



Elemental Analysis Advanced

Rapid Sulfur measurement plus 12 elements from P to Zn.

Petra **MAX**
Elemental Analyzer for Petroleum

Petra **4294**
Elemental Analyzer for Petroleum



ASTM D8252 & D4294
ISO 13032 & 8754 | IP 336

Advanced Precision

Petra MAX delivers ASTM D4294 and ISO 8754 sulfur analysis with an LOD as low as 5.7 ppm. In addition, Petra MAX measures 12 other elements, including nickel and vanadium for ASTM D8252 compliance. Petra 4294 delivers precise sulfur analysis with an LOD as low as 2.6 ppm.

The blending of crude oils from different sources has become more commonplace within the industry to meet specifications for the classification of sweet crude oil. The introduction of new crudes brings new challenges, like higher concentrations of metals such as nickel (Ni), vanadium (V), and iron (Fe). Ni and V are known to rapidly deactivate process catalysts in the catalytic cracker (FCC) and hydrotreaters. In response, many refiners have incorporated Ni and V analysis into their routine crude assay, and pipelines have set specifications for Ni and V in their common stream sweet crude. Fe is introduced into crude oil from corrosion byproducts during transportation and can lead to pump and exchanger fouling, and off-specification coke. The data in Table 1 represents ten separate aliquots of crude oil that were analyzed for 300 seconds by Petra MAX to demonstrate the advanced precision achievable with XOS' EDXRF technology.

Petra MAX Applications

Hydrocarbons | Water | Catalyst Powder | Carbon Powder

Table 1: Crude Oil Analysis by Petra MAX (ppm)				
Repeats	S	V	Fe	Ni
1	4,716	0.35	0.51	2.50
2	4,752	0.35	0.42	2.47
3	4,756	0.31	0.56	2.55
4	4,833	0.41	0.57	2.57
5	4,750	0.36	0.51	2.51
6	4,690	0.32	0.47	2.51
7	4,786	0.30	0.50	2.57
8	4,721	0.32	0.49	2.55
9	4,793	0.27	0.51	2.56
10	4,749	0.31	0.49	2.52
Average	4,755	0.33	0.50	2.53
Standard Deviation	41.4	0.04	0.04	0.03

Advanced Software and Data Management

Petra offers the latest software features and data management for simple, intuitive operation.

- Store up to 30 calibration curves
- Data output via Ethernet connection to LIMS or transfer over USB
- On-screen averaging allows users to quickly check performance levels across multiple measurements
- Data history stores results for 10k measurements

PRESET MEASUREMENT CONFIGURATIONS*

The screenshot shows a software interface with a sidebar on the left containing icons for Scan Info, Results, History, Status, Settings, and Logout. The main area displays 'User: hank' and '18:07'. Under 'Scan Info', there are fields for 'Sample Name: NAPHTHA-823634', 'QR Code: XOS021005557', and 'Description: Light Naphtha'. To the right, 'Preset Details' includes 'Factory Default', 'Cal Curve: Standard Mineral Oil', 'Measurement Time: 300 sec', 'Matrix: Oil', and 'Repeats: 1'. Below this is a 'Preset' section with a 'Select Manually' button and a grid of buttons: 'Factory Default', 'Crude Oil', 'Gasoline', 'Catalyst', 'Bunker Fuel', 'Cylinder Oil', and 'Naphtha'. At the bottom are 'Clear' and 'Save' buttons.

ADDITIONAL MATRICES AVAILABLE*

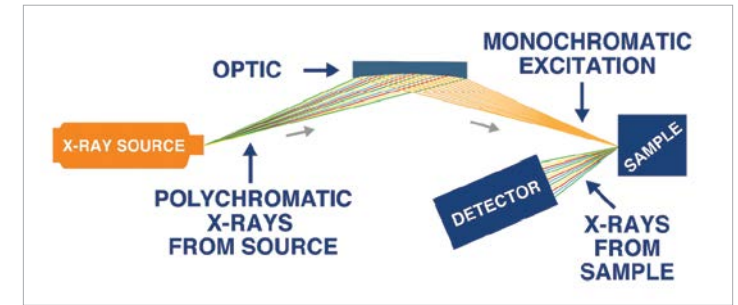
The screenshot shows a software interface with a sidebar on the left containing icons for Scan Info, Results, History, Status, Settings, and Logout. The main area displays 'Completed' with a 'Clear' button. Below is a table with columns for 'Oil', 'Description', and 'Select'. The table lists various matrices such as '10ppm_S-2 S(10.0)', '6%wt_S_in_MO S(60000.0)', '25ppm_S_in_... S(25.0)', and '100ppm_S-2 S(100.0)'. At the bottom are 'Activate' and 'Save' buttons.

*Non-hydrocarbon matrices only available with Petra MAX.

Advanced Analysis

Petra is powered by XOS' EDXRF technology: an elemental analysis technique offering significantly enhanced detection performance over traditional XRF technology. This technique applies state-of-the-art monochromating and focusing optics, enabling dramatically higher signal-to-background ratio compared to traditional polychromatic X-ray Fluorescence. **Figure 1** shows the basic configuration of our EDXRF and its use of focused monochromatic excitation.

Figure 1: EDXRF Technology



Advanced Workflow

Petra boasts an innovative autosampler design and advanced software features for a more flexible and efficient workflow.

Preset Your Measurement Configurations

Customizable measurement configurations allow you to select the correct calibration curve, measurement time, and sample matrix for a foolproof process.

Reduce Idle Time With Continuous Sample Load

The 8-position sample slide offers continuous loading, allowing you to add urgent samples to the queue even during analysis.

How it Works

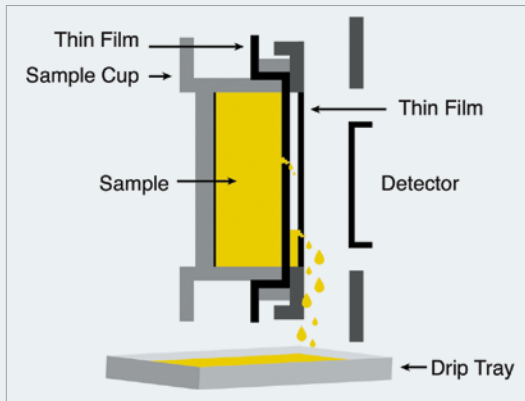
- 1 Use integrated scanner or onscreen keyboard to enter sample name
- 2 Select preset measurement configuration and insert sample into autosampler
- 3 Sample name is prepopulated by the bar code reader scan
- 4 Measurement begins automatically. Upon completion, sample is ejected and next in queue is measured.



Advanced Sample Introduction

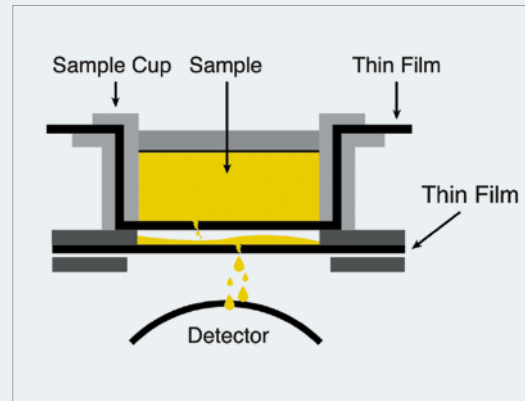
Protect Valuable Components

Petroleum laboratories depend on reliable, robust analytical solutions for their fast-paced environment. Petra was designed to meet these needs with an innovative sample introduction system that directs accidental spills to a drip tray and away from valuable components.



Petra Sample Chamber with Drip Tray

A sample is placed into the Petra sample chamber and when closed, it is turned on its side. This innovative design ensures that any accidental sample leaks are directed to a drip tray—to be easily removed and disposed.

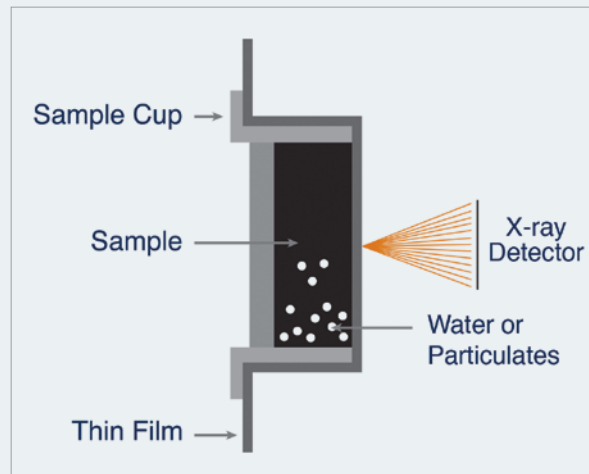


Competitor Sample Chamber

Most competitor sample chamber designs offer a thin film covering the cell window to protect the detector and X-ray tube from accidental sample leaks. If this thin film tears, the sample will leak onto the detector and X-ray tube—a very costly repair.

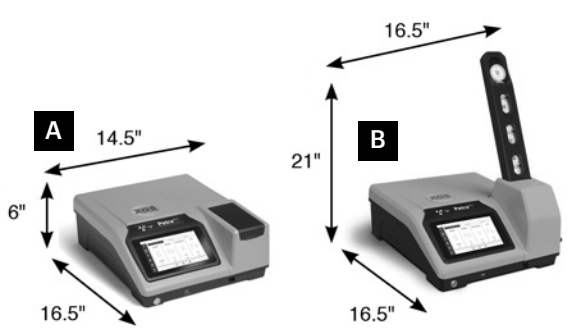
Eliminate Centrifuge

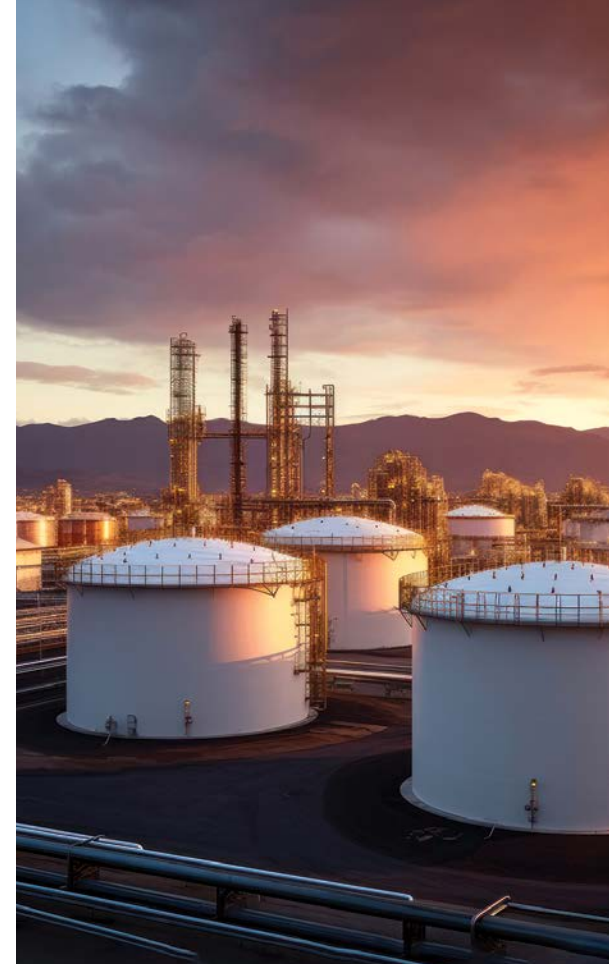
Interfering elements like Si, Ca, Cl, Fe and water are commonly present in crude oil and will settle to the bottom of a sample over time. These interferences can absorb the X-ray signal and reduce the concentration of sulfur reported. To prevent biased results, many laboratories centrifuge the samples prior to analysis, which increases the amount of processing and time it takes to perform the measurement. Petra's sample chamber rotates the sample on its side providing a clear measurement window for more accurate results, and eliminating the need to centrifuge.



Technical Specifications

Dynamic Range, LOD & Applications							
Petra MAX	Dynamic Range	Sulfur 5.7 ppm – 10 wt%					
	Limit of Detection (ppm @ 600 s) in hydrocarbons	Sulfur 5.7 ppm					
		P	Cl	K	Ca	V	Cr
		17	3	0.7	0.4	0.4	0.09
		Mn	Fe	Co	Ni	Cu	Zn
		0.07	0.07	0.07	0.04	0.1	0.1
Applications	Hydrocarbons, water, and catalysts						
Method Compliance	ASTM D8252, D4294, ISO 8754, IP 336, & UOP 979						
Petra 4294	Dynamic Range	Sulfur 2.6 ppm – 10 wt%					
	Limit of Detection (ppm @ 600 s)	Sulfur 2.6 ppm					
	Applications	Hydrocarbons					
	Method Compliance	ASTM D4294, ISO 8754, and IP 336					

Petra Series Specifications	
Measurement Time	30-900 seconds
Calibration	30 calibration curves
Sample Cup Volume	7 mL
Data Output	Printout, USB, and Ethernet to PC connection
I/O Ports	Ethernet 10/100, USB
Power Supply	110-240 VAC ± 10%, 50-60 Hz (hertz)
Operating Temperature	+41°F to 104°F (5°C to 40°C)
Operating Humidity	30 – 85%
Weight & Dimensions	<p>A Unit without Autosampler Weight: 28lbs (12.7 kg) Dimensions: 14.5 in W x 16.5 in L x 6 in H (36.8 cm W x 41.9 cm L x 15.3 cm H)</p> <p>B Unit with Autosampler Weight: 33 lbs (15 kg) Dimensions: 16.5 in W x 16.5 in L x 21 in H (41.9 cm W x 41.9 cm L x 38.9 cm H)</p> 



XOS[®]
better analysis counts

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