

### Determination of Wear Metals and Wear Debris in Petroleum Products

#### Introduction

The analysis of wear metals and of additives in lubricating oils, and contaminants in fuels, is crucial to the proper maintenance and functioning of many types of machinery; heavy transportation & trucking, mining, aircraft, military and marine. Taking into account these rigorous requirements, we have developed the X-5000 for your elemental analysis needs. The X-5000 will provide a quick determination to ensure your lubricants and fuels are in the best possible condition prior to use. The X-5000 allows for instant analysis, providing vital information at that precise moment, and not weeks later. Wear metals such as Cu, Fe, Ni and V in engine oils, and the verification of additive elements for depletion - P, Ca, Zn - key lubrication characteristics. Routine testing identifies those small problems before they become costly failures.

The analytical performance, closed beam safety, and ease of use of traditional bench top XRF units are all captured in the X-5000. And it delivers true field portability, being packaged into an easy to carry, 22 pound battery operated XRF with integrated PC and industrialized large touch screen.

The X-5000 sets the benchmark for performance, power and portability.

No sample preparation, just collect it and analyze - right on the spot.

#### Key Features and Benefits

- Portable and lightweight
- Fits on any lab bench, at the work site, inspection line, production area
- Sample positioning tray accommodates all sample cups/bottles
- No sample preparation required
- No daily calibrations
- Starts up immediately, results are displayed in seconds
- Closed beam operation for user safety
- Data is stored automatically in tamper-proof format

The X-5000 is your answer for the best analytical performance without compromising field portability or operator safety.

The unique sample tray ensures proper placement of the sample every time for accurate analysis. The sample tray accommodates both bottles and cups of any size.

The X-5000 is engineered to be used anywhere - in the field, at the production line, in an inspection area. It ensures operator safety as a fully interlocked, closed beam system. The closed beam, integrated design unique to the X-5000 is a critical safety advancement as portable XRF analyzers continue to increase in X-ray power and be applied to ever more demanding, in-the-field analytical challenges.

#### Element Detection Limits

Element		LOD's
Arsenic	As	1
Calcium	Ca	5
Chlorine	Cl	15
Cobalt	Co	1
Copper	Cu	1
Iron	Fe	1
Lead	Pb	1
Manganese	Mn	1
Molybdenum	Mo	1
Mercury	Hg	1
Nickel	Ni	1
Phosphorus	P	30
Selenium	Se	1
Sulfur	S	12
Vanadium	V	1
Zinc	Zn	1

- LOD's were found in a clean mineral oil matrix without interfering elements, with test times of 180's per beam.

## X-5000 EDXRF Specifications

Feature	Specification
Concentration Range	ppm to % levels
Analyzer Weight	10 kg (22 lbs)
Measurement Time	180 sec
Operating Environment	-10 to 50° C
Power Requirements	AC or Battery
Tube Voltage	10 - 50 kV
Tube Current	200 $\mu$ A
User Interface	Built in Touchscreen
Instrument Dimensions	38 x 33 x 28 cm (15 x 13 x 11 in.)
Sample Chamber	29 x 11 x 15 cm (11 x 6 x 5 in.)



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