

ICPO-30

DIRECT OIL ANALYSIS ICP-OES

Patented technology for direct oil & organic sample analysis



01

NO PRETREATMENT

Direct oil injection eliminates acid digestion and dilution entirely. Samples enter the instrument as-is for immediate multi-element analysis.

02

MULTI-ELEMENT SIMULTANEOUS

Sequential detection delivers up to 15 elements per minute with exceptional sensitivity. Built-in spectral line database with 5000+ wavelengths ensures complete coverage.

03

6 PM RESOLUTION

4320 lines/mm holographic grating achieves sub-6 pm resolution in the UV range, delivering exceptional spectral separation for complex oil matrices.

04

SIMPLE OPERATION

Intuitive software with pre-configured ASTM D5185 and D4951 methods. One-click analysis with automatic calibration, QC, and report generation.

KEY ICPO-30 ADVANTAGES

- No sample pretreatment, direct oil injection analysis
- Multi-element simultaneous detection capability
- Resolution up to 6 pm with 4320 l/mm grating
- Simple operation with built-in 5000+ spectral lines
- Oil-cooled spray chamber for stable organic analysis
- V-groove nebulizer handles viscous samples (2-100 cSt)
- Reinforced quartz torch reduces carbon deposition
- Larger torch injector ID prevents salt clogging
- 1600W RF power fully decomposes organic matrices
- Auxiliary gas flow prevents carbon particle deposition
- Cryogenic cooling pump stabilizes plasma temperature
- Buffer design reduces solvent load, improves sensitivity
- Radial plasma viewing for optimal sensitivity
- Fully demountable torch for easy maintenance



LARGE-BORE TORCH INJECTOR

Slightly enlarged injector ID effectively reduces carbon deposition and salt clogging during continuous oil analysis.

OIL-COOLED SPRAY CHAMBER

Temperature-regulated chamber with cryogenic cooling pump reduces organic vapor entering plasma, preventing temperature spikes.

V-GROOVE NEBULIZER

Precision-machined oil-compatible nebulizer handles 2-100 cSt viscosity without clogging. Designed for direct organic matrix injection.

1600W RF GENERATOR

40.68 MHz vacuum tube RF generator at 1600W provides sufficient power to fully decompose organic compounds while maintaining plasma stability.

AUXILIARY OXYGEN (O₂)

99.99% pure oxygen at 0.02 L/min "shortens" the plasma, preventing carbon particle deposition on the torch while improving excitation efficiency.

PATENTED CORE TECHNOLOGIES

Direct Oil Analysis Breakthrough Engineering



PATENTED SAMPLE INTRO

- No sample pretreatment, direct oil injection
- Oil-cooled spray chamber with cryogenic pump
- V-groove nebulizer for 2-100 cSt viscosity
- Larger torch injector reduces carbon deposits
- Quick-release clamp for tool-free maintenance



ADVANCED RF & PLASMA

- 1600W at 40.68 MHz fully decomposes organics
- 99.99% O₂ at 0.02 L/min prevents carbon buildup
- Plasma "shortening" protects torch from deposits
- Buffer chamber reduces solvent load
- Enhanced excitation energy improves sensitivity



HIGH-RESOLUTION OPTICS

- 1-m Czerny-Turner monochromator, argon purged
- 4320 l/mm grating: <6 pm UV resolution
- Wavelength accuracy: $\leq \pm 0.03$ nm
- 160-800 nm full spectral coverage
- Sequential detection, 15 elements/min

PERFORMANCE PROOF

Direct Oil Analysis Performance — NWSPEC Patented Technology

The ICPO-30 achieves ≤ 6 pm spectral resolution with the 4320 lines/mm holographic grating in the UV range, enabling precise detection of wear metals (Fe, Cu, Pb, Sn, Al, Si) in used engine oil without sample digestion. The enlarged torch injector and auxiliary gas system work together to prevent carbon accumulation, achieving stable plasma operation for over 8 hours of continuous oil analysis. Short-term precision $\leq 1.5\%$ RSD (n=10) and long-term precision $\leq 2.0\%$ RSD (4h) demonstrate analytical quality matching aqueous ICP-OES systems. The cryogenic cooling pump reduces organic solvent vapor loading, while the buffer chamber design further stabilizes the plasma and improves analyte excitation efficiency.

Instrument: ICPO-30 / Method: Direct oil injection ASTM D5185 / Grating: 4320 l/mm / Resolution: <6 pm UV

APPLICATION AREAS

LUBRICANT ANALYSIS

Wear metal monitoring in engine and hydraulic oils per ASTM D5185

PETROCHEMICAL QC

Crude oil characterization and fuel additive verification per ASTM D4951

ENVIRONMENTAL

Organic solvent extracts and waste oil metal contamination analysis

FOOD & BEVERAGE

Edible oil quality control and trace metal contamination testing

MINING & METALS

Organic-based reagent analysis and process control applications

INDUSTRIAL QC

High-throughput quality control for manufacturing and production labs

SPECTROMETER

Optical Design	1-m Czerny-Turner monochromator, argon purged, thermostated
Grating Options	2400 / 3600 / 4320 lines/mm holographic master
Wavelength Range	160-800 nm (configuration dependent)
Wavelength Accuracy	Error $\leq \pm 0.03$ nm
Reproducibility	≤ 0.003 nm
Resolution (4320 l/mm)	<6 pm in UV range
Resolution (other)	6 / 8 / 10 / 16 pm FWHM
Detector	High-sensitivity detector, 160-800 nm
Detection Mode	Single channel sequential

ICP SOURCE

RF Generator	Vacuum tube, 40.68 MHz, frequency stabilized
RF Power	1600 Watts (optimized for organic decomposition)
Load Coil	Water-cooled copper
Torch Assembly	Fully demountable, reinforced quartz for oil
Torch Injector	Larger ID, reduces carbon deposition and salt clogging
Plasma Gas	Argon, 11.5-12.5 L/min
Plasma Viewing	Radial orientation
Auxiliary Oxygen (O ₂)	99.99% purity, 0.02 L/min

SAMPLE INTRODUCTION (OIL)

Spray Chamber	Oil-cooled with cryogenic cooling pump
Cooling System	Reduces organic vapor, stabilizes plasma temperature
Nebulizer	V-groove, oil-compatible
Viscosity Range	2-100 cSt (water to heavy gear oil)
Buffer Chamber	Reduces solvent load, improves sensitivity
Clamp	Quick-release design

PERFORMANCE HIGHLIGHTS

 <6 pm

UV Resolution (4320 l/mm grating)

1600W

RF Power for Full Organic Decomposition

 $\leq 1.5\%$

Short-term Precision RSD (n=10)

15 elem/min

Maximum Analysis Speed

No Digestion

Direct Oil Injection Analysis

ANALYTICAL PERFORMANCE

Short-term Precision $\leq 1.5\%$ RSD (n=10 replicates)Long-term Precision $\leq 2.0\%$ RSD (4 hours continuous oil)Sensitivity (Zn) 213.856 nm ≤ 0.003 mg/LSensitivity (Mn) 257.610 nm ≤ 0.002 mg/LDetection Limit (Ba) 455.403 nm ≤ 0.001 mg/LDetection Limit (Ni) 231.604 nm ≤ 0.01 mg/LDetection Limit (Cu) 324.754 nm ≤ 0.007 mg/LSpec. Bandwidth (Mn) ≤ 0.015 nm FWHM (Class A)

SOFTWARE & DATA SYSTEM

Operating System Windows 7, 10, 11 compatible

Computer Intel Celeron G6900, 8 GB DDR4

Element Database 5000+ wavelengths & interferences

Method Setup Built-in oil analysis protocols

Reporting Auto archiving, exportable, LIMS-ready

Compliance ASTM D5185, D4951 pre-configured

ELECTRICAL & ENVIRONMENT

Power Single phase, 4-5.5 kW, 28 A

Voltage 220/240 V, 50/60 Hz

Dimensions & Weight 59" x 20" x 42" / 235 kg (518 lbs)

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