Spectro Scientific

Confidence in knowing

The Science of Fluid Analysis

Solutions for Predictive Equipment Maintenance

The Importance of Lubricant and Fluid Analysis in Predictive Maintenance

Machine condition monitoring or predictive maintenance is the practice of assessing a machine's condition by periodically gathering data on key machine-health indicators to determine when to schedule maintenance. One of the keys to keeping machinery operating at optimal performance involves monitoring and analyzing lubricant oils for characteristics such as contamination, chemical content and viscosity.

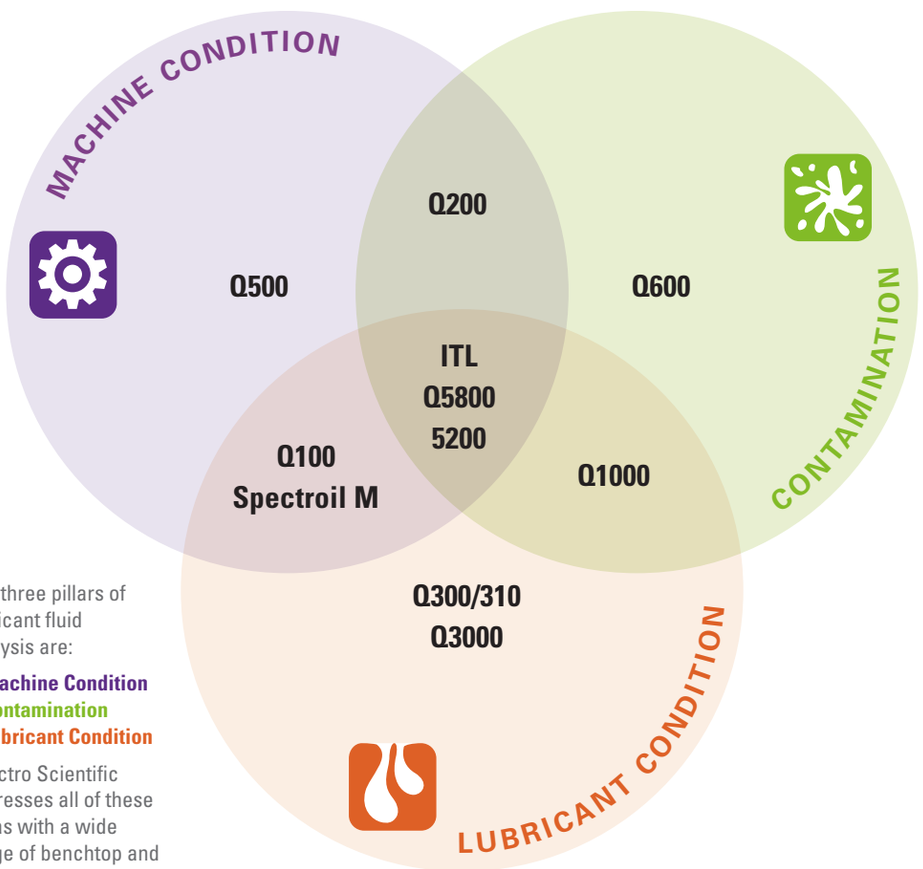
Billions of dollars are spent annually replacing machinery components that have worn out due to the inability of the lubricants to perform the required task. Knowing how to interpret changing lubricant properties can increase both the uptime and the life of your mission critical capital equipment. The existence or amount of debris and particles from wearing parts, erosion and contamination provide insights about the issues affecting performance and reliability.

Lubricants, fuels and other key fluids analyses provide critical early warning information indicative of machine failure. Analyzing and trending the data means you can schedule maintenance before a critical failure occurs. The result – higher equipment availability and productivity, lower maintenance costs, lower total cost of ownership (TCO), fewer outages, optimal equipment performance and a greener operation.

ASSET OPTIMIZATION

Reduced equipment outages
+ Reduced maintenance costs
+ Reduced lubricant consumption
+ Improved safety
+ Increased equipment life
+ Reduced fuel costs

= Increased availability and lower total cost of ownership



The three pillars of lubricant fluid analysis are:

- **Machine Condition**
- **Contamination**
- **Lubricant Condition**

Spectro Scientific addresses all of these areas with a wide range of benchtop and portable solutions.

Common Mission Critical Equipment

Aircraft
Construction
Excavators
Haul Trucks
Locomotives
Military Equipment and Transport
Manufacturing Machinery
Oil Refinery / Drilling Rigs
Race Car Fleets
SAG Mills and Mining Equipment
Ships and Marine Fleets
Turbines in Energy Generation

Typical Equipment Components of Concern

Blowers
Compressors
Differentials
Gas and Steam Turbines
Gear Boxes and Reducers
Hydraulic Systems
Motors and Bearings
Propulsion Systems
Pumps
Roller Element Bearings
Rotary/Scroll Compressors
Reciprocating Engines
Sleeve Bearings
Transmissions
Transformers
Wind and Gas Turbines

Industrial Tribology Laboratory (ITL)

The Spectro Scientific Industrial Tribology Laboratory (ITL) is a turnkey system that provides a complete lubricant analysis condition monitoring solution. The measurements made using the Industrial Tribology Laboratory determine lubricant and machine condition, the core of any effective predictive maintenance system. Spectro Scientific's ITL system is expandable and can incorporate testing and measurement solutions for other machinery fluids such as fuel, coolants, transformer oils and greases.

Spectro Scientific installs and provides training for all instruments as an integrated system. Since the Industrial Tribology Laboratory is a turnkey system, supplied and installed by one vendor, the worry and learning curve errors associated with new methods and equipment are minimized during the startup process. Condition monitoring of your equipment can begin immediately after the installation of your instruments and during the initial training of your personnel.

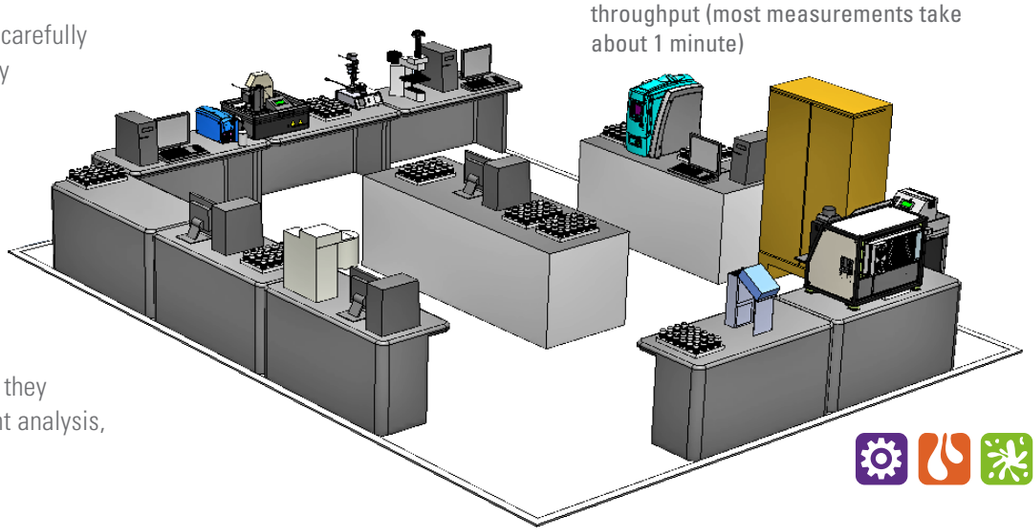
The instruments that constitute an ITL are carefully chosen because they provide the necessary data to effectively monitor the condition of your oil lubricated equipment, but also because they are easy to operate and maintain, require a minimum of special utilities to install and provide strong sample throughput (most measurements take about 1 minute). The analytical instruments send results to the central computer (or a network) where they are stored in a database file for subsequent analysis, evaluation and reporting.

BENEFITS

- World standard ITL solution
- A complete monitoring solution
- Measures all parameters of lubricant, machine and contamination conditions
- ASTM testing
- Asset management software, trending, reporting

FEATURES

- Intuitive web interface (SpectroTrack)
- Easily configurable with both Spectro Scientific and non-Spectro Scientific devices
- Supports multiple fluid types
- High productivity and good sample throughput (most measurements take about 1 minute)



Spectroil Q100
Wear Metals
Contaminants
& Additives

SpectroLNF Q200
Particle Shape & Size
Classification

SpectroVisc Q300
Viscosity

PC
Computers

Mac
Computers

SpectroTrack

iPads and
Tablets

iPhones and
Smartphones

FluidScan Q1000
Lubricant Degradation
and Contamination

SpectroT2FM Q500
Ferrography

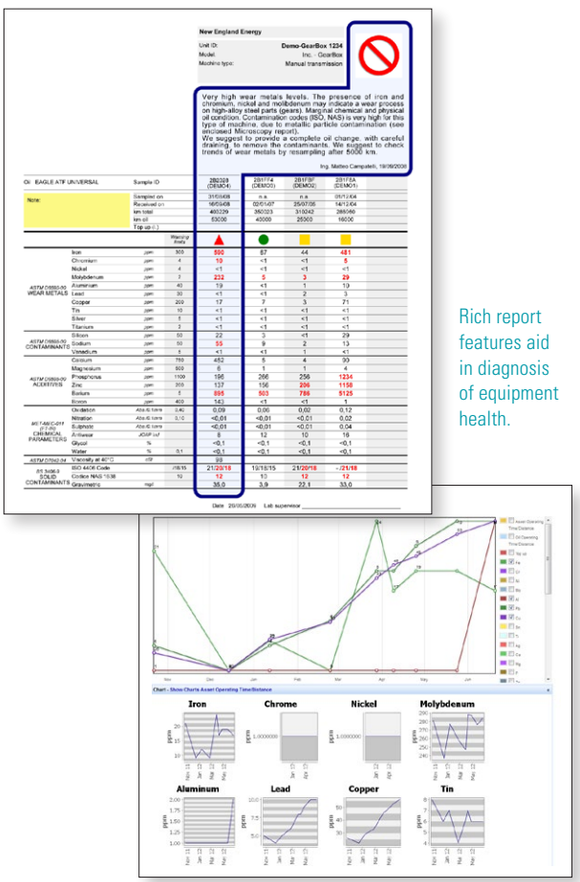
Spectro FDM Q600
Fuel Sniffer

SpectroTrack Information Management System

SpectroTrack is an information management system (IMS) optimized for laboratories that specialize in analysis of in-service (used) lubricants in support of machine condition monitoring applications.

SpectroTrack is the data management platform of our ITL solution. It is a sophisticated, yet simple to use, web-based information management system (IMS) which administers the routine operations associated with managing data for a condition monitoring program. The software implements the tasks of a full function lubricant analysis laboratory including sample logging, analysis, data storage and retrieval, automatic evaluation, reporting and web access to data.

The software provides a system to define assets and sampling points, manage samples, collect measurement data from instruments, facilitate analysis and recommendations and provide reporting and feedback loops.



Rich report features aid in diagnosis of equipment health.

BENEFITS

- High accuracy
- High sample throughput
- Easy to operate
- Rugged and reliable
- Low operating costs and environmental impact
- Faster cleanup

FEATURES

- Self-contained installation on one server
- Designed specifically for oil analysis programs – dedicated or contract testing
- Supports customer (private label) branding
- Remote portals can access systems over the Internet
- Laboratory dashboard for easy workflow management
- Scales well as your business volume grows
- Multi-language support

Q5800 Expeditionary Fluid Analysis System

The Q5800 model is a multi-purpose portable measurement tool that combines abnormal wear metals analysis, particle counting, viscosity and IR spectroscopy into a compact transportable system.

The battery-powered Q5800 is specifically aimed for maintainers of mobile, high cost equipment who need a complete lubricant assessment for condition monitoring and immediate results for time-based maintenance decisions. The device is solvent-free, rugged and easy-to-use. A touch screen interface, new software functionality, and optional bluetooth/WIFI communications enable machine, lubricant and contamination condition data to be shared allowing rapid, collaborative decision making.

The primary beneficiaries of this device are military, marine and mining customers with remote temporary work site conditions and the need for warning of abnormal wear events, lubricant failure, and disruptive contamination ingression.

BENEFITS

- Accurately detects potential failures before they happen
- Portable and compact for on-site testing
- Solvent-free with minimal sample waste
- Tests all types of lubricating fluids and asset compartments
- Immediate results for faster, more informed decision making
- Rugged design for field use

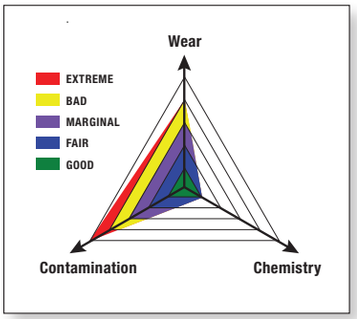
FEATURES

- Elemental wear metal analysis by proprietary XRF technique
- Filtration Particle Quantifier (FPQ)
- Filtration gram patch maker for debris evaluation
- IR spectrometer for lubricant condition, water content, TAN/TBN, soot, oil breakdown and fluid mix-up identification
- Kinematic viscometer at 40°C
- Integrated software for comprehensive fluid analysis
- Touchscreen interface, battery-operated with Bluetooth and WIFI options
- Patent-pending design

Spectro 5200 Trivector®

Minilab Oil Analyzer with OilView® Software

The Spectro 5200 Trivector Oil Analyzer is a multi-function benchtop oil analyzer that detects lubricant related problems and enables on-site analysis of machinery oils and lubricants for metal wear, lubricant chemistry and contamination per ASTM D7416 and Wear Debris Analysis per ASTMD7684.



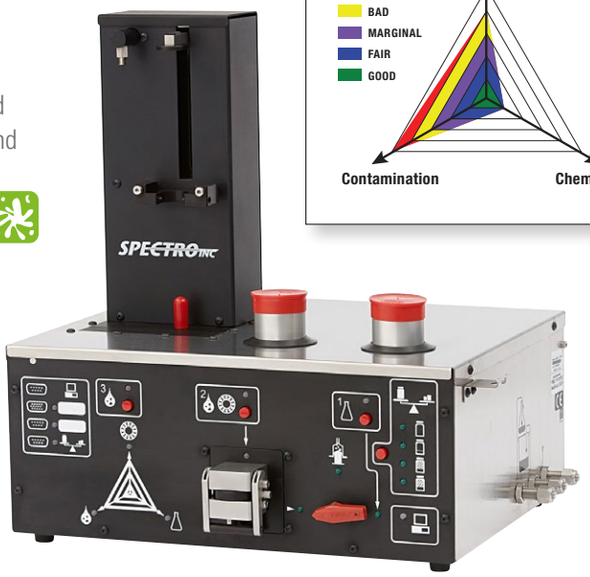
BENEFITS

- Comprehensive screening for industrial machinery and engines
- Generates actionable maintenance information for quick, informed decisions

FEATURES

- Particle counts and codes
- Water contamination measurement
- Ferrous index indicates presence of wear
- Lubricant viscosity and dielectric
- Comprehensive Minilab includes Wear Debris Analysis capability and LIMS

ASTM D7416
ASTM D7684
ISO 11171
ISO 4406



Spectro LNF Q200 Series

Particle Counter, Wear Particle Classifier, Ferrous Monitor

Expand beyond contamination control to include machine wear monitoring for predictive maintenance. The Spectro LNF Q200 series provides particle counts and codes, abnormal wear particle classification and ferrous wear monitoring.

With an intuitive, configurable GUI and no calibration required, just a verification sample, the Q200 series is fast, simple, and easy to use.

THE LNF (LaserNetFines™) IS THE WORLD'S BEST PARTICLE COUNTER TECHNOLOGY:

- Highest saturation limit, up to 5,000,000 particles/ ml
- Error corrections for soot, water, and air bubbles
- Particle counts and codes per ISO 4406, NAV 1638, NAVAIR 01-1A-17, SAE AS 4059, GOST, ASTM D6786, HAL, and User defined bins

The advanced design makes it so much more than a particle counter: The LNF also calculates free water and differentiates contaminants (silica) from machine wear (metal).

ASTM D7596
ISO 4406

National Stock Number
6635015101712

OPTIONS INCLUDE:

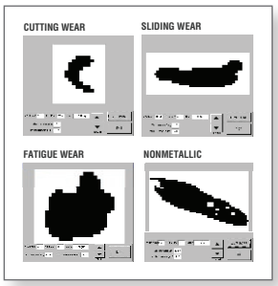
- Ferrous Monitor to measure ferrous content

  Ferrous wear measurement is a critical requirement for monitoring machine condition. The high sensitivity magnetometer measures and reports ferrous content in ppm/ml and ferrous particle count and size distribution for all individual ferrous particles >25 microns. The in-line design of the magnetometer with the LNF flow cell enables measurement of both ferrous content and total particle count on the same sample.

- Classification of wear particle shape

  Wear particle shape classification is the ideal screening tool for wear debris analysis, detecting particles associated with severe wear conditions and abrasive non-metallic contamination. It automatically classifies particles allowing operators to determine the type of wear debris, wear mode and potential source from internal machinery components

- Dynamic viscosity measurement
- AutoSampler for high throughput sample processing



Multiple configurations and options cover the needs of commercial laboratories and of industrial plants for contamination control and predictive maintenance.

LNF Q210	Particle counter
LNF Q220	Particle counter with wear shape classifier
LNF Q230	Particle counter, wear shape classifier, and magnetometer

National Stock Number
6650016153416

FluidScan® Q1000 & Q1100

The FluidScan® family of handheld spectrometers use a patented, direct infrared technology to provide quantitative measurement of a fluid's condition.

The FluidScan quickly detects contamination, degradation and cross-contamination in both synthetic and petroleum-based engine oils and hydraulic fluids. It detects TAN, TBN, oxidation, nitration, sulfation, additive depletion and lubricant. Unlike alternative approaches that can involve field calibration of optical components, Spectro Scientific's patented optical wedge is "hardwired" to the specific spectral bands with reproducibility and repeatability that complies to ASTM D 7889 standard.

BENEFITS

- Accurate, consistent lubricant condition property results correlated to laboratories
- Only one drop of oil needed, solvent free
- Low cost of ownership
- Verification of lubricant type for field investigation
- Simple to use, detects lubricant mix-up or failure

FEATURES

- Patented solid state wave guide technology
- No reagents or sample preparation
- Small sample size (0.03µL)
- Industry-specific fluid libraries and equipment-specific test packages
- 6-8 hours of battery life
- Lightweight, less than 1.4 kg (3 lbs)

National Stock Numbers
6650016153416
6630016222461

Combination Kit – FluidScan® Q1000 and SpectroVisc Q3000

Combining the technologies of two of Spectro Scientific's most popular portable products – the FluidScan® Q1000 and the SpectroVisc Q3000, the combination kit offers the following in a transportable case:

- Viscosity and lubricant properties for field monitoring
- Immediate feedback on critical properties
- Easy transport for shipboard, field service or aftermarket warranty programs
- Reduction in operational and maintenance costs
- Elimination of equipment failures due to lubricant mix-up or viscosity breakdown

Spectroil M Family – M/C-W, M/F-W, M/N-W

The Spectroil M family of rotating disc electrode atomic emission spectrometers is the proven, preferred choice for rugged, deployable elemental oil analysis. Specified and used by the US DoD, the RDE method quickly measures up to 32 elements in oil within 30 seconds. Small particulate wear, contamination and lubricant additives are detected. Fuel, coolant and washdown water applications are also performed.

All versions of the Spectroil M family share the same rugged shock and vibration resistant hardware platform, differing only in application and calibration. The Spectroil M/N-W is the only spectrometer approved to meet the complete technical and performance requirements of the JOAP CID-0191.

National Stock Numbers
6650014151767
6650015354271
6650015354276
6650015354273
6650015354274
6650015356287
6650016164344
6650015660884

ASTM D6595
ASTM D6728

BENEFITS

- Greater return on investment – buy only the capabilities you need now and add more later when you need them as field upgrades
- No sample preparation required
- Easy to use with minimal training; helps ensure fewer errors and higher productivity
- Small footprint for valuable space and flexibility
- Can test oils from all types of lubricated equipment
- Unattended, multi-sample automation option speeds sampling and reduces operator errors

FEATURES

- Models for analyzing oils, fluids, water and coolants
- Optional configurations detect fuel, sulfur, large particles with ARFS in oil, water, and coolants
- Options models for measuring wear metals or ash forming contaminant elements in oil, gas turbine and diesel engine fuel
- Optional robot controlled multi-sample changer (D2R2)

Standard Oil Calibration Program

Element	Symbol	Readout Range in PPM
Aluminum	Al	0-1,000
Barium	Ba	5-6,000
Boron	B	0-1,000
Cadmium	Cd	0-1,000
Calcium	Ca	0-6,000
Carbon	C	Reference
Chromium	Cr	0-1,000
Copper	Cu	0-1,000
Hydrogen	H	Reference
Iron	Fe	0-1,000
Lead	Pb	0-1,000
Magnesium	Mg	0-6,000
Manganese	Mn	0-1,000
Molybdenum	Mo	0-1,000
Nickel	Ni	0-1,000
Phosphorus	P	10-6,000
Potassium	K	0-1,000
Silicon	Si	0-1,000
Silver	Ag	0-1,000
Sodium	Na	0-6,000
Tin	Sn	0-1,000
Titanium	Ti	0-1,000
Vanadium	V	0-1,000
Zinc	Zn	0-6,000
Lithium	Li	0-1,000
Antimony	Sb	0-1,000

ASTM D6595
ASTM D6728

Spectroil Q100

The Spectroil Q100 is an atomic emission spectrometer that analyzes wear metals, additives and contaminants in machinery fluids (oil, fuel, cooling/washdown water). Results are obtained in less than 30 seconds with minimal operator training and no sample preparation.

The quality and stability of the Q100's solid state optics provides reliable trending data to determine the actions required to protect the health of your critical equipment.

BENEFITS

- Increased productivity with rapid testing and reliable trend data
- Reduced waste
- Cost effective solution for fixed laboratory sites

FEATURES

- Small footprint
- Smallest rotating disc spectrometer with solid state CCD optics
- No gases, coolants, special chemicals or solvents are needed

Extended Oil Calibration Program

Element	Symbol	Readout Range in PPM
Bismuth	Bi	0-100
Arsenic	As	0-100
Indium	In	0-100
Cobalt	Co	0-100
Zirconium	Zr	0-100
Tungsten	W	0-100
Cerium	Ce	0-100

SpectroVisc Q3000 Series

The Q3000 kinematic viscometer is an easy-to-use, reliable instrument designed for remote field use when immediate lubricant kinematic viscosity measurement is required.

With no solvents, density checks or thermometer needed, the 1.8 kg (4 lbs) SpectroVisc Q3000 is ready for use whenever and wherever needed. Each sample is measured at a constant temperature for consistent accuracy without pre-test measurements. The Q3050 provides extended viscosity range and calculated viscosity at 100˚C for industrial applications.

BENEFITS

- Fast, simple operation with no pre-checks
- Solvent free and small sample size (60µL)
- Lower cost
- Less environmental impact
- Easy cleanup
- Consistent accurate readings with fast and reliable results
- Portable

FEATURES

- Patent-pending split cell design
- Ability to correct user induced errors
- Lightweight and battery powered
- Multi-language support
- Temperature controlled at 40°C ±0.1°
- 10-350 cSt (Q3000, 40°C)
- 1-700 cSt (Q3050, 40°C)

ASTM D7279
ISO 3104

National Stock Number
665001580707

SpectroVisc Q300 and Q310

The Q300 and Q310 bench-top kinematic viscometers analyze fuels and used and new lubricants and provide ASTM accuracy and repeatability.

The SpectroVisc Q300 and Q310 are ideal for laboratories that need to test a wide range of lubricant viscosities. The Q300 and Q310 offer compact footprints and low sample volumes and solvent usage for benchtop viscometers. Optionally, an external computer can control the system for applications requiring more extensive data handling. The Q310 Dual Bath Viscometer can conduct two independent measurements simultaneously.

BENEFITS

- High sample throughput of used oils with less handling
- Low operating costs and environmental impact
- Easy, fast cleaning

FEATURES

- Up to 60 samples per hour at ASTM precision levels
- Small sample volume (0.3-6 ml)
- Low solvent consumption (2.5 ml) per sample
- Fast, easy tube replacement – No need to drain bath between tests when sooty or highly contaminated oils are tested
- Easy maintenance

SpectroT2FM Q500

The Q500 is a complete ferrography analysis package for the interpretation of wear and contaminant particles in used lubricant oils, hydraulic fluids, coolants and fuels per ASTM D7690 and D7684.

The Spectro Scientific T2FM Q500 consists of the T2FM Ferrogram maker, a bichromatic microscope, a video camera and image capture software. Comparison of ferrograms allows determination of evolving wear modes inside a machine or engine.

BENEFITS

- Classification of wear and contaminant particles per ASTM and Wear Particle Atlas
- Low maintenance (no need for software or manual adjustment)
- Fast preparation of ferrogram
- No particle deformation

FEATURES

- A complete all-in-one ferrography lab
- Immediate separation of particles from fluid samples
- Particle separation up to 800µm in size
- Thistle tube deposition technique

ASTM D7690
ASTM D7684

Fuel Dilution Meter Q6000

Portable, Battery Powered

The Q6000 is a portable fuel dilution meter ("fuel sniffer") that can be used in the laboratory or the field to provide rapid and accurate measurements of fuel contamination in engine oil.

Excessive fuel in the lubricant causes wear and loss of performance. Developed in collaboration with the U.S. Navy, the Spectro Q6000 is widely used for rapid detection of fuel contamination in railway, marine, mining and other industries.

BENEFITS

- Minimizes the worry and errors that come with learning different methods and equipment
- Lets you maintain equipment at peak performance with less downtime
- Fast analysis
- Simple-to-use
- Results correlate to expensive GC methods

FEATURES

- Innovative headspace sampling system
- Memory for up to 3 fuel in oil calibrations for quick start up
- Touchscreen interface

National Stock Number
6630015100495

Product Selection Guide

This table is intended to help guide your specific product selection. As always, Spectro Scientific sales and support teams are available to help address any questions based on application needs.

MACHINE CONDITION – WEAR DEBRIS

	New Oil	In-use/Used Oil	Hydraulic Fluid	Coolants	Grease	QC Fuel
Elemental Concentration and Identification (Wear Metal Classification)		Q5800 Spectroil M/ Q100	Q5800 Spectroil M/ Q100	Spectroil M/ Q100	Spectroil M/ Q100	Spectroil M/ Q100
Large Particle Spectroscopy ***RFS option*		Spectroil M**	Spectroil M** Q5800	Spectroil M** Q5800	Spectroil M** Q5800	
Wear Debris Analysis Shape Classification		Q5800 5200 (WDA) Q500 Q200			Q500 Q200 (Diluted)	

LIQUID CONTAMINATION AND SOLID PARTICLES

	New Oil	In-use/Used Oil	Hydraulic Fluid	Coolants	Grease	QC Fuel
Particle Count and ISO Cleanliness **single channel*	5200 Q200	Q5800* 5200 Q200	Q5800* 5200 Q200	5200 Q200		
Glycol (Coolant Content)		Q5800 Spectroil M/ Q100 Q1000/Q1100	Q5800 Spectroil M/ Q100 Q1000/Q1100			
Cross Contamination or Lubricant Mix-up	Q5800 Q1000/Q1100	Q5800 Q1000/Q1100	Q5800 Q1000/Q1100			
Fuel Contamination		Q600	Q600			
Water Contamination	Q5800 5200 Q1000/Q1100	Q5800 5200 Q1000/Q1100	Q5800 5200 Q1000/Q1100			
Soot		Q5800 Q1000/Q1100 Q200				

LUBRICANT CONDITION

	New Oil	In-use/Used Oil	Hydraulic Fluid	Coolants	Grease	QC Fuel
Nitration/Oxidation/Sulfation (Lubricant Breakdown)		Q5800 Q1000/Q1100	Q5800 Q1000/Q1100			
Additive Levels or Depletion	Q5800 Spectroil M/ Q100 Q1000/Q1100	Q5800 Spectroil M/ Q100 Q1000/Q1100	Q5800 Spectroil M/ Q100 Q1000/Q1100	Spectroil M/ Q100	Spectroil M/ Q100	
TBN/TAN	Q5800 Q1000/Q1100	Q5800 Q1000/Q1100	Q5800 Q1000/Q1100			
Viscosity *[2]Dynamic viscosity at 40°C (Q200) or room temperature (5200)*	Q5800 5200[2] Q3000/Q3050 Q300/Q310 Q200[2]	Q5800 5200[2] Q3000/Q3050 Q300/Q310 Q200[2]	Q5800 5200[2] Q3000/Q3050 Q300/Q310 Q200[2]			Q5800 5200[2] Q3000/Q3050 Q300/Q310 Q200[2]

Consumables (C) and Accessories (A)

SPECTROIL Q100 AND MC/MF/MN SERIES (PAGE 9)

M97008	Graphite Disc Electrodes D-2 AGKSP (500 per box)	C
M97009	Graphite Rod Electrodes .242 x 6" SGKDP (50 per box)	C
P-10524	Sample Holder High Temperature (1000/pkg)	C
CS-24-100-200G	Calibration Standard, 24 Element, 100 ppm, 200 g	C
SMA -900-200G	Calibration Standard, Additive Elements, 900 ppm, 200g	C
CS-75-500	Standard Oil, 75 Base, 500g	C
M90202	Sample Holder Re-usable White	C
M90204	Sample Holder Cover Re-usable for Low Flash Point Samples	C
M99913	Kimwipes EX-L 4.5 x 8.5" 1-Ply 280/Box	C
M99914	Pipettes Transfer 8ml 400/Box	C
M97102	Electron Solvent 1Qt (22oz) Case/12	C
M99915	Window Cleaner 1 oz Bottle	C
M97101A	Ultrasonic Cleaner with Basket B200, 117V, 50/60 Hz	A
M90110	Electrode Sharpener	A

SPECTROIL ROBOTIC SYSTEM (PAGE 9)

MR9019	Electrode Set Box/500 angled & box/500 D2S for D2R2	C
MR9000	Electrode Angled Disc Box/500	C
MR9014	Electrode Disc 2S Box/500	C
P-10524	Sample Holder High Temperature (1000/pkg)	C
CS-75-500	Standard Oil 75 Base CS-75 500 mL	C
SMA-900-200G	Standard Oil SMA-900-200G	C
CS-24-100-200G	Calibration Standard CS24 100 ppm 200G	C
M99913	Kimwipes EX-L 4.5 x 8.5" 1-Ply 280/Box	C
M99914	Pipettes Transfer 8ml 400/Box	C
M99915	Window Cleaner 1 oz Bottle	C

ARFS (PAGE 9)

RFS-375	Graphite Electrode 500/Box ID=.375 OD=.492 W=.20	C

Q200 (PAGE 7)

LNF-509	LNF Particle Counter Check Fluid	C
M97101A	Ultrasonic Cleaner B200 117V 50/60Hz	A
M97103	Ultrasonic Cleaner B200 220V 50/60Hz	A
P-10193	Electron solvent (1 Gallon)	C
ASP	Automatic Sample Processor	A
LNF-902	LNF-Q200 Skydrol Kit (includes LNF-543, 3' of tubing and o-rings)	A

COMBINATION KIT – Q3000 AND Q1000 OR Q1100 (PAGE 8)

FL360	Full Library License	A
FL310	IR Check Fluid 5 ml (Q1000)	C
PV1025/PV1026	Viscosity Standard Fluid (Q3000)	C
PV1011	Disposable Non-Abrasive Cleaning Pads; package of 500	C
P-11052	60 µL Disposable Pipettes, package of 500	C
PV1012	60 µL Disposable Pipettes & Non-Abrasive Cleaning Pad kit; pkg. of 100	C
P-11032	Barcode scanner (Q1000)	A
M90011	FluidScan Printer, includes USB Cable M90316 (Q1000)	A
P-10744	Thermo Paper for FluidScan Printer (36 rolls/box) (Q1000)	A
AA75101	OilView® LIMS Software (Q1100)	A

SPECTROVISC Q300, Q310 (PAGE 10)

SVS123	Micro-pipettor, 100-10000 µL	A
SVS124	Pipette tips, 50-1000 µL	C
SVS111	ASTM Certified Thermometer, 39-41°C/0.05°C	A
SVS112	ASTM Certified Thermometer, 99-101°C/0.05°C	A
SVS110	Viscometer Mineral Bath Oil 20 Liters Thermostatic	C
P-10680	Compressor 230/240V, 50/60Hz	A

Q5800 (PAGE 6)

34682120	Backpack	A
FL 310	IR Check Flui	C
34683142	FPQ Filtergrams (25 pack)	C
34682166	Q5800 Verification Standard (6 bottles)	C
34683143	FPQ Waste Container (3 pack	C
PV1012	60 µL Disposable Pipettes & Non-Abrasive Cleaning Pad kit; pkg. of 100	C
P-11160	3 ml Luer Syringe (100 pk)	C
34682210	Felt Wick, 3 pair	C
34683101	Q5800 Startup Consumable Kit, 100 samples	C
34683014	Q5800 Consumable Kit, 500 samples	C

5200 (PAGE 7)

A5051SF	Solvent Filtration and Dispenser	A
MHM-10698-BX	Bottle, 4 oz. Plastic w/lid, Box of 48	C
MHM-10605	Syringe, 10ml Plastic Non-hypo, Qty. 100, Test 1	C
MHM-10610	Syringe, 30ml Plastic Non-hypo, Qty. 50, Test 3	C
MHM-92631	Filter patch 5um, PVDF, 25MM DIA, Qty. 100	C
MHM-10603	Cotton Tip Applicator 15/64 O Head	C
A510050	52DV Calibration Fluids, 8 Pack	C
A510051	5200 Calibration Fluids, A & B	C

T2FM (PAGE 11)

F4010	Glass Substrates, 50/pkg	C
F4023	Sample Vials, 250/box	C
F4012	Pipette Tips, 250/pkg	C
F4013	Pipettor	A
F4015	Storage Box for Ferrograms	A
F2180	Thistle Tube	C

C = Consumable A = Accessory

Customer Services

Spectro Scientific's Customer Service Team and its partners around the world are working hard to achieve the highest levels of customer satisfaction. Our support and service offerings for out of warranty products are:

Telephone and email support – Included in any annual maintenance contract as Level 1 Eastern Standard Time (EST) business hours telephone and email support to help customers perform basic troubleshooting. Special priority and extended-hour telephone and email support upgrades are available.

Training – Spectro Scientific offers standard training programs covering basic and advanced instrument operation and basic daily maintenance. These programs are conducted by a dedicated Spectro Scientific training resource; the length of the training varies by product.

Preventative maintenance (PM) – A good preventative maintenance program will significantly increase the uptime of a spectrometer and reduce the repair cost. We recommend users periodically perform preventative maintenance on our products. Customers can choose preventive maintenance intervals that suit their specific maintenance needs. A basic preventive maintenance inspection for the Spectroil product line is typically performed within eight hours and consists of instrument inspection, cleaning, profiling, standardization, worn component replacement and analytical performance validation.

Field repair – Spectro Scientific certified Customer Service Engineers are deployed to the customer site to perform repair work as agreed upon at time of quotation.

In-house repair, upgrade and annual PM – Customers may elect to return certain products, at their expense, for in-house service and repair at Spectro Scientific's headquarters. Some older product lines can be returned for upgrade with updated controllers and other electronics after approval from Spectro Scientific Some products can also be sent to the factory for annual PM and performance verification. During the repair, upgrade and PM periods, customers have the option of paying for a loaner instrument throughout the repair process.

Additional service offerings – Based on the service contract the following options can be considered:

- **Parts –** Parts used in preventative maintenance and emergency repairs are generally included in the service agreement price. (There are some exceptions depending on the instrument.) Certain discount pricing may apply based on the type of contract.
- **Emergency Repair Response Time –** Guaranteed response times are agreed upon between the customer and Spectro Scientific and are unique to each instrument contract.
- **Escalation –** Emergency repair escalation includes two levels of response:
    1. Troubleshooting and remote repair
    2. Deployment of a Spectro Scientific certified field service technician

About Spectro Scientific

Spectro Scientific is enabling the fast-growing field of predictive equipment maintenance with the most innovative oil analysis tools for lab and field applications. Reliability and maintenance engineers worldwide rely on Spectro Scientific's instruments to monitor in-use oil to keep vital equipment finely tuned and running at peak performance and efficiency.

The benefits include reduced costs, improved safety, maximum equipment effectiveness and uptime along with greener operations. Spectro Scientific tools are at work in the military, power, mining, marine and many other critical industries.

With more installed units and more experience than any other company in the business, Spectro Scientific is the choice of laboratories and predictive maintenance programs around the globe.

To learn more about Spectro Scientific products please call 978.431.1120 or visit us online at www.spectrosci.com.

Spectro Scientific
Confidence in knowing

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