



# SpectrOil M Series

## OIL ANALYSIS SPECTROMETER

Standard for rugged spectrometric oil analysis in the field

The SpectrOil M Series RDE-OES Elemental Analyzer is a compact, rugged, transportable spectrometer designed for accurate elemental analysis of a variety of fluids tested in the field or in a laboratory. Using the proven, reliable rotating disc electrode (RDE) technique, the analyzer measures trace quantities of elements dissolved or suspended as fine particles in natural or synthetic petroleum-based products. It includes new and in-service lubricants, hydraulic fluids, light (gasoline or diesel) or heavy fuels (HFO), coolants, industrial process water or wash-down water for gas turbines.

The SpectrOil M Series is widely used in commercial and military aviation, ground transportation, mining, power generation and commercial in service oil analysis laboratories.

Originally designed for military applications in the mid 1990s, the SpectrOil M is the only in service oil analysis spectrometer approved by the US Department of Defense (DoD) Joint Oil Analysis Program (JOAP). Since its development, the SpectrOil M has been the industry standard for reliable, deployable spectrometers that perform the rapid analysis of wear metals, contaminants and additives in lubricants, hydraulic fluids, fuels, coolants and water.

### SpectrOil M Series key features

- Rugged frame and optics system that meets military shock and vibration and environmental test standards (JOAP CID-0191 and CID-486J)
- Designed for remote locations and frequent transportation
- No sample preparation required
- 30 second analysis time
- Analyzes up to 31 elements simultaneously
- Self-sustained with built-in industrial touch panel PC
- Simple to operate; does not require special training
- No special utilities or gases required, only AC power
- Compliant to ASTM D6595 (In service Lubricant) and ASTM D6728 (Fuel)

### SpectrOil M Series includes the following models:

MODEL	APPLICATIONS	DEFAULT CALIBRATION PROGRAM
M/C-W	In service oil analysis for military, mining, oil & gas and commercial laboratories in remote locations	24 elements for lubricant and hydraulics
M/F-W	Fuel quality control for power plant turbines and diesel/gas engines	15 elements for light fuel and heavy fuel
M/F-LD	No.2 diesel quality control for gas turbines, ultra low limits of detection for alkali metals and vanadium	15 elements for No.2 Diesel, ultra low limits of detection
M/N-W	Only approved oil analysis elemental spectrometer for aerospace, marine and ground support for US DoD Joint Oil Analysis Program (JOAP)	15 elements for JOAP
800-00100	JOAP Navy spectrometer with mechanical features that pass shipboard shock specification	30 elements for Navy

# Laboratory Precision

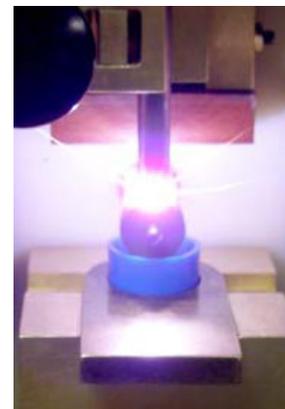
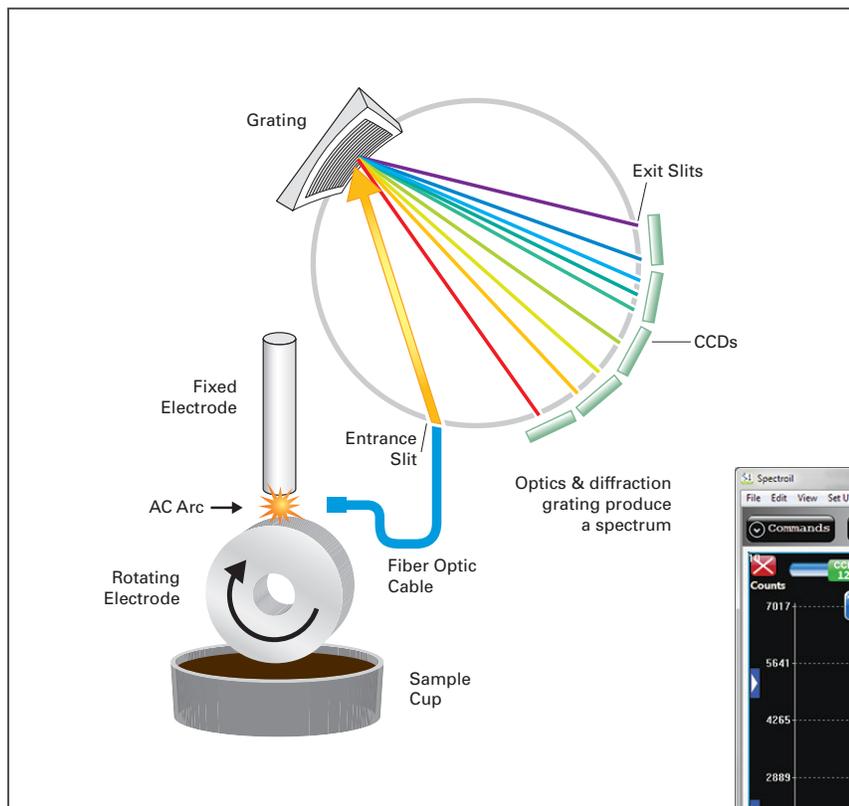
SpectrOil M is a rugged and precise Rotating Disc Electrode Optical Emission Spectrometer (RDE-OES).

- Measures sub-ppm elemental concentrations with high-purity carbon electrodes
- Detects elements in solution or particles as large as 10µm with RDE's precise pulsed-power, high-temperature plasma
- Accurately identifies elements in a wide variety of substances without sample preparation or dilution

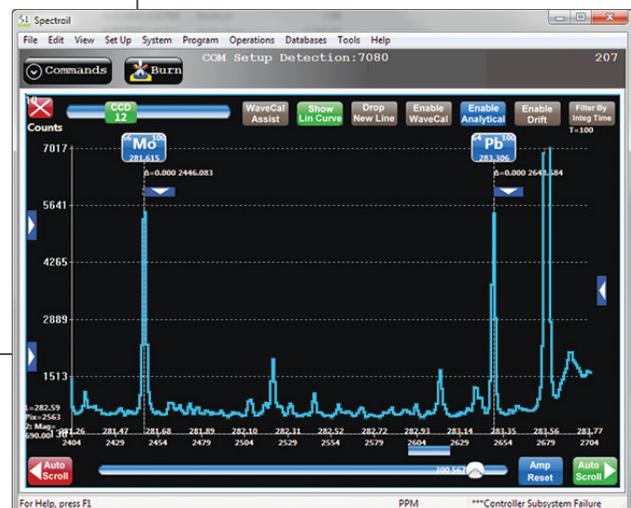
## SpectrOil M Series consists of three main components

1. **Excitation Source** – introduces energy to the sample. This includes a high voltage AC source that applies voltage across a small gap formed by the highly purified graphite rod and disc with the disc rotating and picking up oil from the sample holder under it.
2. **Optical System** – At the core of the spectrometer is a Rowland circle grating optics system with 400 mm focal length. The temperature of the optics is tightly controlled at 40°C for the most stable result. Fourteen CCD array chips are precisely aligned on the edge of the optics. Light emitted from the burning sample is transmitted by optical fiber into the optics and diffracted by the grating into different wavelengths and picked up by the CCD chips.
3. **Readout System** – detects and measures the light that has been separated into its component wavelengths by the optical system and presents this information to the operator in a usable fashion.

A specific calibration program is applied to raw spectrum which eliminates the matrix effect, so results are compliant to ASTM standards. Then, the user only needs to select the calibration profile for specific fluids. So, switching from oil to fuel to coolant or water only takes seconds, not hours like ICP and other instruments.



Schematic of how a SpectrOil analyzes a fluid sample to determine sub-ppm elemental content



## Available calibration programs (can be added to every model)

CALIBRATION	DESCRIPTION	STANDARDS	
Lubricating oil (Commercial)	Detects and quantifies elemental wear and additives in lubricants. Conforms to ASTM-D6595. Default 24 elements, up to 31 elements	CS-75-500	Base oil
		CS-24-100-200G	24 elements, 100 ppm
		SMA-900-200G	5 elements, 900 ppm
Fuel (Light and heavy fuel)	Detects quality and contamination of petrochemicals from crude through the final blended light fuels. Conforms to ASTM D-6728. It includes both light and heavy fuel calibration programs.	CS-75-500	Base Oil
		CS-GT15-10	10 ppm for light fuel
		CS-GT15-100	100 ppm for heavy fuel
Low Detection (LD) Diesel	Special calibration for #2 Diesel with low limits of detection for alkali metals and vanadium. Specifically, the LOD of V is down to 0.1ppm, critical to meet turbine OEM specifications for diesel fuel quality control	CS-HP-100	High purity base oil
		CS-GT15-10	10 ppm, 15 elements
		CS-GT15-100	100 ppm, 15 elements
		300-00010	1 ppm for Li, Na, K, V
		600-00111	0.2 ppm for V
Coolant/Glycol	Analyzes in service coolants (water glycol mix) for additives and contamination	JDIW	DI water
		SIGLYCOLSTD-500	Diluted glycol standard
Process water	Measures contamination in a variety of applications like power plant cooling water and turbine wash-down water	STE006 KIT	DI water and 5ppm standard
JOAP Airforce	JOAP Airforce calibration with 15 elements. Results correlate to SpectroOil M/N-W	D19-0	Base Oil
		D12-100	12 elements, 100 ppm
		D3-100	Zn, Mo, B, 100 ppm
JOAP Army	JOAP Army calibration with 20 elements. Results correlate to SpectroOil M/N-W	D19-0	Base Oil
		D12-100	12 elements, 100 ppm
		D3-100	Zn, Mo, B, 100 ppm
		CS-24-100-200G	24 elements, 100 ppm
JOAP Navy (only available for PN 800-00100)	JOAP Navy calibration with 30 elements. Results correlate to SpectroOil M/N-W	D19-0	Base Oil
		D12-100	12 elements, 100 ppm
		D3-100	Zn, Mo, B, 100 ppm
		D15-100	15 elements, 100 ppm
		CS-24-100-200G	24 elements, 100 ppm



### Transit Case

A transit case was designed for military personnel to transport the SpectroOil M where it is needed. A hydraulic lifting system is carefully balanced to the right of the SpectroOil so it is easily raised without effort. Four lifting rods are supplied with the SpectroOil M; they can be mounted on the unit so two people can quickly transfer the SpectroOil M from the transit case to a table top, and vice versa.



## Consumables used by calibration programs

To ensure accurate and stable measurement results, different consumables are used for different calibration programs. Only Spectro Scientific certified consumables are qualified to meet performance specifications.

CALIBRATION PROGRAMS	DISC	ROD	SAMPLE HOLDER (CUP)
Lubricant, coolant, water	M97008	M97009	P-10524 high temperature sample cup (black)
Light, heavy fuel, LD fuel	M97008	M97009	P-10524 high temperature sample cup (black) M90204 sample cover for low flash point fuels
JOAP Airforce, Army and Navy	M97200	M97201	M90909 Aluminum boat sample holder

## SpectroOil M Series Product Information

PRODUCT INFORMATION	
Part Numbers	Spectro-M/C-W, Spectro-M/F-W Spectro-M/N-W, Spectro-M/C/R-W Spectro-M/N/R-W, 800-00100 (JOAP Navy)
Applications	New and in service lubricant, hydraulic, light or heavy fuel, water/glycol mix, water
Output	mg/kg (ppm)
ASTM	D6595 (Oil), D6728 (Fuel)
Calibration	Factory set, no re-calibration needed
HARDWARE SPECIFICATIONS	
Excitation Source	Oscillatory arc discharge
Optical System	Rowland Circle polychromator Optic. Temperature controlled at 40°C +/- 1C
Spectral Range	203 nm to 810 nm
Detectors	CCD array
OPERATIONAL SPECIFICATIONS	
Sample Volume	2 ml of fluid
Ambient Operating Temperature	0 to 40°C (32F to 104F)
Relative Humidity	0 to 90%, non-condensing
USER INTERFACE SPECIFICATIONS	
Operating System	Windows 7 Pro; Software – SpectroOil V8
PC and Display	Industrial touch panel PC, 12" display
Data Storage	Internal PC, USB, CD-RW
POWER REQUIREMENTS	
Voltage Input	AC 120/240V, 50/60Hz
Power Consumption	1000 Watts at test
MECHANICAL SPECIFICATIONS	
Dimensions	80 cm (L) x 63.5 cm (W) x 70 cm (H) (31.5 in x 25 in x 27 in) M/C, M/N, M/F
Weights	114 kg (250 lbs) M/C, M/N, M/F 132 kg (290 lbs) M/C/R, M/N/R
Shipping Dimensions	102 cm (L) x 91 cm (W) x 94 cm (H) (40 in x 36 in x 37 in) for M/C, M/N, M/F 152 cm (L) x 91 cm (W) x 94 cm (H) (60 in x 36 in x 37 in) for M/C/R, M/N/R
Shipping Weights	261 kg (575 lbs) M/C, M/N, M/F 295 kg (650 lbs) M/C/R, M/N/R

Element	Lubricant	Lubricant Extended	Light Fuel	Heavy Fuel	Fuel Low Detection	Glycol/Coolant
Ag	0 - 1000					
Al	0 - 1000		0 - 50	0 - 500	0 - 100	0 - 50
As		0 - 100				
B	0 - 1000					0 - 1,000
Ba	0 - 6,000					
Bi		0 - 100				
Ca	0 - 6,000		0 - 50	0 - 500	0 - 100	0 - 50
Cd	0 - 1000					
Ce		0 - 100				
Co		0 - 100				
Cr	0 - 1000		0 - 50	0 - 500	0 - 100	
Cu	0 - 1000		0 - 50	0 - 500	0 - 100	0 - 50
Fe	0 - 1000		0 - 50	0 - 500	0 - 100	0 - 50
In		0 - 100				
K	0 - 1000		0 - 50	0 - 500	0 - 100	0 - 10,000
Li	0 - 1000		0 - 50	0 - 500	0 - 100	
Mg	0 - 6,000		0 - 150	0 - 1,500	0 - 100	0 - 50
Mn	0 - 1000		0 - 50	0 - 500	0 - 100	
Mo	0 - 1000					0 - 500
Na	0 - 6,000		0 - 50	0 - 500	0 - 100	0 - 10,000
Ni	0 - 1000		0 - 50	0 - 500	0 - 100	
P	0 - 6,000					0 - 2,500
Pb	0 - 1000		0 - 50	0 - 500	0 - 100	0 - 50
Sb	0 - 100					
Si	0 - 1000		0 - 50	0 - 500	0 - 100	0 - 500
Sn	0 - 1000					
Ti	0 - 1000					
V	0 - 1000		0 - 50	0 - 500	0 - 100	
W		0 - 100				
Zn	0 - 6,000		0 - 50	0 - 500	0 - 100	0 - 50
Zr		0 - 100				

### Robotics Option

The Double Disc Rapid Robot (D2R2) autosampler is a factory configured option for the SpectroOil M/C or SpectroOil M/N spectrometers that provides automatic operation of used oil sample analysis. The SpectroOil D2R2 does not use the traditional rod electrode used in manual systems. A specially designed rotrode disc is used, allowing for unattended operation.

