NEX CG
PETROLEUM

Elemental analysis by X-ray fluorescence

Energy dispersive XRF analyzer

Vanadium	Iron	Nickel	Lead
V 23	Fe 26	Ni 28	Pb 82
Atomic Weight = 50.94	Atomic Weight = 55.85	Atomic Weight = 58.69	Atomic Weight = 207.20

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Rigaku NEX CG is a Cartesian geometry energy dispersive X-ray fluorescence (EDXRF) analyzer that delivers rapid qualitative and quantitative determination of major and minor atomic elements in a wide variety of sample types of interest to the petroleum industry.

Element	LLD
S	0.54 ppm
* 300 second analysis time	

Sulfur in ULSD by ASTM D7220-12

Regulations around the world have limited the amount of sulfur in various fuels oils with particular attention to diesel fuel. Regulations limiting sulfur concentration affects all levels of the petroleum industry, from the price of crude oil, to blending and refining, pipelines, transportation and storage, as well as product QC at the refinery level and as fuel is delivered to the pump. Rigaku NEX CG provides a fast, reliable method of measuring and monitoring ultra-low sulfur concentrations in diesel and other petroleum products. A typical empirical calibration, shown at right as an example, was built using a suite of seven certified diesel calibration standards. For a 300 second analysis time, the lower limit of detection (LLD or LOD) is 0.54 parts-per-million (ppm). Please request AppNote #1024 for more details.

Element: S	RMS Dev: 0.2
Units: ppm	Correlation: 0.99995

Sample ID	Standard Value	Calculated Value
1	0	0.0
2	5	5.2
3	10	10.0
4	15	14.9
5	20	20.1
6	25	24.7
7	50	50.1

Simultaneous determination of sulfur and ultra-low chlorine in crude oil

Monitoring the sulfur and chlorine content is important in crude oil, where chlorine may be present through natural processes or possible adulteration. If unmeasured or not corrected for, chlorine may bias the sulfur measurement and potentially cause corrosion damage in blending operations, in pipelines or during the refining process. The industry requires a fast, simple means of screening and monitoring the chlorine content of crude at the well site, along pipelines, during blending and other pre-refining checks. Rigaku NEX CG, employing monochromatic polarized excitation, brings the industry a simple means to simultaneously measure sulfur and chlorine from one pour in 300 seconds. The NEX CG delivers the lowest chlorine detection limits available with EDXRF spectroscopy. Please request AppNote #1432 for more details.

Element	LLD
S	<1.0 ppm
Cl	0.3 ppm*
* in crude up to 1.5% sulfur, 300 second analysis time	

Lead in gasoline by ASTM D5059

Even in the age of unleaded road gasoline, lead levels still need to still be monitored. Additionally aviation gasoline (avgas) is still leaded for now. The amount of lead in a liter of gasoline varies widely, from a low of 0.02 g/L (~50% more lead than the US standard) to a high of 0.84 g/L (more than 40X higher). For a 300 second analysis time, the NEX CG delivers a lower limit of detection (LLD or LOD) of 0.0002 g/L (0.2 ppm). Please request AppNote #1443 for more details.

Element	LLD
Pb	0.0002 g/L
* 300 second analysis time	

Other elements in crude and resids

Metals in crude may be inorganic or organometallic compounds that consist of hydrocarbon combinations with vanadium (V), iron (Fe), and nickel (Ni). These materials promote fouling and can cause catalyst poisoning in subsequent refinery processes, such as catalytic cracking methods, and they may also contaminate finished products. With a 300 second analysis time, the Rigaku NEX CG delivers a 1 ppm LLD for vanadium and nickel, and a 2 ppm LLD for iron. AppNotes #1293 and #1323 address these applications using the Rigaku NEX QC and NEX QC+ respectively.

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Analyze from sodium through uranium

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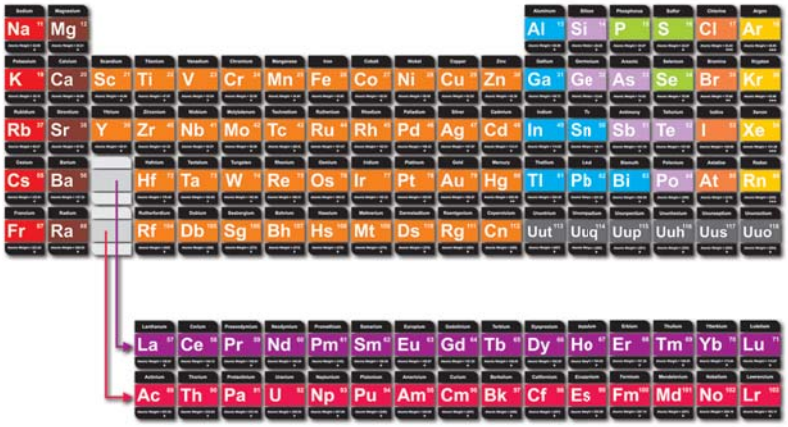
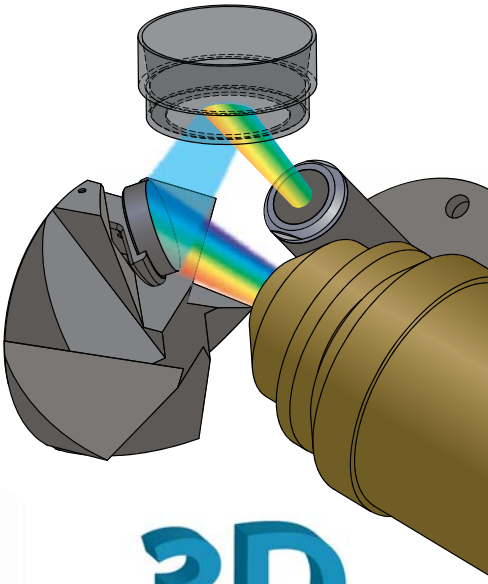




3D

Analyze sodium (Na) to uranium (U)

Exceptional versatility. Measure most elements from parts-per-million (ppm) levels to wt%, in liquids, solids or powders.

3D optics with monochromatic/polarized excitation

Unique three-dimensional (3D) close-coupled Cartesian Geometry (CG) optical kernel employs monochromatic excitation for exceptionally low detection limits.

High-performance SDD detector

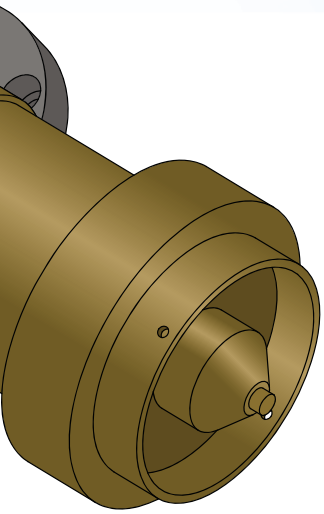
Silicon drift detector (SDD) delivers superior peak shape and resolution while supplying high count rates for lowest possible detection limits.

15-position autosampler

Accepts standard 32 mm diameter cups for automated sample handling.

EZ Analysis for simple routine operation

Rigaku NEX CG software is extremely easy to use. For non-technical operators, routine analyses are performed through a simplified EZ Analysis interface. Select the sample position on the computer screen and enter a sample name. Next select the application method (i.e., calibration). Click the "start" button with the mouse to initiate the analysis.



Simultaneous S & Cl measurement

Simultaneous measurement of sulfur and chlorine, from one sample pour in 300 seconds, saves time and money.

Sulfur in ULSD

Rigaku NEX CG provides a fast, reliable method of measuring and monitoring ultra-low sulfur concentrations in diesel and other petroleum products.

Lead in gasoline

For a 300 second analysis time, the NEX CG delivers a lower limit of detection (LLD) of 0.0002 g/L.

Trace elements

Fast analysis of other trace minor and major elements in crude, lube oils, waste oil and cutting fluids.

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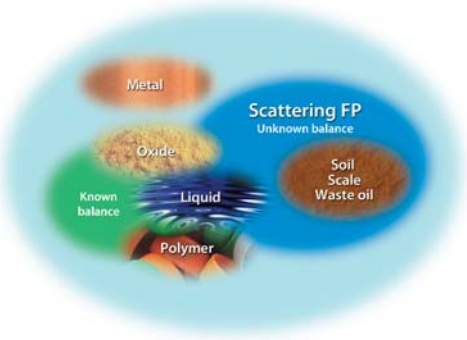
Optional FP for standardless semiquantitative analysis

NEX CG is optionally available with the RPF-SQX fundamental parameters (FP) software package that features Rigaku Profile Fitting (RPF) technology. The software allows semi-quantitative analysis of almost all sample types without reference materials, and rigorous quantitative analysis with standards. Featuring Rigaku's famous Scatter FP method, the software can automatically estimate the concentration of unobserved low atomic number elements (H to F) and provide appropriate corrections.



Other Rigaku products for petroleum analysis:

NEX QC – benchtop EDXRF elemental analyzer

Rigaku NEX QC energy dispersive X-ray fluorescence (EDXRF) analyzers deliver rapid qualitative and quantitative determination of major and minor atomic elements in a wide variety of sample types. Especially designed and engineered for heavy industrial use, whether plant floor or remote field environments, the instrument is ideal for measuring sulfur (S) in oils by ASTM D4294 and lead (Pb) in gasoline by ASTM D5059.

NEX QC+ – benchtop EDXRF elemental analyzer

For more demanding applications, or for situations where analysis time or sample throughput is critical, Rigaku offers the new NEX QC+ spectrometer. Employing the next generation silicon detector technology, the enhanced NEX QC+ affords significant improvement in elemental peak resolution and counting statistics. The instrument is ideal for measuring sulfur (S) in oils by ASTM D4294, ultra-low sulfur (S) by ISO-13032 and lead (Pb) in gasoline by ASTM D5059.

NEX XT – total sulfur process analyzer

Rigaku NEX XT is the next generation process gauge for high-level total sulfur measurement (0.02% to 6% S) of crude, bunker fuel, fuel oils, and other highly viscous hydrocarbons, including residuums. This versatile, compact and robust X-ray Transmission / Absorption (XRT / XRA) process gauge is specifically optimized for the total sulfur analysis needs of refineries, pipelines, blending operations, and bunkering terminals.

NEX OL – process EDXRF elemental analyzer

Featuring advanced 3rd generation energy dispersive X-ray fluorescence (EDXRF) technology, the Rigaku NEX OL represents the next evolution of process elemental analysis for liquid stream applications. NEX OL is configurable for use in both classified and non-classified areas and can analyze from aluminum (Al) to uranium (U). It is ideal for monitoring Co, Mn and Br catalysts in PIA and PTA plants as well as sulfur (S) in diesel and gas oil.

Specifications

Excitation
X-ray tube, end-window type with Pd anode
50 W max power
50 kV max voltage
Four standard polarization and secondary targets for optimum excitation

Detection
High performance SDD
Peltier electronic cooling
Large active detection area
Optimum balance of spectral resolution and high count rate
Helium purge system

Environmental conditions
Ambient temperature 18 – 28°C (65 – 82°F)
Relative humidity ≤75%
Vibration undetectable by human
Free from corrosive gas, dust and particles

Computer
External PC computer system
Microsoft® Windows® operating system
Keyboard and mouse
Monitor

Software
Menu-based software for control of spectrometer functions and data analysis
Application templates
Simple flow bar wizard to create your own methods
Empirical calibration with overlap and matrix compensation

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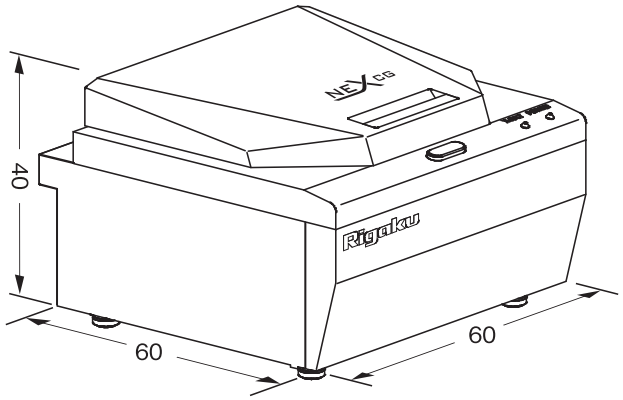
Backed by Rigaku

Since its inception in 1951, Rigaku has been at the forefront of analytical and industrial instrumentation technology. Today, with hundreds of major innovations to our credit, the Rigaku Group of Companies are world leaders in the field of analytical X-ray instrumentation. Rigaku employs over 1,400 people worldwide in operations based in Japan, the U.S., Europe, South America and China.

Options
10-position automatic sample changer (35 – 40 mm sample cups and pellets)
RFP-SQX fundamental parameters software
Commercial standards kit
Uninterruptible power supply (UPS)

Spectrometer data	
Single phase AC	100/220 V, 15/7 A (50/60 Hz)
Dimensions:	60 (W) x 60 (D) x 40 (H) cm (23.6 x 23.6 x 15.7 in)
Weight:	80 kg (176 lbs.)



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Elemental analysis by X-ray fluorescence

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