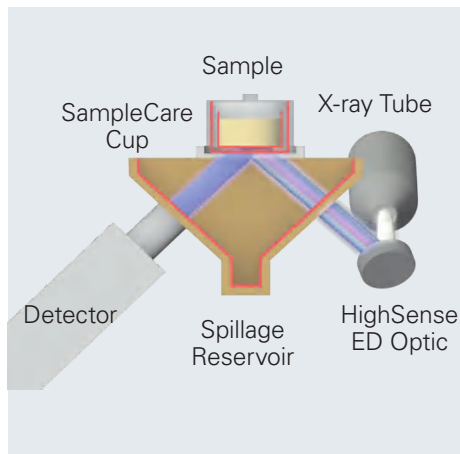
S2 POLAR Refinery Analyzer

- Spectrometry Solutions

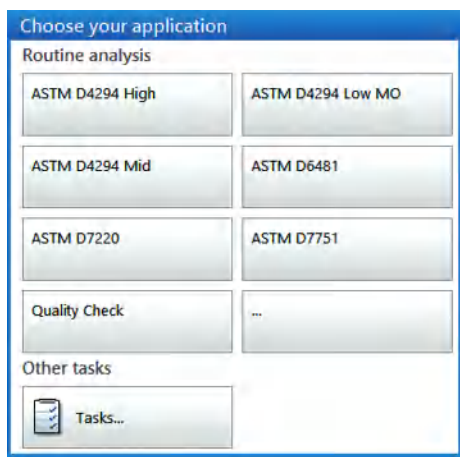
Sulfur Analysis at its Best: Ultra-low Sulfur Diesel with S2 POLAR



S2 POLAR – Compact for on-site process control



SampleCare with HighSense beam path



'One Button' Ready-to-analyze solutions

Sulfur concentrations are strongly regulated in automotive fuels. The current sulfur limit is at 10 ppm in many countries and others are to follow. This specification leads to an increasing demand in monitoring such ultra-low sulfur (ULS) limits for diesel and gasoline, not only in refineries but also along the supply chain including transport in pipelines and storage at terminal stations. Finally these limits are supervised by external service laboratories and inspection laboratories, either for comparative measurements or for customs and tax purposes.

Optimize your Refinery Processes – from Crude Oil to Final Automotive Fuels

Expensive efforts are required to remove sulfur at various fractions in the refinery process, especially when it comes to very low sulfur levels. Accurate and precise monitoring of all these sulfur levels in the refinery leads to cost-effectiveness and pays back immediately.

X-ray fluorescence (XRF) is the perfect method for all these applications. Easy-to-use with straightforward sample preparation: The S2 POLAR masters all requirements for S analysis from diesel to crude oil. This includes continuous process control of higher sulfur levels in refineries and norm-compliant ultra-low sulfur analysis of final products.

The S2 POLAR complies with the following international norms:

- **ASTM D7220, D4294**
- **ISO 13032, 20847, 8754**
- **IP 336, 496, 532**
- **JIS K2541-4**

It's not all about sulfur: Monitoring of Cl to minimize impact of corrosion, P in crude oil and middle distillates, and catalyst residues such as Fe, Ni and V. The S2 POLAR is a dedicated ultra-low sulfur and multi-element analyzer for the analytical demands of refineries, as well as for the downstream supply chain of pipelines, oil terminals and petrol stations. Remarkably, the S2 POLAR combines the performance of several single-element analyzers in a single powerful benchtop instrument.

Top-performing Fuel Analysis:

S2 POLAR with

- HighSense™
- SampleCare™
- TouchControl™

Ease-of-use With One-Button TouchControl™

The S2 POLAR compact benchtop analyzer with an intuitive, easy-to-use TouchControl™ enables users with minimal training to run routine samples:

1. Fill 7 g automotive fuel into a liquid cup
2. Select the method with one click
3. Enter the sample ID.

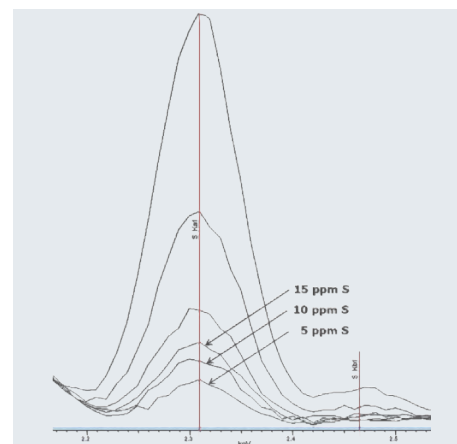
That's it – easy and straight forward. Results are displayed within minutes. The Ready-to-analyze solutions also include all required standards, QC and DC samples. The compact instrument with its integrated touchscreen is either installed for on-site process control in the refinery or in the laboratory where all kind of process samples come together.

Safe Liquid Sample Handling with SampleCare™ Technology

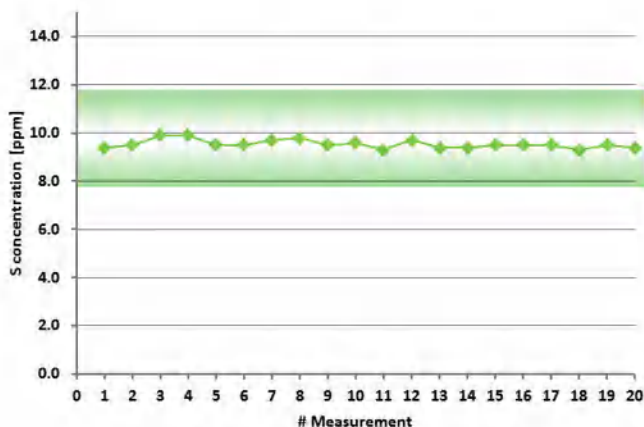
Highest instrument uptime is crucial for your operation. This is ensured with Bruker's SampleCare technology. SampleCare cups prevent sample leakages of your liquid samples and protect important system components. This guarantees maximum instrument availability, even with high throughput of refinery process samples.



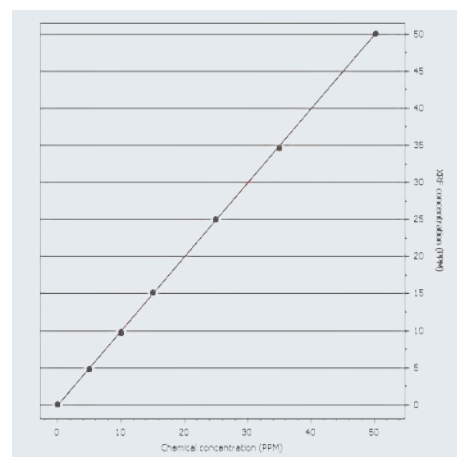
TouchControl operation of S2 POLAR



Overlaid sulfur signals in gasoline



Repeatability test of a sulfur sample according to ASTM D7220. The shaded area denotes the allowed limits by the norm.



Calibration curve for ASTM D7220 for ultra-low sulfur in gasoline in the range of 0 to 50 ppm

Features and Benefits

	Specification	Benefits
Applications	Elemental analysis in refineries e.g. sulfur analysis of <ul style="list-style-type: none"> ■ gasoline, diesel ■ biodiesel ■ kerosene, jet fuel, heating oil ■ naphtha, residual oil to crude Further elements on request (e. g. P, Cl, Fe, Ni, V)	All refinery applications on one unit
Norms	ASTM D7220-17: Sulfur in automotive, heating, and jet fuels from 3 ppm to 942 ppm ASTM D4294-16: Sulfur in petroleum and petroleum products from 16 ppm to 5 % Ready-to-analyze solutions* for ASTM D7220 and D4294 including blanks, set of standards, QC and DC samples Fulfills ISO 13032, 20847, 8754, IP 336, 496, 532, and JIS K2541-4	Norm-compliant sulfur analysis, internationally accepted, including ultra-low sulfur (ULS) applications Dedicated, optional pre-installed push button methods to fit for purpose
Detection Limit (LLD)	0.7 ppm S at 300 s measurement time	Precise and accurate S measurements, including ultra-low sulfur (ULS). Enables threshold relevant process control at all steps in refineries
Measurement Range	3 ppm to 5 % S, combined in one calibration with automated line switch Higher concentrations on request	One calibration with wide concentration range
Atmosphere Modes*	Helium mode Vacuum mode	Optimal light element analysis of liquids Low cost of operation
Sample Preparation*	Liquid cups, SampleCare cups, Prolene and Mylar® foils, pipettes, balance	Accessories ensure high throughput of liquid samples. Low-cost per sample due to standardized liquid cups
Further Options*	Emergency Machine Off (EMO) Uninterruptible Power Supply (UPS) Sample rotation	Compliant with safety requirements Enables removing of liquid samples Enhanced precision for inhomogenous samples, such as polymer pucks
X-ray Tube	50 W, high-power X-ray tube, max. voltage 50 kV, with polarizing HighSense™ beam path Optionally: 30 kV max.	Max. power for short measurement times and high sample throughput, beam path optimized for petrochemical materials Simplify regulatory efforts (e.g. Austria, France, Italy, Taiwan)
Detector	HighSense™ ULS Silicon Drift Detector	Highest count rates for fast analysis, low LLD
TouchControl™	Integrated 12.1" TFT touchscreen, multilingual user interface: English, German, French, Spanish, Portuguese, Italian, Russian, Chinese, Japanese	IslandMode™ without external PC Intuitive and easy-to-use, in your own language
Connectivity	Ethernet port RJ45, 3x USB ports for mouse, keyboard, and printer; HDMI/VGA ports for external display, remote access via TCP/IP	IslandMode™ but not isolated, various options for printing and network data transfer, even fully remotely
Power Supply	100 - 240 V, 50/60 Hz, max. 600 VA	Standard wall plug
Dimensions; width x depth x height, weight	46.6 x 74.5 x 37.0 cm, 55 kg 18.3" x 29.3" x 14.6", 121 lbs	Small and compact for installations with limited space, e.g. for on-site process control in refineries
Safety	DIN EN ISO 9001:2008, 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 R0V pending, Fully radiation-protected system; radiation <1 µSv/h (H*), Compliant to ICRP, IAEA, EURATOM	

* Optional packages