



Benchtop & Process Analysis Solutions

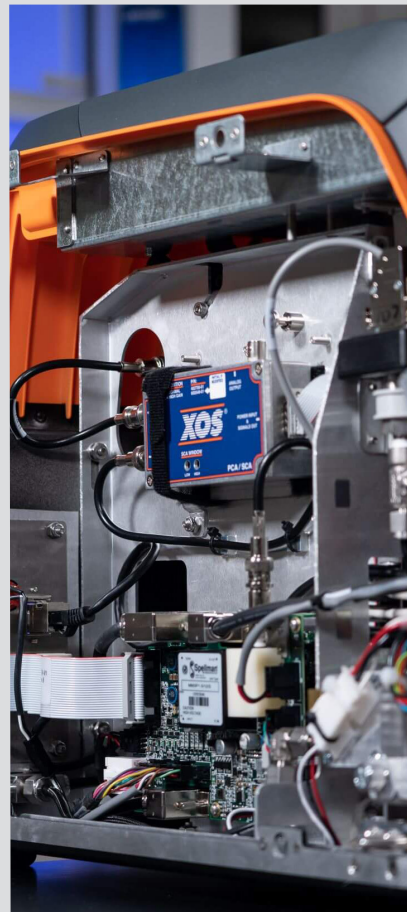
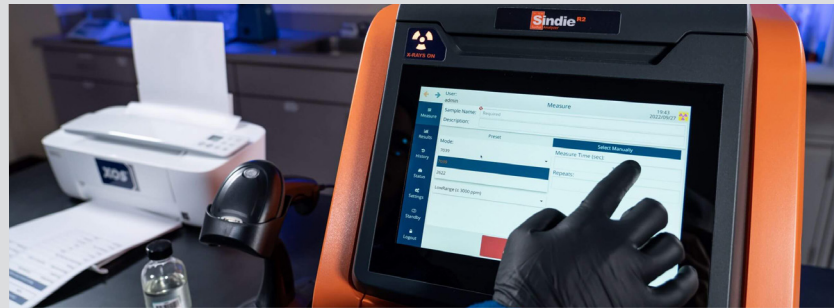
Sulfur, Chlorine, & Other Elements at Sub-ppm Levels





Better Analysis Counts

XOS is a leader in the manufacture of X-ray analyzers for a wide range of elemental analysis, offering solutions that improve process monitoring efficiencies in the petroleum industry and deliver on public safety and environmental compliance. XOS offers lab and process analyzers for a range of applications, including conventional petroleum, renewable fuels, plastics recycling and pyrolysis, aviation fuel, maritime, and more. **XOS: better analysis counts.**



Sulfur Analyzers

XOS offers XRF sulfur analyzers for a wide range of applications including diesel, jet, kerosene, other distillate oil, naphtha, residual oil, lubricating base oil, hydraulic oil, crude oil, gasoline, and gasoline-ethanol blends. Discover hassle-free sample prep, easy operation, rapid testing, compliance flexibility, and industry-leading precision.



Petra MAX & Petra 4294

Advanced sulfur analysis and data management, with optional autosampler capability.



Sindie R Series

Analyze sulfur with unmatched precision & complete flexibility.



Sindie +Cl R Series

Ideal solution for refineries and labs to certify sulfur levels and assess chlorine for corrosion mitigation.



Sindie Online

Process analyzer delivering continuous sulfur measurement to monitor fuel or feed streams and help prevent contamination.

Chlorine Analyzers

Precise determination of chlorine in petroleum is critical during refining processes. Chlorine may poison expensive catalysts and lead to corrosion in areas like the overhead or reactor effluent systems.



Clora R Series

Analyze total chlorine with enhanced precision & performance.



Clora Online

Process analyzer delivering reliable and continuous chlorine analysis to monitor real-time process variation and improve optimization.

Total Phosphorus & Silicon Analyzers



Phoebe

From crude oil to bio-fuels, in additives or water, Phoebe benchtop analyzers deliver exceptional precision and accuracy for complete phosphorus analysis.



Signal

Complies with ASTM D7757 and delivers quantitative analysis of silicon (Si) from gasoline to ethanol, other hydrocarbons, and toluene.

Petra^{MAX}
Elemental Analyzer for Petroleum

Petra⁴²⁹⁴
Sulfur Analyzer for Petroleum



Advanced Sulfur Analysis & Data Management

The Petra series delivers high-precision D4294 sulfur analysis across a broad measurement range. Petra MAX™ delivers D4294 sulfur analysis in addition to 12 elements from P to Zn, for rapid monitoring of critical elements like Ca, Fe, K, Ni, and V at sub-ppm levels.

TECHNICAL SPECIFICATIONS							
Petra MAX	Dynamic Range	Sulfur 5.7 mg/kg (ppm) – 10 wt%					
	Limit of Detection mg/kg (ppm) @ 600 s	Sulfur 5.7 mg/kg (ppm)					
		P	Cl	K	Ca	V	Cr
		17	3	0.7	0.4	0.1	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					
Petra 4294	Dynamic Range	Sulfur 2.6 mg/kg (ppm) – 10 wt%					
	Limit of Detection (ppm @ 600 s)	Sulfur 2.6 mg/kg (ppm)					
	Applications	Hydrocarbons, Water					

Petra Series Autosampler

Boasts a novel design with advanced software features for a more flexible and **efficient workflow**. Using unique identifier (X-ID) sample cups and an open-ended sample slide, the autosampler offers sample tracking and continuous sample loading. It is an **optional add-on feature** for a Petra 4294 or Petra MAX analyzer. QR/barcode scanner included with purchase.



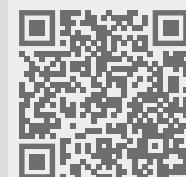
X-ID Sample Cup
ASTM D4294
ISO 8754 | IP 336

Learn More

[Click Here for
Petra MAX](#)

[Click Here for
Petra 4294](#)

or
Scan the Code



Seamless data
management with full
LIMS integration

Save critical analysis time
and minimize reporting errors
with custom sample presets

Complies with
ASTM D7039, D2622,
ISO 20884, EN 16997

Powered by MWDXRF

**Learn More
About the
Sindie R Series**

[Click Here](#) or
Scan the Code



16 32.06
Sindie^R Series
Sulfur Analyzer

APPLICATIONS

Petroleum Products

First & Second-Generation Biofuels

Oils (Edible) & Fats

Chemicals

Water

Analyze Sulfur with Unmatched Precision & Flexibility

Easier to use than ever, the Sindie R Series is our most advanced sulfur analytical solution for compliance with ASTM D2622, ASTM D7039, ISO 20884, and EN 16997 methods, enabling complete flexibility for your analytical needs.

Sindie R3

LOD: 0.18 mg/kg (ppm) at 300s, 0.15 mg/kg (ppm) at 600s**

Our most advanced sulfur analytical solution for compliance—enabling complete flexibility for analytical needs. Advanced R3 optics, provide extremely low limits of detection, allowing for cycle time flexibility to save up to hours per day in testing time.

Sindie R2

LOD: 0.4 mg/kg (ppm) at 300s, 0.28 mg/kg (ppm) at 600s**

Provides the best value and combination of detection limits, measurement speed, ease of use, and reliability.

Sulfur + Chlorine Analyzer



APPLICATIONS

Total sulfur analysis from ultra low sulfur fuels to crudes

Total chlorine analysis from aqueous solutions and aromatic products to heavy fuels, and crudes

For use in refinery labs, pipeline terminals, additive plants, and inspection laboratories



Extremely low maintenance:
no gasses, heating elements,
columns, or quartz tubing

Seamless data
management with
full LIMS integration

Two Critical Elements with One Instrument

Sindie® +Cl is a two-in-one instrument enabling trace analysis of both sulfur and chlorine with one analyzer. It is the ideal solution to certify sulfur levels in finished products, assess chlorine for corrosion mitigation, and optimize process parameters.*

Sulfur

LOD: 0.4 mg/kg (ppm) at 300 s, 0.28 mg/kg (ppm) at 600 s**

Dynamic Range: 0.4 mg/kg (ppm) to 5 wt%

Chlorine

LOD: 0.3 mg/kg (ppm) at 300 s, 0.21 mg/kg (ppm) at 600 s**

Dynamic range: 0.3 mg/kg (ppm) to 3000 ppm

Two Critical Measurements

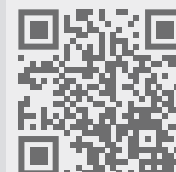
Sindie +Cl performs trace analysis of both sulfur and chlorine with one push of a button. You can measure both elements in one sample, or measure each separately by simply inserting a new sample.

Complies with ASTM D2622,
D7039, D7536, D4929C,
SH/T 0842, ISO 20884

Powered by MWDXRF

**Learn More
About the
Sindie + Cl**

[Click Here](#) or
Scan the Code



Seamless data management with full LIMS integration

Save critical analysis time and minimize reporting errors with custom sample presets

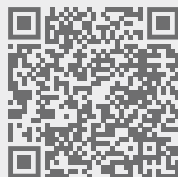
Complies with ASTM D7536 and D4929C

Powered by MWDXRF

Learn More

[Click Here for Clora 2XP](#)

[Click Here for Clora](#)
or
Scan the Code



APPLICATIONS

Total chlorine analysis in petroleum products, biofuels, aromatics and other chemicals, and water. For use in refineries, petrochemical and additive plants, pipeline terminals, and test laboratories

Analyze Chlorine with Enhanced Precision & Performance

Clora® measures total chlorine in hydrocarbons such as aromatics, distillates, heavy fuels, crude oils, and water. This state-of-the-art technology complies with ASTM D7536 and D4929C and delivers unparalleled accuracy and precision for petroleum and petrochemical applications where simple, quick, and reliable analysis is critical.*

Clora 2XP

LOD: 0.1 mg/kg (ppm) at 300s, 0.07 ppm at 600s in hydrocarbons**

Dynamic range: 0.1 mg/kg (ppm) – 2 wt%

Automatic sulfur correction saves time and improves accuracy and precision on high sulfur samples.

Clora

LOD: 0.13 mg/kg (ppm) at 300s, 0.09 mg/kg (ppm) at 600s for hydrocarbons, 0.3 mg/kg (ppm) at 300s, 0.21 mg/kg (ppm) at 600s for aqueous samples**

Dynamic range: 0.13 mg/kg (ppm) to 4 wt%

Manual sulfur correction to correct for high sulfur samples.

Sulfur Online Analyzer



APPLICATIONS

Refinery: hydrotreating, hydrofiner, and blending processes

Pipeline Terminals: interface cuts, custody transfer acceptance, and tank contamination prevention

OPTIONS

Multi-stream analysis capability

Extended Range (XR) available for measurements above 3000 ppmw up to weight percent levels

Auto-validation capability

Variations of sample conditioning systems and environmental control equipment depending on installation requirements



ATEX and NEC
Certified



ATEX Zone 1 and
NEC Cl | Div 2 Certified

Uses ASTM D7039
technology

Low maintenance:
no consumable liquids,
gasses, combustion,
or sample conversion

Powered by MWDXRF

Effective Online Analysis in Petroleum Process Streams

Sindie® Online is an industrial grade process sulfur analyzer with breakthrough detection capability to monitor ultra low sulfur in petroleum or aqueous process streams.*

LOD: 0.5 ppmw in hydrocarbon matrices @ 300 s

LOD: 1.5 ppmw in aqueous streams @ 300 s

Dynamic range: 0.5 ppmw – 3000 ppmw

**Learn More
About the
Sindie Online**

[Click Here](#) or
Scan the Code



ATEX Zone 1 and
NEC Cl | Div 2 Certified

Uses ASTM D7536
technology

Low maintenance:
no consumable liquids,
gasses, combustion,
or sample conversion

Powered by MWDXRF

**Learn More
About the
Clora Online**

[Click Here](#) or
Scan the Code



APPLICATIONS

*Upstream production, refining process,
and effluent management*

*Total chlorine analysis in raw and desalted crudes,
water and effluent streams, refinery process
streams, and finished product*

OPTIONS

Multi-stream analysis capability

Auto-validation capability

*Variations of sample conditioning systems
and environmental control equipment
depending on installation requirements*



ATEX and NEC
Certified

Chlorine Analysis in Liquid Hydrocarbon Process Streams

Clora® Online uses ASTM D7536 technology and delivers real-time, continuous analysis of total chlorine by monitoring desalted crude, a plant can optimize performance and immediately see impacts of crude changes (including organic chloride).

LOD: 0.2 ppmw in hydrocarbon matrices @ 300 s**

LOD: 0.6 ppmw in aqueous streams @ 300 s

Dynamic range: 0.2 ppmw – 3000 ppmw

Silicon Analyzer



APPLICATIONS

Total silicon analysis in hydrocarbons and bio fuels
Refinery labs, pipeline terminals, additive plants,
and inspection laboratories

OPTIONS

LIMS data output compatible software



User programmable
measurement time:
30-900 s

Complies with
ASTM D7757

Low maintenance:
no conversion gasses,
heating elements,
quartz tubes, or columns

Powered by MWDXRF

Silicon Analysis in Petroleum and Bio Fuels

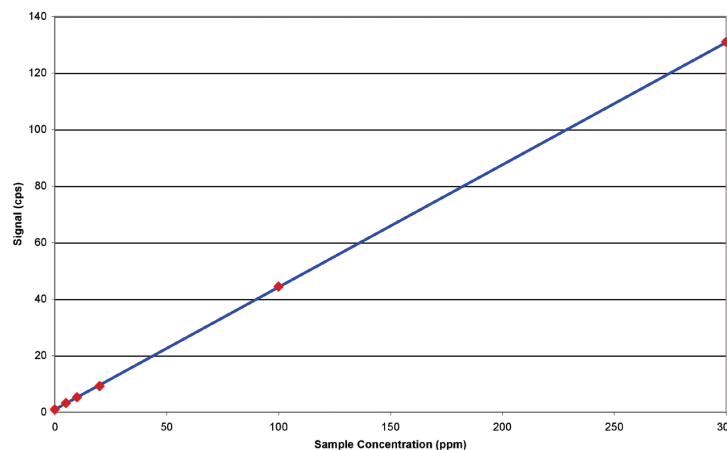
Signal delivers quantitative analysis of silicon (Si) across multiple liquid hydrocarbons, including gasoline to ethanol, and toluene, as well as aqueous materials. Silicon contamination continues to impact fuel quality, resulting in costly engine failures and catalyst fouling. Powered by MWDXRF, Signal complies with ASTM D7757 and provides exceptional Si analysis and is an ideal solution for demanding petroleum and industrial environments.

LOD: 0.65 ppm at 600 s

Dynamic Range: 0.65 ppm - 3000 ppm

Long Range Calibration

Signal uses a weighted least squares regression which is extremely linear and easy to set up. Typical correlation (R value) is expected to be on the order of 0.999 or better.



**Learn More
About the
Signal Analyzer**

[Click Here](#) or
Scan the Code





APPLICATIONS

Total phosphorus analysis in hydrocarbons, bio-fuels and aqueous matrices

Refinery, additive plants, oil recycle facilities and test labs

OPTIONS

LIMS data output compatible software

Accu-flow



User-programmable measurement time: 30-900 s

Automatic sulfur correction

Low maintenance: no conversion gasses, heating elements, quartz tubes, or columns

Powered by MWDXRF

Learn More About the Phoebe Analyzer

[Click Here](#) or Scan the Code



Phosphorus Analysis in Hydrocarbon & Aqueous Matrices

From crude oil to biofuels, in additives or water, Phoebe benchtop analyzers deliver exceptional precision and accuracy for complete phosphorus analysis. It is very easy to operate with an intuitive touchscreen enabling use in various industrial environments. Phoebe is hassle-free and does not require extensive sample preparation, consumable gasses, or sample conversion. Phoebe is available with Accu-flow.

LOD: 0.4 ppm at 600 s

Dynamic Range: 0.4 ppm to 3000 ppm

Automatic Sulfur Correction

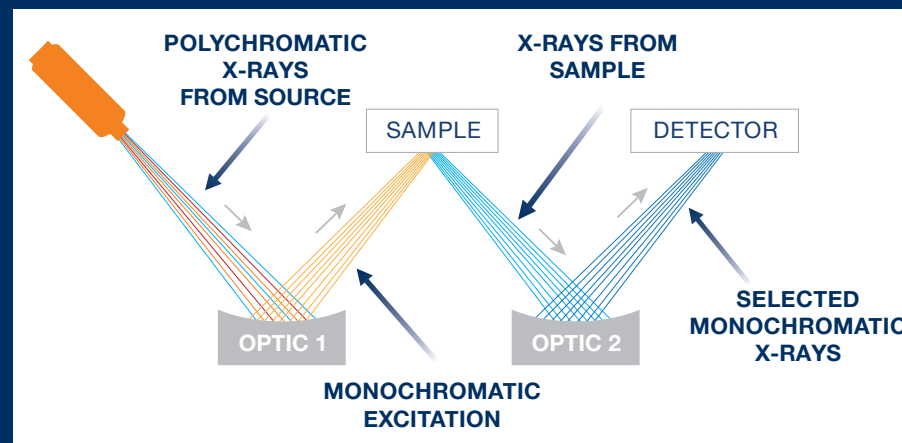
Many heavy samples, like crude oil, VGO or coker residual, may have percent-level sulfur present while phosphorus may be as low as a few parts per million. High sulfur levels will typically increase the phosphorus measurement result during XRF analysis. Phoebe is able to measure the phosphorus and sulfur concentrations simultaneously, and the sulfur counts information is then used to automatically correct the phosphorus measurement.

Advanced Analysis with MWDXRF

Monochromatic Wavelength Dispersive X-ray Fluorescence (MWDXRF) utilizes state-of-the-art focusing and monochromating optics to increase excitation intensity and dramatically improve signal-to-background ratio compared to traditional WDXRF instruments. This enables significantly improved detection limits, precision, and a reduced sensitivity to matrix effects.

A monochromatic and focused primary beam excites the sample and secondary characteristic fluorescence X-rays are emitted from the sample. A second monochromating optic selects the sulfur or chlorine characteristic X-rays and directs these X-rays to the detector.

MWDXRF is a direct measurement technique and does not require consumable gasses or sample conversion delivering robust and low-maintenance analyzers with dramatically lower detection limits and faster response times.



Eliminate Particle Settling with Accu-flow

Available on M-Series Clora & Phoebe **ACCU-FLOW**

Accu-flow technology helps to minimize the effects of particulate settling, which is common when testing for chlorides in crude oil using XRF in the laboratory. Over a typical measurement cycle, the heavier particles can settle to the bottom of the sample cup and cause higher than normal results. Accu-flow pushes the sample through the system keeping the sample uniform, delivering a result that better reflects crude streams as they exist in the refinery. Accu-flow is available with Clora® benchtop analyzers.

Autosampler

Available on M-Series Clora, Sindie 2622, and Sindie 7039

- 8 sample cell capacity
- Increases productivity
- Utilizes XOS Accucell sample cups



Streams & Applications Analyzed

- | | | | | |
|---------------------|--------------------|----------------|----------------------------|-----------------------------|
| • Aromatics | • Blending Ethanol | • Fuel Oil | • High Sulfur Hydrocarbons | • Liquid Hydrocarbons |
| • Aviation Gasoline | • Crude Oil | • Fuel Ethanol | • Jet Fuel | • Liquid Petroleum Products |
| • Biodiesel | • Diesel | • Gasoline | • Kerosene | • Naphthas |