

## MiniLab EL Series for High Performance Engine Development and Maintenance



Optimize  
performance  
output

Detect  
problems  
early

Ensure  
safety in  
operation



# Engine Oil Analysis:

## A Reliable Technique for Engine Condition Monitoring

Engine oil analysis is a reliable and mature non-destructive testing (NDT) technique used to monitor the condition of the engine in development, on the production line and for in-service maintenance. High performance reciprocating engines and jet turbines are complicated mechanical systems with many high-speed moving parts. Comprehensive engine oil analysis provides a complete picture of engine wear and other mechanical failures in addition to lubricant condition and contamination, in almost real time with a small amount of oil. This information advances engine design and development, ensures quality in production and reduces maintenance and repair costs.



### ENGINE WEAR

- > Elemental wear analysis
- > Total ferrous measurement



### CONTAMINATION

- > Fuel dilution
- > Coolant leak
- > Water
- > Soot
- > Sand and dirt



### OIL CONDITION

- > Viscosity
- > Total Base Number (TBN)
- > Oxidation, Sulfation, Nitration
- > Antiwear additive depletion
- > Total Acid Number (TAN – natural gas engines only)



## The need for real time engine oil analysis for high performance engines

Achieving and maintaining optimal performance from high performance engines in airplanes, racing cars or locomotives requires much care in engineering, production, and maintenance due to size, high speed or high power output. They also need great sensitivity in oil analysis as only a few parts per million (ppm) of trace metals in the oil can indicate abnormal wear of a critical part. Near real time, lab quality engine oil analysis can significantly improve the productivity of research and development, production quality, and performance and reliability of these engines.

## MiniLab EL Series: A new non-destructive tool for use throughout an engine's lifecycle

The new MiniLab EL Series oil analyzer is an ideal non-destructive testing (NDT) tool for engineers in research and development, production QC or in-service maintenance. The MiniLab EL system allows organizations to gain deep insights into engine and lubricant condition when and where it is needed.

### HIGH PERFORMANCE

- Comprehensive (up to 36 parameters)
- Full ASTM compliance
- Wear, contamination, oil condition

### CONVENIENT

- Fast (less than 5 minutes)
- No sample preparation
- No special facility requirements

### ENVIRONMENTALLY FRIENDLY

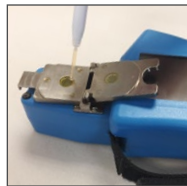
- Low waste (total 4ml of oil used)
- No solvent
- No hazardous chemicals

### EXPANDABLE

- Extended metals (up to 31 elements)
- Coolant analysis
- Fuel analysis

# MiniLab EL Series

5 simple tests to comprehensive engine oil analysis



## Oil Chemistry

ASTM D7889

60 microliters of oil with no sample preparation

1 minute test time

No solvent or chemicals



## Viscosity

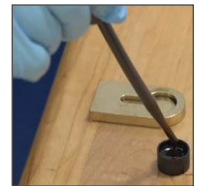
ASTM D8092

60 microliters of oil with no sample preparation

2 sec- 6 min, viscosity dependent

Temperature controlled at 40C

No solvent or chemicals



## Elements

ASTM D6595

2 ml of oil with no sample preparation

30 seconds test time

No solvent or chemicals

24 elements by default

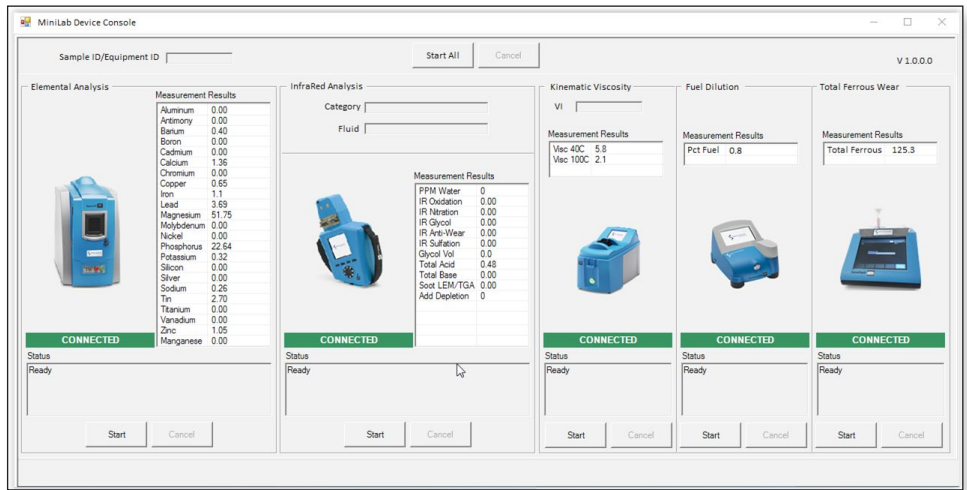


# MiniLab Software Suite

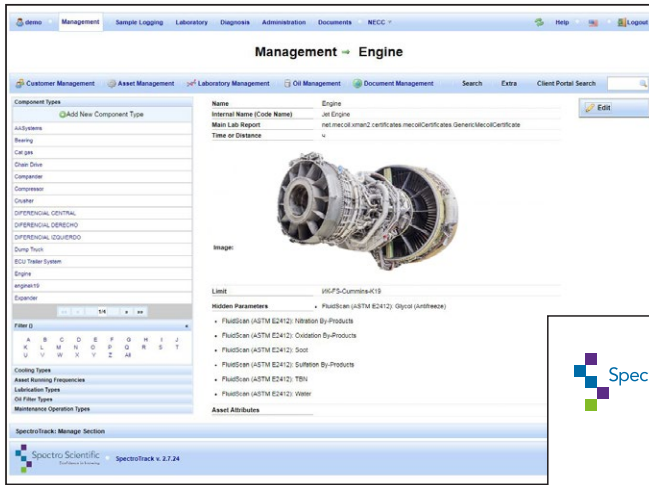
The MiniLab Software Suite is powerful yet easy to use and includes two components: the MiniLab Device Console (MDC) and the MiniLab LIMS.

The MiniLab Device Console is installed on a local PC and controls:

- Sample or asset ID entry
- Instrument operation
- Data acquisition
- Automatic data transfer to LIMS system



MiniLab device console



The MiniLab LIMS is a browser-based tool; it can be installed on local PCs, local networks, or hosted in the cloud server.

MiniLab LIMS includes:

- Asset management
- Alarm limits and alarm management
- Customizable reports, including multi-parameter trend graphs
- Enhanced notification and email options
- Option to support multiple MiniLab EL Series analyzers in different locations across an enterprise

**Spectro Scientific**  
Confidence in knowing

Location: P42 LE Clara  
Unit ID: S1db Main Engine E1061073  
Model: 671F47  
Machine Type: Engine, Diesel, Liquid-Cooled

Warning: Viscosity at 40 is not consistent with the stated grade.  
Edward O'Dwyer, 20 Jun 2017

Oil: Maxol HD Marine 1240	Sample ID	671F23 R6202	671F47 R6203	6669BE P5588	669410 R5789	656984 R4703
Sampled on		08 Jun 2017	01 Jun 2017	05 May 2017	18 May 2017	07 Apr 2017
Received on		15 Jun 2017	15 Jun 2017	30 May 2017	31 May 2017	05 May 2017
Km Total		30098	30570	30336	30500	30456
Km Oil		556	568	554	538	484
Top up (L)		700.0	600.0	600.0	500.0	50.0
Warning Limit		▲	▲	⊘	▲	⊘
Iron	µm	8	12	12	14	18
Chromium	µm	<1	<1	<1	<1	<1
Nickel	µm	<1	<1	<1	<1	<1
Molybdenum	µm	<1	1	<1	<1	<1
ASTM D685-00 WEAR METALS						
Lead	µm	<1	<1	<1	<1	<1
Copper	µm	<1	<1	<1	<1	<1
Tin	µm	<1	<1	<1	<1	<1
Silver	µm	<1	<1	<1	<1	<1
Titanium	µm	<1	<1	<1	<1	<1
ASTM D685-00 CONTAMINANT S						
Silicon	µm	10	5	6	6	8
Sodium	µm	20	2	4	2	2
Vanadium	µm	<1	<1	<1	<1	<1
Calcium	µm	2878	2898	3391	3303	3753
Magnesium	µm	9	10	10	10	10
ASTM D685-00 ADDITIVES						
Phosphorus	µm	354	489	444	408	319
Zinc	µm	426	417	468	479	410
Barium	µm	<1	<1	<1	<1	<1
Boron	µm	<1	<1	<1	<1	<1
ASTM D445	Viscosity at 40°C	cSt 100-168	122	126	120	117
	Viscosity at 100°C	cSt 10.0-16.0	13.9	14.5	13.1	14.2
	TBN	mg KOH/g	13.00	13.10	12.71	14.10
	Water	µm	79.0	12.0	<10.0	90.0
ASTM E212	Oxidation By-Products	absw/m2	5.3	4.5	5.3	6.1
	Glycol (antifreeze)	%	2.6	1.2	0.1	2.2
	Soot	%wt	2.0	2.6	2.1	2.4
	Fuel Dilution	% p.p.	1.8	1.2	2.0	0.0

Date: 29 Aug 2017

# MiniLab 143EL or 123EL

Two MiniLab EL Series models are available:

**MiniLab 143EL** – Elements, Oil Chemistry, Viscosity, Fuel Dilution, Total Ferrous

**MiniLab 123EL** – Elements, Oil Chemistry, Viscosity



	PARAMETER	Elements ASTM D6595	Oil Chemistry ASTM D7889	Viscosity ASTM D8092	Fuel Dilution ASTM D8004	Total Ferrous ASTM D8120
<b>Contamination</b> 	Boron, Sodium, and Potassium	✓				
	Water		✓			
	Soot		✓			
	Glycol		✓			
	Fuel dilution				✓	
<b>Chemistry</b> 	Total Base Number (TBN)		✓			
	Oxidation, Nitration, and Sulfation		✓			
	Additive depletion (ZDDP)		✓			
	Total Acid Number (TAN) for NatGas engines and lube oils		✓			
	Magnesium, Calcium, Barium, Zinc, Molybdenum, and Phosphorus	✓				
	Viscosity			✓		
<b>Wear</b> 	Total Ferrous					✓
	Copper, Silver, Chromium, Titanium, Aluminum, Nickel, Iron, Manganese, Lead, Tin, Cadmium, and Vanadium	✓				

## Optional Accessories

Two other instruments complement the MiniLab EL Series:

The **SootMeter** extends MiniLab EL soot in engine oil measurement up to 15% by measuring infrared absorption at a fixed wavelength.

- ASTM Method D7686
- 1 ml sample volume with no sample preparation
- 30 seconds test time
- No solvent needed for cleaning
- Battery powered
- Measurement range: 0-15% soot



The **CoolCheck 2** provides measurement and profiling of coolant condition with a near IR (NIR) and UV/Visible dual spectrometer design that measures 8 different properties in less than 45 seconds.

- 15 ml sample volume with no sample preparation
- 45 second test time
- No solvents needed for cleaning
- Parameters reported are:
  - Type of coolant
  - Clarity
  - Contamination
  - Freeze point
  - Glycol content
  - Boiling point
  - Nitrites



## MiniLab EL Series Product Information

PART NUMBER	
800-00084	MiniLab 123EL with SpectroTrack LIMS, 115VAC, 60Hz
800-00085	MiniLab 123EL with SpectroTrack LIMS, 230VAC, 50Hz
800-00086	MiniLab 123EL with SpectroTrack LIMS, 115VAC, 50Hz
800-00087	MiniLab 123EL with SpectroTrack LIMS, 230VAC, 60Hz
800-00089	MiniLab 143EL with SpectroTrack LIMS, 115VAC, 60Hz
800-00090	MiniLab 143EL with SpectroTrack LIMS, 230VAC, 50Hz
800-00091	MiniLab 143EL with SpectroTrack LIMS, 115VAC, 50Hz
800-00092	MiniLab 143EL with SpectroTrack LIMS, 230VAC, 60Hz

ACCESSORIES AND CONSUMABLES	
800-00088	MiniLab 123EL standard accessories
600-00034	MiniLab 123EL consumables kit for 500 samples
800-00093	MiniLab 143EL standard accessories
600-00035	MiniLab 143EL consumables kit for 500 samples
600-00126	MiniLab 123EL validation standards kit
600-00127	MiniLab 143EL validation standards kit
M99903	Coolant analysis capability program for SpectroOil 120C (factory install)
450-00030	MiniLab tray assembly for FluidScan and MiniVisc
42000-00	Coolcheck 2, 115/220VAC, 50
29701-00	Coolcheck 2 standard accessories
405-2048	InfraCal 2 Soot Meter

PRODUCT INFORMATION	
Applications	Mineral and synthetic lubricants including gear, engine, hydraulic, turbine and distillate fuels
Methodology	ASTM D6595, D8120, D8092, D7889, D8004
Calibration	Factory calibrated, field calibration not required. Validation and standardization fluids supplied.

OPERATIONAL SPECIFICATIONS	
Environmental requirements:	5-40°C ambient temperature, 10-80% RH non-condensing
Sample volume	< 5 ml
Solvents:	None required

USER INTERFACE SPECIFICATIONS	
Software/operating system	Personal computer with Windows 7 Pro or Win 10, 32 or 64 bit, US English version. Quad core microprocessor speed 2.6 GHz or higher and 8 GB RAM minimum.

POWER REQUIREMENTS	
Power	1 phase power, 1200W maximum (123EL and 143EL)

MECHANICAL SPECIFICATIONS	
Dimensions (H x W x D)	MiniLab 123EL: 71 cm x 183 cm x 66 cm (28" x 72" x 26") MiniLab 143EL: 71 cm x 214 cm x 66 cm (28" x 84" x 26")
Weight	MiniLab 123EL: 76 kg (167 lbs) MiniLab 143EL: 82 kg (180 lbs)

COMPLIANCE	
CE Mark-EMC directive, RoHS.	

ANALYTICAL RANGE		
Output	Analytical Range	Repeatability
Elemental concentration of 24 elements, ppm	Range and repeatability varies with element	
Total ferrous, ppm	0-10,000 ppm	≤ 3% RSD
Fuel dilution	0.2-15%	≤ 5% RSD + 0.2% fuel dilution
40°C Kinematic viscosity, cSt	1-320 cSt at 40°C	≤ 3% RSD
100°C kinematic viscosity calculated from V40C and Viscosity Index	320-700 cSt at 40°C	≤ 5% RSD
Total Acid Number (TAN), mg KOH/g	0-6 mg KOH/g	≤ 3% RSD
Total Base Number (TBN), mg KOH/g	0-70 mg KOH/g	≤ 3% RSD
Oxidation, abs/0.1 mm	5-32	≤ 3% RSD
Nitration, abs/cm	0.5-18	≤ 3% RSD
Sulfation, abs/0.1 mm	16-39	≤ 3% RSD
Soot	0-2%	≤ 3% RSD
Glycol	0.2-10%	≤ 3% RSD
Additive depletion (ZDDP)	0-100%	≤ 3% RSD
Water, dissolved ppm	100 ppm-saturation*	≤ 3% RSD

\*Oil specific. RSD = Relative Standard Deviation.



Validation standards for MiniLab 143EL



Consumables for MiniLab 143EL

To learn more about Spectro Scientific products please call 978-431-1120 or visit us online at [www.spectrosci.com](http://www.spectrosci.com).