

# GENERAL TEST EQUIPMENT

Test Methods	Page	Test Methods	Page
<b>Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents</b> ASTM D611; IP 2; ISO 2977; DIN 51775; FTM 791-3601 .....	42-43	<b>Acidity (Inorganic) of Petroleum Products by Color Indicator Titration Method</b> IP 182 .....	60
<b>Saybolt Color of Petroleum Products</b> ASTM D156; DIN 51411; FTM 791-101 .....	44, 46-47	<b>Salt Content of Crude Petroleum and Products</b> IP 77 .....	60
<b>ASTM Color of Petroleum Products</b> ASTM D1500, D6074; IP 196; ISO 2049; FTM 791-102 .....	45-47	<b>Conradson Carbon Residue of Petroleum Products</b> ASTM D189, D6074; ANS Z-11.25; IP13; ISO 6615; DIN 51551; FTM 791-5001 .....	60
<b>Visual Examination of Used Electrical Insulating Oils of Petroleum Origin in the Field</b> ASTM D1524 .....	45	<b>Sediment in Crude Oils and Fuel Oils by Extraction Method</b> D473; IP 53; ISO 3735; DIN 51789; FTM 791-3002 .....	61
<b>Automated Colorimeter</b> ASTM D156, D1209, D1500, D1544, D5386, D6045; ISO 4630, 6271; DIN 5033, 6162, 6174, EN 1557; AOCs Cc 13e; Ph EUR .....	47	<b>Salts in Crude Oil (Electronic Method)</b> ASTM D3230 .....	61
<b>Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method</b> ASTM D287, D1298, D6074, D6159, E100; API MPMS Chapters 9.1; IP 60; ISO 3675; DIN 51757 .....	48-50	<b>Precipitation Number of Lubricating Oils (Centrifuge Method)</b> ASTM D91, D96, D893, D1796, D2273, D2709, D2711, D4007; IP 75, 145, 359; API 2542, 2548; ISO 3734; DIN 51793 .....	62
<b>Water in Crude Oils by Coulometric Karl Fischer Titration</b> ASTM D4928; IP 386; API Chapter 10.9 .....	51	<b>Precipitation Number of Lubricating Oils (Centrifuge Method)</b> ASTM D96 .....	63
<b>Water Content by Volumetric Karl Fischer Titration</b> .....	51	<b>Calibration of Liquid-in-Glass Thermometers</b> NBS Monograph 150 .....	63
<b>Distillation of Petroleum Products at Reduced Pressures</b> ASTM D1160; ISO 6616 .....	52-54	<b>Un sulfonated Residue of Petroleum Plant Spray Oils</b> ASTM D483; DIN 51362 .....	64
<b>Distillation of Petroleum Products</b> ASTM D86, D216, D233, D447, D850, D1078, E133; IP 123, 195; ISO 3405; DIN 51751; FTM 791-1001, 791-1015 .....	56	<b>Rust Protection by Metal Preservatives in the Humidity Cabinet</b> ASTM D1748, FTM 791-5310 .....	65
<b>Automatic Distillation System</b> ASTM D86, D285, D850, D1078; ISO 3405; DIN 51751; IP 123 .....	57	<b>Sampling of Petroleum and Petroleum Products</b> ASTM D4057, D1265, D6074; GPA 2140 .....	66-67
<b>Sulfur in Liquefied Petroleum Gases (Oxy-Hydrogen Burner)</b> ASTM D2384, D2747, D2784, D2785-80; GPA 2140; IP 243; ISO 4260; DIN EN41 .....	58	<b>Sampling Liquefied Petroleum (LP) Gases</b> ASTM D1265 and GPA 2140 .....	66-67
<b>Traces of Volatile Chlorides in Butane-Butene Mixtures</b> ASTM D2384 .....	58	<b>Freezing Point of Aqueous Engine Coolant Solution</b> ASTM D1177 .....	68
<b>Trace Quantities of Total Sulfur (Wickbold Apparatus)</b> ASTM D2785 .....	58	<b>Color of Maleic and Phthalic Anhydrides</b> ASTM D3366 .....	68
<b>Sulfur in Petroleum Products (Wickbold Apparatus)</b> IP 243 .....	58	<b>Automatic Melting Point Range Apparatus</b> BP Appendix 5-Method 6; GLP .....	69
<b>Ramsbottom Carbon Residue of Petroleum Products</b> ASTM D524, D6074; IP 14; ISO 4262; FTM 791-5002 .....	59	<b>General Purpose Water Baths</b> .....	70-71
<b>Lead in Gasoline by Volumetric Chromate Method</b> ASTM D2547; IP 77, 182, 248; ISO 2083 .....	60	<b>Water in Petroleum Products and Bituminous Materials by Distillation</b> ASTM D95, E123, D244, D370; AASHTO T55, T59; API MPMS CH. 10.5; IP 74, 291; FTM 791-3001; ISO 3733 .....	72
		<b>General Purpose Utility Heater</b> .....	72
		<b>Refractive Index and Refractive Dispersion of Hydrocarbon Liquids</b> ASTM D1218, D1747 .....	73
		<b>Remaining Useful Life Evaluation Routine (RULER®) for the Condition Monitoring of Lubricants</b> .....	74-75
		<b>Portable Field Test Kits for the Condition Monitoring of Lubricants and Fuel Oils</b> .....	76-77



# Aniline Point and Mixed Aniline Point of Petroleum Products



K10200 Automatic Aniline Point Apparatus

## Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents

### Test Method

Aniline point is used to characterize pure hydrocarbons and to indicate the aromatic content of hydrocarbon mixtures. Equal volumes of aniline and sample or sample plus *n*-heptane are stirred together while being heated at a controlled rate. After the two phases become miscible, the mixture is cooled at a controlled rate and the temperature at which the two phases separate is the aniline point or mixed aniline point of the sample.

### Automatic Aniline Point Apparatus with New Automated Sampling System

- Conforms to ASTM D611 and related specifications
- For samples ranging from clear to very dark
- Temperature range 0°C to 150°C (32°F to 302°F)
- Digital temperature display

Performs aniline point and mixed aniline point determinations automatically by means of a modified thin film technique (ASTM D611 Method E). The sample-aniline mixture is directly heated by a platinum immersion heater and the aniline point is detected photoelectrically. Temperature is displayed on a large LED indicator. Built-in pressure regulator and solenoid valve permit the use of cooling air for quicker cooling cycles or to determine subambient aniline point temperatures. Aniline points as low as 0°C (32°F) can be determined with the use of refrigerated cooling air. Equipped with variable controls for heater, light source and stirrer speed. Cabinet exterior surfaces have a chemical resistant polyurethane enamel finish.

**Automated Sampling System** – Provides hands-free operation for aniline point determinations, preventing operator contact with the aniline, *n*-heptane, and test samples. Automatically adds exact volumes of the test components to the mixing chamber, followed by transfer of the test mixture to a waste container and rinsing of the mixing chamber with solvent at the completion of the test. *Retrofit automated sampling system is available for existing aniline point systems. Please contact your Koehler representative for additional information.*

### Specifications

Conforms to the specifications of:  
 ASTM D611; IP 2; ISO 2977; DIN 51775; FTM 791-3601; NF M 07-021  
 Testing Range: 0 to 150°C (32 to 302°F)  
 Temperature Display: 0-999.9°C  
 Electrical Requirements:  
 115V 50/60Hz, Single Phase, 0.4A  
 220-240V 50/60Hz, Single Phase, 0.2A

### Included Accessories

Standard Pyrex™ Test Cell with drain

### Dimensions l x w x h, in. (cm)

14½ x 8½ x 20¾ (37 x 22 x 53)  
 Net Weight: 32½ lbs (14.7kg)

### Shipping Information

Shipping Weight: 46 lbs (21kg)  
 Dimensions: 8.2 Cu. ft.

*For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.*

### Ordering Information

Catalog No.		Order Qty
<b>Automatic Aniline Point Apparatus</b>		
K10200	Automatic Aniline Point Apparatus, 115V 50/60Hz	1
K10290	Automatic Aniline Point Apparatus, 220-240V 50/60Hz	
<b>Automatic Sampling System</b>		
K10280	Automatic Sampling System, 115V/220-240V 50/60Hz <i>Factory installed on K10200 and K10290 Automatic Aniline Point Apparatus or shipped separately as a retrofit for existing units.</i>	1
<b>Accessories</b>		
250-000-33F	ASTM 33F Thermometer Range: -36.5 to +107.5°F	1
250-000-33C	ASTM 33C Thermometer Range: -38 to +42°C	
250-000-34F	ASTM 34F Thermometer Range: 77 to 221°F	1
250-000-34C	ASTM 34C Thermometer Range: 25 to 105°C	
250-000-35F	ASTM 35F Thermometer Range: 194 to 338°F	1
250-000-35C	ASTM 35C Thermometer Range: 90 to 170°C	
K10210	Pyrex™ Test Cell with drain	
K10220	Heating-Cooling Tube with platinum element	

# Aniline Point and Mixed Aniline Point of Petroleum Products

## Thin Film Aniline Point Apparatus

- Conforms to ASTM D611 and related specifications

For aniline point and mixed aniline point determinations according to Method B. Stirs aniline-sample mixture in a borosilicate glass thin film tube suspended in a heating bath. Thin film of mixture flows over a light well illuminated by a variable 6V lamp. Adjust heating rate per specifications using accessory Powertrol Heater. When lamp filament brightens inside well, allow mixture to cool until the two phases separate as indicated by obscuring of the lamp filament. Consists of thin film tube; 400mL Pyrex™ beaker; cover assembly with bath stirrer; sample pump rotor and cooling coil; 6V lamp with line cord; and drive motor. Positive drive pulley system rotates sample and bath stirrers. Accessory Powertrol Heater has variable stepless control and a reference dial for repeatable control of heating rate. Porcelain refractory top plate shields 750W heater and has a positioning well for the Pyrex™ bath. Low voltage receptacle in heater housing accepts line cord of 6V lamp.

### Specifications

Conforms to the specifications of: ASTM D611; IP 2; ISO 2977;

DIN 51775; FTM 791-3601; NF M 07-021

Bath Medium: 400mL of heat transfer fluid

(355-000-001 mineral oil is suitable for this application)

Electrical Requirements:

115V 50/60Hz, Single Phase, 6.5A

220-240 V 50/60Hz, Single Phase, 13.4A

### Included Accessories

Thermometer Ferrules (2)

Clamps and Support Rod

### Dimensions l x w x h, in. (cm)

14½ x 18½ x 20¾ (37 x 22 x 53)

Net Weight: 24 lbs (10.9kg)

### Shipping Information

Shipping Weight: 42 lbs (19.1kg)

Dimensions: 5.7 Cu. ft.



K10190 Thin Film Aniline Point Apparatus

Ordering Information		
Catalog No.		Order Qty
K10190	Thin Film Aniline Point Apparatus, 115V 50/60Hz	1
K10191	Thin Film Aniline Point Apparatus, 220-240V 50/60Hz	1
K10020	Powertrol Heater, 115V 50/60Hz	1
K10029	Powertrol Heater, 220-240V 50/60Hz	1
Accessories		
250-000-33F	ASTM 33F Thermometer Range: -36.5 to +107.5°F	2
250-000-33C	ASTM 33C Thermometer Range: -38 to +42°C	2
250-000-34F	ASTM 34F Thermometer Range: 77 to 221°F	2
250-000-34C	ASTM 34C Thermometer Range: 25 to 105°C	2
250-000-35F	ASTM 35F Thermometer Range: 194 to 338°F	2
250-000-35C	ASTM 35C Thermometer Range: 90 to 170°C	2

For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.

## U-Tube Aniline Point Apparatus

- Developed by Standard Inspection Laboratories

Similar to the Thin Film Aniline Point Apparatus but with 'U-Tube' aniline-sample tube and stirrer as developed by Standard Inspection Laboratories. Suitable for samples having 6.5 or lighter ASTM D1500 color. As illustrated in IP2-56, Method D. Consists of U-tube; 400mL Pyrex™ beaker; cover assembly with bath stirrer; sample stirrer and cooling coil; 6V lamp with line cord; and drive motor. Thermometer ferrules and mounting hardware are included. Accessory Powertrol Heater provides variable stepless control of heating rate and 6V tap for lamp.

Ordering Information		
Catalog No.		Order Qty
K10090	U-Tube Aniline Point Apparatus, 115V 50/60Hz	1
K10091	U-Tube Aniline Point Apparatus, 220-240V 50/60Hz	1
K10020	Powertrol Heater, 115V 50/60Hz	1
K10029	Powertrol Heater, 220-240V 50/60Hz	1

# Saybolt Color of Petroleum Products



K13009 Saybolt Chromometer

## Specifications

Conforms to the specifications of:

ASTM D156; DIN 51411; FTM 791-101; NF M 07-003

## Included Accessories

Whole Color Standards (3)  
Half Color Standard (1)  
Engraved Conversion Chart

## Dimensions lwxhxh, in. (cm)

5½x5½x26½ (14x14x67)  
Net Weight: 15½ lbs (7kg)

## Shipping Information

Shipping Weight: 31 lbs (14.1kg)  
Dimensions: 4.0 Cu. ft.  
*Includes accessory lamp*

## Test Method

The Saybolt Color test is used for quality control and product identification purposes on refined products having an ASTM Color of 0.5 or less. Products in this range include undyed motor and aviation gasolines, jet propulsion fuels, naphthas, kerosene and petroleum waxes. Color is an important quality characteristic for many products, and can also be used to detect product contamination. The Saybolt Chromometer measures color by comparing a column of sample against standard color discs. The Saybolt Wax Chromometer measures color of non-fluid waxes by heating the samples during the test.

## Saybolt and Saybolt Wax Chromometers

- Conforms to ASTM D156 and related specifications
- Three-position color standard turret
- Tests non-fluid waxes and liquid petroleum products

Determines Saybolt Color of highly refined petroleum products. Consists of a matched set of sample and standard tube assemblies with optical viewer. Compares a sample of the product to be tested against standard color discs under a uniform light source. Reduce column height until the sample field is lighter than the color standard and convert height to Saybolt Color using chart on instrument. Three-position turret on standard tube permits convenient changing of color disc combinations. Accessory Daylight Lamp (Cat. No. K13010) provides standard light source per ASTM specifications.

For petroleum waxes, the Saybolt Wax Chromometer is equipped with heaters to keep waxes that are not fluid at ambient temperature molten during testing. Sample tube has a 200W chrome steel strip heater and a hinged cover to maintain even heat distribution. An aluminum block heater with 50W cartridge element keeps wax molten in the draincock assembly. Accessory variable transformer may be used to regulate the sample temperature. Optical viewer and stand are fully insulated from the heaters. Sample tube assembly has heat resistant fiber handles.

## Ordering Information

### Catalog No.

K13009	Saybolt Chromometer
K13100	Saybolt Wax Chromometer, 115V 50/60Hz
K13190	Saybolt Wax Chromometer, 220-240V 50/60Hz

### Accessories

K13010	Daylight Lamp Meets ASTM D156 and related test specifications for illumination of Saybolt Chromometers. Adjustable for correct positioning. Standard 60W bulb not included.
K13020	Whole Color Standard
K13029	Half Color Standard
K13032	Matched Set of Tubes with Turret and Draincock Assembly for K13009 Saybolt Chromometer
K13033	Matched Set of Tubes with Turret and Draincock Assembly for K13100/K13190 Saybolt Wax Chromometer
279-115-005	Frosted Bulb, 60W, 115V
279-230-002	Frosted Bulb, 60W, 220-240V
280-115-005	Variable Transformer, 115V Regulates heaters of Saybolt Wax Chromometer.
280-230-003	Variable Transformer, 220-240V

# ASTM Color of Petroleum Products

## Test Method

The ASTM color of petroleum products applies to products having an ASTM color of 0.5 or darker, including lubricating oils, heating oils and diesel fuel oils. (For products having an ASTM color lighter than 0.5, use the Saybolt Chromometer.) To determine ASTM color, the sample is compared against standard color discs in the Petroleum Colorimeter.

## Petroleum Colorimeter

- Conforms to ASTM D1500 specifications

Grades and compares petroleum oils and waxes according to ASTM D1500 specifications. Color discs situated on either side of the sample contain standards conforming to the chromaticity coordinates of ASTM D1500. Rotate the discs by turning dials on the front of the comparator until the sample color matches the color standards and take the reading directly from the dials. Two-disc configuration offers a distinct advantage over single-disc systems—the sample is always bracketed between the next lower and higher color standards allowing the viewer to easily determine the actual sample color. Comparator may also be used to quickly determine if a sample falls between two predetermined color limits.

View the sample from either a standing or sitting position through a prism eyepiece that brings the standards and sample together in a three-field comparison. A detachable prism light shield may be inserted to eliminate any outside light interference. Color corrected filtered halogen light source corresponding to Illuminant C of the CIE system provides clear visibility, assuring accurate readings.

## Specifications

Conforms to the specifications of:

ASTM D1500, D6074; IP 196; ISO 2049; FTM 791-102

## Included Accessories

Light Shield

Sample Containers (3)

Calibration Certificate



K13200 Petroleum Colorimeter

**Dimensions** l x w x h, in. (cm)  
10x10½x7¼ (25x27x18)  
Net Weight: 10 lbs (4.5kg)

## Shipping Information

Shipping Weight: 15 lbs (6.8kg)  
Dimensions: 2.6 Cu. ft.

## Ordering Information

Catalog No.		Order Qty
K13200	Petroleum Colorimeter, 115V 50/60Hz	1
K13290	Petroleum Colorimeter, 220-240V 50/60Hz	
<b>Accessories</b>		
K13210	Sample Container	
K13220	Replacement Halogen Lamp	

# Visual Examination of Used Electrical Insulating Oils

## Visual Examination of Used Electrical Insulating Oils of Petroleum Origin in the Field

## Test Method

Provides an estimate of the color and condition of in-service oils by visual observation and comparison with ASTM color standards in an oil comparator.

## Oil Comparator

- Conforms to ASTM D1524 specifications
- Yields results equivalent to ASTM D1500

Complete ASTM oil color test outfit for comparison of oils against ASTM color standards. Includes two color discs, ranging from 0.5 to 5.0 in 10 steps and 5.0 to 8.0 in 7 steps. Magnifying prism brings the sample and standard color fields together for side by side comparison. Portable unit is suitable for laboratory or field use. Supplied with two precision 33mm rectangular glass cells, carrying case and instructions.

## Shipping Information

Shipping Weight: 10 lbs (4.5kg)  
Dimensions: 1 Cu. ft.

## Ordering Information

Catalog No.		Order Qty
K13203	Oil Comparator	1
<b>Accessories</b>		
K13204	Daylight Illuminator, 115V Provides uniform lighting for Oil Comparator	1
K13294	Daylight Illuminator, 220-240V	
K13205	Rectangular Glass Cell	

# Portable Automated Colorimeter



K13250 Portable Automatic Colorimeter

### Specifications

Conforms to the specifications of:

- ASTM D156, D1209, D1500, D1544; ISO 4630, 6271; DIN 6162; NF M 07-003; NF T 60-104

Reproducibility:  $\pm 0.2\%$  T (referenced to distilled water)

Reference Standard: distilled water

Data Output: RS232/printer

Light Source: krypton lamp

### Dimensions

l x w x h, in. (cm)

7.9 x 10 x 3.5 (20 x 26 x 90)

Net Weight: 2.9 lbs (1.3kg)

### Shipping Information

Shipping Weight: 10 lbs (4.5kg)

### Electrical Requirements

115-240V 50/60Hz

## Portable Automated Colorimeter

- Conforms to ASTM D156, D1500, D1544, D1209, DIN 6162, and related international test specifications
- Measures up to 5 color ranges
- Portable design for remote applications

Single-beam filter colorimeter system utilizes reference beam path technology to measure samples over eight spectral wavelengths ranged between 400 and 700nm in comparison to 5 standard color scales. Provides photometric high precision color measurements that are objective, accurate, and consistent over a wide variety of samples required for quality control programs. Measurements are initiated by just a single key press and require less than one minute to complete. The test results can be either displayed on the LCD screen or sent to an external printer.

### Color Ranges

- Saybolt Color (ASTM D156, ISO 2049, NF M 07-003)
- Mineral Oil Color (ASTM D1500, NF M 60-104)
- Iodine Color (DIN 6162)
- Hazen Color, APHA Color, Pt/Co Color (ASTM D1209, ISO 6271)
- Gardner Color (ASTM D1544, ISO 4630)

### Ordering Information

#### Catalog No.

K13250

Portable Automatic Colorimeter  
*Please specify color range(s) when ordering.*

#### Accessories

K13251

Printer (w/cable & paper)

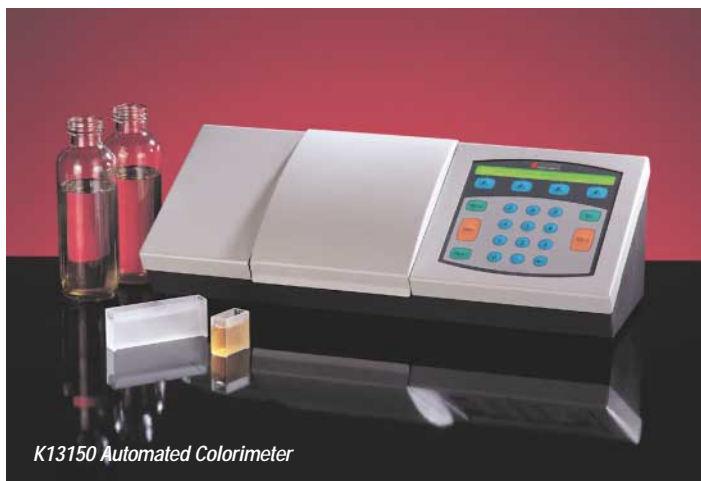
K13252

Equipment Case

K13253

Color Calibration Standards

# Automated Colorimeter for Saybolt and ASTM Color



K13150 Automated Colorimeter

### Specifications

Conforms to the specifications of:

- ASTM D156, D1500, D6045, E 308; JIS K2580

Reproducibility:  $\pm 0.25\%$  T,  $\pm 1$  Saybolt value

Spectral Range: 410-710 nm

Data Output: RS232/printer

Light Source: tungsten halogen lamp

Illuminant: CIE Illuminant C

Observer: 2°

## Saybolt and Mineral Oil Colorimeter

- Conforms to ASTM D156, D1500, D6045, and related test specifications
- Designed for color measurement of waxes and other petroleum products

High precision spectrophotometer for objective color analysis of petroleum fuels, oils, waxes and petrochemicals according to the Saybolt and ASTM Color scales. Test results can also be displayed in terms of CIE values and spectral data. The colorimeter is rugged with a fabricated steel housing which is designed to function equally as a QC instrument within the laboratory or on 24 hour operation in a production environment. A diagnostic test routine allows users to conduct periodic checks on the instrument or to identify faults. Direct access of the precision filament lamp from outside the instrument allows for easy replacement. The colorimeter is also supplied with a colored glass filter of known Saybolt value for regular conformance testing.

### Dimensions

l x w x h, in. (cm)

7.7 x 20.3 x 6.7 (19.5 x 51.5 x 17)

Net Weight: 17 lbs (7.75kg)

### Shipping Information

Shipping Weight: 23 lbs (10.5kg)

### Ordering Information

#### Catalog No.

K13150

Automatic Saybolt and ASTM Colorimeter,  
115-240V 50/60 Hz

# Automated Colorimeter

## Automated Colorimeter

- Conforms to ASTM D156, D1500, and related specifications
- Spectral range for color measurement: 340-900nm
- Versatile and readily tailored to various applications
- Capable of measuring up to 15 color ranges
- Additional feature allows measurements of solid samples
- Portable model available

Provides photometric color measurements required for purity and quality control testing that are objective, accurate, and consistent over a wide variety of samples. Microprocessor-based unit features a modern optical system with reference beam path (RST-technology) and measures samples in comparison to 15 possible color ranges. Units are custom configured to user specifications, and easily perform single measurement, multi-measurement, color difference, and color strength tests. Tests take less than one minute to complete, and results can be either displayed on LCD screen or sent to an external printer.

### Color Ranges

- Saybolt Color (ASTM D156, ISO 2049, NF M 07-003)
- Mineral Oil Color (ASTM D1500, NF M 60-104)
- Iodine Color
- Hazen Color (APHA Color, Pt/Co Color)
- Gardner Color
- Lovibond®
- European Pharmacopoeia
- Klett Color
- Hess-Ives Color
- Yellowness Index
- CIE-L\*, a\*, b\* Values
- CIE-L\*, a\*, b\* Difference
- Hunter Lab Values
- Chromaticity Coordinates
- Tristimulus Values

### Specifications

Conforms to the specifications of:

ASTM D156, D1209, D1500, D1544, D5386, D6045; ISO 4630, 6271; DIN 5033, 6162, 6174; EN 1557; AOCs Cc 13e; Ph EUR; NF M 07-003; NF T 60-104

Viewing Geometry: 0°/180° (transmission)

Reproducibility: ±0.2% T (referenced to distilled water)

Display: LCD, 4\*20 - digit for measuring value,  
1\*20 - digit for key display

(Advanced model utilizes a backlit graphical LCD display)

Reference Standard: distilled water

Data Output: RS232 port

Spectral Range:

Monochromator: optical concave grating

Receiver: two Si photodiode cells

Color Measurement: 380-720nm in steps of 10nm,

X, Y, Z illuminant C and standard observer 2° (DIN 5033)

Photometer: 340-900nm in steps of 1nm

Light Source: halogen lamp 12V/20W

Electrical Requirements:

115V 50/60Hz

220-240V 50/60Hz



K14400 Automatic Colorimeter

### Dimensions l x w x h, in. (cm)

12 1/4 x 14 1/4 x 8 (32 1/2 x 37 1/2 x 20)

Net Weight: 15.4 lbs (7kg)

### Shipping Information

Shipping Weight: 19.8 lbs (9kg)

### Ordering Information

#### Catalog No.

K14400 Automatic Colorimeter 115V, 50/60Hz

K14490 Automatic Colorimeter 220-240V, 50/60Hz

#### Accessories

K14459 Printer (w/cable & paper)

K14460 Spectral QC for Windows® 95/98/NT Data Processing

K14461 PC connector cable

K14462 Equipment Case

K14463 Test Filters with Quality Control Certificate  
(DIN 55350)

K14464 Sample Heater for Waxes

*Please specify color range choices and/or test methods when ordering. Please inquire with Koehler Customer Service about our advanced models as well as the additional feature which allows for the measurement of solid samples.*

# Density, Relative Density (Specific Gravity), or API Gravity

## Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

### ASTM Hydrometers

For density, relative density (specific gravity) or API gravity determination of crude petroleum, liquid petroleum products and mixtures of petroleum and non-petroleum products. For density of LPG and light hydrocarbons refer to page 103.

#### Specifications

Conforming to the specifications of: ASTM E100

#### Applicable Test Method Standards:

ASTM D287, D1298, D6074, D6158;

API MPMS Chapter 9.1; IP 160; ISO 3675; DIN 51757

### API Gravity Hydrometers

Standard temperature 60°F, subdivisions 0.1° API, length 330mm

Catalog No.	ASTM Hydrometer No.	Nominal API Gravity Range, deg.
251-000-01H	1H	-1 to +11
251-000-02H	2H	9 to 21
251-000-03H	3H	19 to 31
251-000-04H	4H	29 to 41
251-000-05H	5H	39 to 51
251-000-06H	6H	49 to 61
251-000-07H	7H	59 to 71
251-000-08H	8H	69 to 81
251-000-09H	9H	79 to 91
251-000-10H	10H	89 to 101

### Specific Gravity Hydrometers

Standard temperature 60/60°F, subdivisions 0.0005, length 330mm

Catalog No.	ASTM Hydrometer No.	Nominal Specific Gravity Range
251-000-82H	82H	0.650 to 0.700
251-000-83H	83H	0.700 to 0.750
251-000-84H	84H	0.750 to 0.800
251-000-85H	85H	0.800 to 0.850
251-000-86H	86H	0.850 to 0.900
251-000-87H	87H	0.900 to 0.950
251-000-88H	88H	0.950 to 1.000
251-000-89H	89H	1.000 to 1.050
251-000-90H	90H	1.050 to 1.100

*Calibrated hydrometers and thermohydrometers are available from Koehler with an ISO/IEC 17025 and ANSI/NCSL Z-540-1 Report of Calibration.*

*When inquiring about calibrated hydrometers and thermohydrometers, please refer to the catalog number for the corresponding hydrometer/thermohydrometer and replace the middle three zeros in the catalog number with 004. Example: 251-000-01H API Gravity Hydrometer would be 251-004-01H Certified API Gravity Hydrometer.*



### API Gravity Hydrometers

Standard temperature 60°F, subdivisions, 0.1° API, length 330mm

Catalog No.	ASTM Hydrometer No.	Nominal API Gravity Range, deg.
251-000-21H	21H	0 to 6
251-000-22H	22H	5 to 11
251-000-23H	23H	10 to 16
251-000-24H	24H	15 to 21
251-000-25H	25H	20 to 26
251-000-26H	26H	25 to 31
251-000-27H	27H	30 to 36
251-000-28H	28H	35 to 41
251-000-29H	29H	40 to 46
251-000-30H	30H	45 to 51
251-000-31H	31H	50 to 56
251-000-32H	32H	55 to 61
251-000-33H	33H	60 to 66
251-000-34H	34H	65 to 71
251-000-35H	35H	70 to 76
251-000-36H	36H	75 to 81
251-000-37H	37H	80 to 86
251-000-38H	38H	85 to 91
251-000-39H	39H	90 to 96
251-000-40H	40H	95 to 101

### API Gravity Thermohydrometers - Thermometer in Body

Standard temperature 60°F, subdivisions 0.1° API, length 380mm, thermometer scale °F 0-150 (designation L), 30 to 180 (designation M), 60 to 220 (designation H)

Catalog No.	ASTM Thermohydrometer No.	Nominal API Gravity Range, deg.
251-000-51HH	51HH	-1 to 11
251-000-51HL	51HL	-1 to 11
251-000-52HH	52HH	9 to 21
251-000-52HL	52HL	9 to 21
251-000-53HM	53HM	19 to 31
251-000-53HL	53HL	19 to 31
251-000-54HM	54HM	29 to 41
251-000-54HL	54HL	29 to 41
251-000-55HL	55HL	39 to 51
251-000-56HL	56HL	49 to 61
251-000-57HL	57HL	59 to 71
251-000-58HL	58HL	69 to 81
251-000-59HL	59HL	79 to 91
251-000-60HL	60HL	89 to 101

### API Gravity Thermohydrometers - Thermometer in Stem

Standard temperature 60°F, subdivisions 0.1° API, length 380mm, temperature scale °F 30-220

Catalog No.	ASTM Thermohydrometer No.	Nominal API Gravity Range, deg.
251-000-71H	71H	-1 to 11
251-000-72H	72H	9 to 21
251-000-73H	73H	19 to 31
251-000-74H	74H	29 to 41

# Density, Relative Density (Specific Gravity), or API Gravity

## Specific Gravity Hydrometers

Standard temperature 60/60°F, subdivisions 0.001 length 260mm

Catalog No.	ASTM Hydrometer No.	Nominal Specific Gravity Range
251-000-102H	102H	0.650 to 0.700
251-000-103H	103H	0.700 to 0.750
251-000-104H	104H	0.750 to 0.800
251-000-105H	105H	0.800 to 0.850
251-000-106H	106H	0.850 to 0.900
251-000-107H	107H	0.900 to 0.950
251-000-108H	108H	0.950 to 1.000
251-000-125H	125H	1.000 to 1.050
251-000-126H	126H	1.050 to 1.100
251-000-127H	127H	1.100 to 1.150
251-000-128H	128H	1.150 to 1.200
251-000-129H	129H	1.200 to 1.250
251-000-130H	130H	1.250 to 1.300
251-000-131H	131H	1.300 to 1.350
251-000-132H	132H	1.350 to 1.400
251-000-133H	133H	1.400 to 1.450
251-000-134H	134H	1.450 to 1.500
251-000-135H	135H	1.500 to 1.550
251-000-136H	136H	1.550 to 1.600
251-000-137H	137H	1.600 to 1.650
251-000-138H	138H	1.650 to 1.700
251-000-139H	139H	1.700 to 1.750
251-000-140H	140H	1.750 to 1.800
251-000-141H	141H	1.800 to 1.850

## ASTM Metric Thermohydrometers

Standard temperature 15°C, subdivisions 0.5kg/m<sup>3</sup>, length 380mm, thermometer scale °C: -20 to +65 (designation L), 0 to 85 (designation M), 20 to 105 (designation H).

Catalog No.	ASTM Thermohydrometer No.	Density, Range kg/m <sup>3</sup>
251-000-300HL	300HL	600 to 650
251-000-301HL	301HL	650 to 700
251-000-302HL	302HL	700 to 750
251-000-302HM	302HM	700 to 750
251-000-303HL	303HL	750 to 800
251-000-303HM	303HM	750 to 800
251-000-304HL	304HL	800 to 850
251-000-304HM	304HM	800 to 850
251-000-305HL	305HL	850 to 900
251-000-305HM	305HM	850 to 900
251-000-306HL	306HL	900 to 950
251-000-306HM	306HM	900 to 950
251-000-307HL	307HL	950 to 1000
251-000-307HH	307HH	950 to 1000
251-000-308HH	308HH	1000 to 1050
251-000-308HL	308HL	1000 to 1050
251-000-309HH	309HH	1050 to 1100
251-000-309HL	309HL	1050 to 1100

## Hydrometer Cylinders\*

- Wide base for maximum stability
- Convenient pour-out lip
- Choice of glass or metal construction



K26300 Brass Hydrometer Cylinder

## Ordering Information

Catalog No.	Construction	Dimensions dia.xh.
K26300	Brass	2½x12" (64x305mm)
K26390	Brass	2x15" (51x381mm)
332-002-011	Glass	2x15½" (51x394mm)

\*Not suitable for use with K26400 series baths

Calibrated hydrometers and thermohydrometers are available from Koehler with an ISO/IEC 17025 and ANSI/NCSL Z-540-1 Report of Calibration.

When inquiring about calibrated hydrometers and thermohydrometers, please refer to the catalog number for the corresponding hydrometer/thermohydrometer and replace the middle three zeros in the catalog number with 004. Example: 251-000-01H API Gravity Hydrometer would be 251-004-01H Certified API Gravity Hydrometer.

For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.

## Density, Relative Density (Specific Gravity), or API Gravity

### Constant Temperature Hydrometer Bath

- Holds 12 hydrometer cylinders
  - Can be used for Reid Vapor Pressure immersion type cylinders
  - Conforms to ASTM D323, D1298, D6074, D6158 and related specifications
- A versatile constant temperature bath designed for density/gravity determinations of petroleum products at temperatures of up to 195°F (90°C), and also for Reid Vapor Pressure determinations using immersion bombs. Microprocessor PID control provides quick temperature stabilization without overshoot and the unit is protected by an overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.*

*Also available—Special bath to accommodate both ASTM D323 (Vapor Pressure of Petroleum Products—Reid Method listed on page 93) and D942 (Oxidation Stability of Lubricating Greases by the Oxygen Bomb Method listed on pages 152-153), as well as D525 (Oxidation Stability of Gasoline—Induction Method listed on pages 81-82). Please contact a Koehler Customer Service representative for additional information.*

#### Dimensions lwxhx, in. (cm)

30x14x28 (76x36x71)

Net Weight: 64 Lbs (29.0kg)

#### Shipping Information

Shipping Weight: 118 lbs (53.5kg)

Dimensions: 11.4 Cu. ft.

### Specifications

Capacity: twelve (12) hydrometer cylinders (without base) or Reid Vapor Pressure one-opening type bombs

Temperature Range: ambient to 250°F (121°C)

Temperature Control Stability: ±0.2°F (±0.17°C)

Heater Range: 0-2500W

Bath Medium: 19 gal (71.9L) water

Electrical Requirements:

115V 50/60Hz, Single Phase, 22A

230V 50/60Hz, Single Phase, 11A

### Ordering Information

Catalog No.		Order Qty
K26400	Constant Temperature Hydrometer Bath, 115V	1
K26490	Constant Temperature Hydrometer Bath, 230V	

### Accessories

K26410	Hydrometer Cylinder Borosilicate glass, 15½"lx2"dia. with 2½" lip	12
250-000-61F	ASTM 61F Thermometer Range: 90 to 260°F	1
250-000-61C	ASTM 61C Thermometer Range: 32 to 127°C	

*For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.*

## Density, Relative Density (Specific Gravity), or API Gravity

### Constant Temperature Hydrometer Bath

- Accommodates one standard 2"x15" (51x380mm) hydrometer cylinder with base
- Compact design saves space

Thermostatically controlled water bath with 500W copper immersion heater and hydraulic thermoregulator for operation at temperatures of up to 210 ±2°F (99±1°C). Holds one 2"x15" (51x381mm) hydrometer jar —top of jar extends 1½" (38mm) above the top of the bath for easy viewing of the hydrometer. Insulated double-wall construction with stainless steel tank and shelf and finished steel exterior. Has variable speed control for magnetic stirrer, temperature control dial, and on/off switches for motor and power.

#### Specifications

Temperature Range: Ambient to 210°F (99°C)

Temperature Control Stability: ±2°F (±1°C)

Bath Medium: 2 gal (7.57L) water

Electrical Requirements: 115V 50/60Hz, Single Phase, 4.3A

230V 50/60Hz, Single Phase, 2.2A

#### Dimensions dia.xh.(cm)

Bath Interior: 6x16½ (15x42)

Overall: 9x22 (23x56)

Net Weight: 20 lbs (9.1kg)

#### Shipping Information

Shipping Weight: 35 lbs (15.9kg)

Dimensions: 5 Cu. ft.

### Ordering Information

#### Catalog No.

K26200 Constant Temperature Hydrometer Bath, 115V 50/60Hz

K26290 Constant Temperature Hydrometer Bath, 230V 50/60Hz



K26200 Hydrometer Bath

# Coulometric Karl Fischer Titrator

## Test Method

Determines low concentrations of water in a wide range of liquid, gas and powder samples. Used for assessing water content in petroleum and petrochemical products including oils, gasolines, solvents, and fluids as well as other products such as pharmaceuticals and cosmetics.

## Coulometric Karl Fischer Titrator

- Conforms to ASTM D4928; IP 386; API Chapter 10.9
- Microprocessor-controlled stepped pulse current technology
- Automatically controlled background drift compensation
- Most results available within one minute

The Koehler Coulometric Karl Fischer Titrator utilizes the latest measurement technology featuring a microprocessor-controlled stepped pulse current for automatic determination of the appropriate titration speed depending on the amount of water present in the sample. As the end point is approached, the titration speed is reduced for obtaining accurate test results. The titrator displays and prints out the results in  $\mu\text{g}$ , ppm, or % along with the input parameters (sample ID, number, sample weight, volume delay times, etc.). Background drift is automatically compensated during the titration and all displays/printouts can be programmed in several different languages. Up to 10 individual methods can be stored in memory for easy recall. The titrator is suitable for use in the laboratory or the field. The built-in battery pack provides up to 8 hours of continuous power for remote operation and is automatically recharged when the unit is connected to a main power supply. The titrator is supplied with glassware, built-in printer and a calibration certificate.

**Dimensions** lwxh,in.(cm)  
16.4x11.4x4.7 (41.5x29x12)  
Net Weight: 11 lbs (5 kg)

**Shipping Information**  
Shipping Weight: 24 lbs (11 kg)  
Dimensions: 2.76 Cu. ft.



K90300 Coulometric Karl Fischer Titrator

## Specifications

Measuring Range:  $1\mu\text{g}$  - 10mg of water      Accuracy: 10/100 $\mu\text{g}$ :  $\pm 3\mu\text{g}$   
Moisture Range: 1ppm - 100%                      100 $\mu\text{g}$ /1mg:  $\pm 5\mu\text{g}$   
Maximum Sensitivity: 0.1 $\mu\text{g}$                       Above 1mg:  $\pm 0.5\%$   
Maximum Titration Speed: 2mg/min

## Ordering Information

Catalog No.	Description
K90300	Coulometric Karl Fischer Titrator, 115V 50/60Hz
K90390	Coulometric Karl Fischer Titrator, 220-240V 50/60Hz

*Volumetric Karl Fischer Titrators are also available from Koehler. Please contact Koehler Customer Service for additional information.*

# Portable Coulometric Karl Fischer Titrator

## Portable Coulometric Karl Fischer Titrator

- Conforms to ASTM D4928; IP 386; API Chapter 10.9
- Microprocessor-controlled stepped pulse current technology
- Two portable models specifically designed for either crude oil and petroleum products or transformer and insulating oils

The Koehler Portable Coulometric Karl Fischer Titrators are designed specifically for the petroleum/petrochemical and power generation industries. The titrator systems are pre-programmed to provide accurate results with minimal operator training and utilize a microprocessor-controlled stepped pulse current for automatic determination of the appropriate titration speed depending on the amount of water present in the sample. The titrators display and print out the test results in  $\mu\text{g}$ , ppm, or % along with the input parameters (sample ID, number, sample weight). Supplied complete with a rugged carrying case, glassware, built-in printer and a calibration certificate, the systems can be transported with the reagents in the titration cell and ready for immediate use upon arrival on site. System mobility is further enhanced by flexible power options from either the built-in battery pack, main power supply, or an automobile power outlet. The built-in battery pack provides up to 8 hours of continuous power for remote operation and is automatically recharged when the unit is connected to a power supply.

## Specifications

Measuring Range:  $1\mu\text{g}$  - 10mg of water      Accuracy: 10/100 $\mu\text{g}$ :  $\pm 3\mu\text{g}$   
Moisture Range: 1ppm - 100%                      100 $\mu\text{g}$ /1mg:  $\pm 5\mu\text{g}$   
Maximum Sensitivity: 0.1 $\mu\text{g}$                       Above 1mg:  $\pm 0.5\%$   
Maximum Titration Speed: 2mg/min



K90350 Portable Coulometric Karl Fischer Titrator

**Dimensions** lwxh,in.(cm)  
9.8x9.6x4.7 (25x24.5x12)  
Net Weight: 6.5 lbs (3 kg)

**Shipping Information**  
Shipping Weight: 15.5 lbs (7 kg)  
Dimensions: 1.9 Cu. ft.

## Ordering Information

Catalog No.	Description
K90350	Portable Coulometric Karl Fischer Titrator, 115-240V 50/60Hz or 12V DC <i>Designed for crude oil and petroleum/petrochemical samples.</i>
K90360	Portable Coulometric Karl Fischer Titrator, 115-240V 50/60Hz or 12V DC <i>Designed for transformer and insulating oil samples.</i>

# Distillation of Petroleum Products at Reduced Pressure

## Test Method

The sample is distilled at a controlled, reduced pressure under conditions which provide approximately one theoretical plate fractionation. A distillation curve relating volume distilled and boiling point atmospheric equivalent temperature is prepared.

## VDA3000 Vacuum Distillation System

- Conforms to ASTM D1160 and ISO 6616 test specifications

The Koehler VDA3000 Vacuum Distillation System performs reduced pressure distillations of petroleum products in accordance with ASTM specifications. Complete borosilicate glassware system with support panel and base, heating mantle and clamps. Includes vacuum jacketed, strip silvered column with integral primary and secondary condensers and 35/25 spherical joints, PRT thermocouple adapter, PRT Temperature Probe, 500mL quartz distilling flask with thermowell, 200mL water jacketed receiver, vacuum adapter, two Dewar-type cold traps with 10mL graduated receiver and stopcock drain and 35/25 ball adapter for extra cold trap. Finished aluminum panel and base and stainless steel spring leashes. Glassware is assembled by adjustable No. 35 clamps to assure proper alignment to panel and base. Accessory control unit includes digital temperature indicator with selector switch for reading pot temperature or overhead temperature; vacuum gauge; variable controls for heating mantle, and line switch. Control unit is housed in a finished aluminum cabinet.

## Specifications

Conforms to the specifications of:

ASTM D1160; ISO 6616

## Shipping Information

Shipping Weight: 40 lbs (18.1kg)

Dimensions: 11 Cu. ft.

## Dimensions lwxh,in.(cm)

Base/Support Assembly: 12x24x36 (30.5x61x91.4)

Control Unit: 8x10x12 (20.3x2.5x30.5)

Net Weight: 25 lbs (11.3kg)



K80200 Vacuum Distillation System (VDA 3000)



K80201 Control Unit

## Ordering Information

Catalog No.	Description	Order Qty
K80200	VDA3000 Vacuum Distillation System, 115V 50/60Hz	1
K80290	VDA3000 Vacuum Distillation System, 230V 50/60Hz	
K80201	Control Unit, 115V 50/60Hz	1
K80291	Control Unit, 230V 50/60Hz	

## Accessories

K80202	Column, vacuum jacketed, strip-silvered, with integral primary and secondary condensers and 35/25 spherical joints	
K80203	Receiver, 200mL, water jacketed, with 35/25 joints	
K80204	Cold Trap, Dewar-type, with 10mL receiver and stopcock drain	
K80205	Vacuum Adapter, with 35/25 joints	
K80206	Quartz Flask, 500mL round bottom, with thermowell and 35/25 joint	
K80208	Thermocouple Adapter, PRT Type	
K80208-J	Thermocouple Adapter, J Type	
K80211	Temperature Probe, PRT Type	
K80211-J	Temperature Probe, J Type	
K80214	Vacuum Pump, 115V 50/60Hz	
K80294	Vacuum Pump, 230V 50/60Hz	

# Semi-Auto Distillation of Petroleum Products at Reduced Pressure

## VDA5000 Semi-Auto Vacuum Distillation System

- Conforms to the specifications of ASTM D1160 and ISO 6616
- Automatically regulates pressure
- Electronic temperature adjustment
- Records and plots test data
- Automatic nitrogen degassing at test conclusion

The Koehler VDA5000 Semi-Automatic Distillation System simplifies operation of the vacuum distillation test by controlling test functions and plotting test data. Distillation pressure is maintained automatically by means of a built-in vacuum pump and automatic pressure regulator. Temperature is also maintained at the desired setting throughout the test. A recorder plots key test data, including: sample identification, time, pressure and vapor temperature at IBP, fractions and end point. Temperature readings are presented in observed and Atmospheric Equivalent Temperatures (AET) format. Nitrogen degassing is initiated automatically at the end of the cleaning run, or by pressing the emergency button on the control console at any time during the test. (Requires an external source of nitrogen.)

Includes: glassware with spherical joints; heating mantle with elevator; PT100 sensor; absolute vacuum detector; supports, clamps, and tubing; receiver with illumination; cold trap with 12mL graduated receiver for light products, water circulator; control console with LCD display; heater control, pressure manometer; vacuum gauges and controller; absolute vacuum detector; and water circulator, all mounted on an aluminum frame with sliding transparent panels.

*Complete product information and specifications are available. Please contact your Koehler representative.*

### Specifications

Conforms to the specifications of:

ASTM D1160; ISO 6616

Electrical Requirements:

230V 50Hz, 14A

230V 60Hz, 14A

**Dimensions** lwxh,in.(cm)

31½x40½x26¾ (80x103x68)

Net Weight: 231 lbs (104kg)

### Shipping Information

Shipping Weight: 286 lbs (130kg)

Dimensions: 34.6 Cu. ft.

## Ordering Information

Catalog No.	
K87000	VDA5000 Semi-Automatic Vacuum Distillation System, 230V 50Hz
K87010	VDA5000 Semi-Automatic Vacuum Distillation System, 230V 60Hz

### Accessories

K87015	Cryothermostat for connecting to cold trap, 230V 50Hz
K87020	Cryothermostat for connecting to cold trap, 230V 60Hz

# Automatic Distillation of Petroleum Products at Reduced Pressure



K87150 Automatic Vacuum Distillation System (VDA 7000)

## VDA7000 Automatic Vacuum Distillation System

- Conforms to ASTM D1160 and ISO 6616 test specifications
- Windows®-based software fully automates data acquisition and analysis
- Operating Range: 0.1 to 760 mm Hg
- Test data is displayed in real-time
- Automatic shutdown and cleaning procedures
- Automatic nitrogen degassing at test conclusion
- RS 232 interface for LIMS connection

The Koehler VDA7000 Automatic Vacuum Distillations System performs reduced pressure distillations of petroleum products, fully automated from the Initial Boiling Point (IBP) to the detected or pre-selected Final Boiling Point (FBP). Advanced Windows®-based software package allows continuous operation at reduced pressure and atmospheric conditions, and the selection of intermediate stops at pre-selected vapor or flask temperatures followed by the continuation of the distillation analysis at various user-selected reduced pressures. The distillate volume is automatically measured in a temperature-controlled receiver, and the heat rate is automatically controlled for a proper distillation rate. All test parameters are displayed during the distillation process in real-time, including actual boiling temperature, AET (atmospheric equivalent temperature), distillation rate, distilled volume, distillation rate vs. yield, and vacuum pressure. Test results, parameters and oil specific data are archived on the computer hard drive, and easily printed to an external printer.

## Ordering Information

### Catalog No.

K87150	VDA7000 Automatic Vacuum Distillation System, 230V 50Hz
K87160	VDA7000 Automatic Vacuum Distillation System, 230V 60Hz

Includes: distillation flasks (2) and receivers (2); upper distillation flask insulation jacket; Pt-100 temperature sensors for distillation head and flask; ASTM-compliant column with silvered high vacuum jacket, integrated product cooler, and condenser; 3L circulating thermostat; 750W high-temperature heating mantle with Pt-100 temperature sensor, electrical lifting platform, and integrated stirrer; volume follower system for automatic control of the distillation rate (mL/min) and heating rate (°C/min) equipped with light barrier, stepper-motor and a Pt-100 temperature sensor; absolute vacuum detector with stainless steel diaphragm, range 0.01 – 10.0 mm Hg (other ranges available upon request); vacuum control valve with automatic motor driven throttle valve; 2-stage vacuum pump with final pressure of 0.005 mbar.

### Dimensions l x w x h, in. (cm)

23½ x 63 x 35½ (60 x 160 x 90)  
Net Weight: 220 lbs (100kg)

### Shipping Information

Shipping Weight: 374 lbs (170kg)  
Dimensions: 190 Cu. ft.

# Automatic Distillation of Petroleum Products at Reduced Pressure



K87250 Automatic Vacuum Distillation System (VDA 9000)

## Test Method

Crude petroleum and/or heavy hydrocarbon samples are distilled under controlled, reduced pressure conditions to determine their value. The test provides samples for analytical studies, engineering and product quality evaluations as well as an estimate of the yields of fractions of various boiling ranges.

## VDA9000 Automatic Vacuum Distillation System

- Conforms to ASTM D2892 and D5236 test specifications for True Boiling Point (TBP) and Vacuum Potstill petroleum product distillation test methods
- Windows®-based software fully automates data acquisition and analysis
- Vapor and hydrogen sulfide (H<sub>2</sub>S) leak detection and notification system
- Automatic nitrogen degassing at test conclusion
- RS 232 interface for LIMS connection

The Koehler VDA9000 Automatic Vacuum Distillation System performs automated reduced pressure distillations for the fractionation and collection of crude petroleum products and/or high boiling components according to ASTM D2892 and D5236. The system is fully computer automated, featuring an automatic fraction collector equipped with twelve (12) receivers and a built-in internal balance, a distillate volume optical sensor system used for the simultaneous determination of the fractional weight and collected volume for direct distillation rate control, and a separate volume follower system for discharging the fractions into the final receivers with determination of the fraction volume. Under the TBP mode, the following steps are automatically performed: debutanization, atmospheric distillation, and vacuum distillations at 100, 10, and 2 mm Hg. Under the Potstill mode, two distillations are automatically performed at predesignated pressures programmed by the operator between 0.1 and 10 mm Hg. The final test data including the TBP and/or the Potstill distillation curves in weight % and volume % are printed out at the conclusion of the test.

## Ordering Information

Catalog No.	
K87250	VDA9000 Automatic Vacuum Distillation System, 230V 50Hz
K87260	VDA9000 Automatic Vacuum Distillation System, 230V 60Hz

Includes: distillation flask; upper distillation flask insulation jacket; Pt-100 temperature sensors for distillation head and flask; ASTM-compliant column with silvered high vacuum jacket, reflux divider, and packed with 4mm Propak 316 providing approximately 15 theoretical plates; 2400W high-temperature heating mantle with Pt-100 temperature sensor, electrical lifting platform, and integrated stirrer; tower heating mantle for adiabatic operation; volume follower system for automatic control of the distillation rate (mL/min) and heating rate (°C/min) with product discharge and collection system; absolute vacuum detector with stainless steel diaphragm, range 0.01 – 100.0 mm Hg; fraction collector with twenty (20) final receivers and integrated internal balance for measuring the fraction weights; gas trap for the debutanization; cryostat for main condenser, distillate cooler, and volume measuring system with a range of –20° to +60°C; vacuum control valve with automatic motor driven throttle valve; 2-stage vacuum pump with final pressure of 0.005 mbar; pressure drop sensor; mobile mounting frame equipped with all electric and mechanic control elements.

**Dimensions** l x w x h, in.(cm)  
23½ x 102¼ x 138¾ (60 x 260 x 350)  
Net Weight: 1320 lbs (600kg)

**Shipping Information**  
Shipping Weight: 2200 lbs (1000kg)  
Dimensions: 570 Cu. ft.

*Please inquire about our custom-designed and other standard models for reduced-pressure distillations, including separate systems for ASTM D2892 or D5236.*

# Distillation of Petroleum Products



K45090 Front View Distillation Apparatus

## Test Method

The sample is evaporated and condensed under controlled conditions, and observations are made of the temperatures at which various percentages are recovered and/or the percentages recovered at specified temperatures.

## Front View Distillation Apparatus

- Conforms to ASTM D86, E133 and related ASTM and international standards
- Choice of three different models

**Front View Distillation Apparatus, Groups 0, 1, 2 and 3**—Meets all ASTM and related specifications for distillation of motor and aviation gasolines, aviation turbine fuels, naphthas, kerosenes, distillate fuels, natural gasoline, liquid hydrocarbon mixtures and other petroleum products. Consists of fully insulated stainless steel condenser and heater units. Heater unit includes flask support platform, viewing window, 1000W heater with stepless variable control, and rack and pinion heater elevation mechanism with push-turn control knob. *Please inquire about higher wattage heaters.* White receiving flask background facilitates viewing of fractions during test. Available with right-hand or left-hand heater unit for convenient pairing. Includes graduate support block and flask support boards.

**Group 4 Front View Distillation Apparatus**—Front View Distillation apparatus designed for testing of Grade No. 2 fuel oil, Grade No. 2-D diesel fuel oil, gas oils and other distillates requiring condenser bath temperatures of up to 140°F (60°C). Also suitable for gasolines, aviation turbine fuels, naphthas, kerosenes and other liquid petroleum products. Similar in features and construction to the standard Front View Distillation Apparatus, but equipped with a 300W copper immersion condenser heater with stepless electronic control. Available with right or left-hand heater unit. *Note: The Group 4 Apparatus can also run distillations for petroleum products categorized as Groups 0, 1, 2 and 3.*

## Specifications

Conforms to the specifications of:  
 ASTM D86, D216, D233, D447,  
 D850, D1078, E133; IP 123, 195;  
 ISO 3405; DIN 51751; FTM 791-  
 1001, 791-1015; NF M 07-002

## Included Accessories

Flask Support Boards A and C  
 Graduate Support Block

## Shipping Information

Shipping Weight: 65 lbs (29.5kg)  
 Dimensions: 13.3 Cu. ft.

## Dimensions lwxh, in.(cm)

15½x18½x19½ (39x46x50)

## Ordering Information

### Catalog No.

#### Front View Distillation Apparatus

K45000	Right-Hand Model, 115V 50/60Hz
K45100	Left-Hand Model, 115V 50/60Hz
K45090	Right-Hand Model, 220-240V 50/60Hz
K45190	Left-Hand Model, 220-240V 50/60Hz

#### Group 4 Front View Distillation Apparatus

K45200	Right-Hand Model, 115V 50/60Hz
K45300	Left-Hand Model, 115V 50/60Hz
K45290	Right-Hand Model, 220-240V 50/60Hz
K45390	Left-Hand Model, 220-240V 50/60Hz

## Accessories

Catalog No.	Type	Capacity, mL
<b>Flasks</b>		
332-003-006	A	100
332-003-001	B	125
332-003-002	C	200
332-003-005	D	250
<b>Graduates</b>		
332-002-013	A	25
332-002-003	B	100
332-002-014	C	200
<b>Flask Support Boards</b>		
K45410	A	1¼" (3.18)
K45420	B	1½" (3.81)
K45430	C	2" (5.1)
K45440	D	2¾" (6.98)

## ASTM Distillation Thermometers

Catalog No.	Thermometer	Range
250-000-02C	ASTM 2C Partial Immersion	-5 to +300°C
250-000-07F	ASTM 7F Low Distillation	30 to 580°F
250-000-07C	ASTM 7C Low Distillation	-2 to +300°C
250-000-08F	ASTM 8F High Distillation	30 to 760°F
250-000-08C	ASTM 8C High Distillation	-2 to +400°C
250-000-37C	ASTM 37C Solvents Distillation	-2 to +52°C
250-000-38C	ASTM 38C Solvents Distillation	24 to 78°C
250-000-39C	ASTM 39C Solvents Distillation	48 to 102°C
250-000-40C	ASTM 40C Solvents Distillation	72 to 126°C
250-000-41C	ASTM 41C Solvents Distillation	98 to 152°C
250-000-42C	ASTM 42C Solvents Distillation	95 to 255°C
250-000-102C	ASTM 102C Solvents Distillation	123 to 177°C
250-000-103C	ASTM 103C Solvents Distillation	148 to 202°C
250-000-104C	ASTM 104C Solvents Distillation	173 to 227°C
250-000-105C	ASTM 105C Solvents Distillation	198 to 252°C
250-000-106C	ASTM 106C Solvents Distillation	223 to 277°C
250-000-107C	ASTM 107C Solvents Distillation	248 to 302°C

For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.

# Automatic Distillation of Petroleum Products

## Automatic Distillation System

- Conforms to ASTM D86, D285, and related international specifications
- Pt-100 RTD probe with **completely automatic temperature calibration system** (°C or °F)
- Windows® 95/98 software package for easy PC control of distillation unit
- Versatile unit performs distillation analysis on samples with final boiling points (FBP) up to 420 °C and according to distillation group (DG) methods 0 to 4
- Microprocessor-based diagnostic system continuously ensures proper operation and user safety
- Low mass, low inertia 24V AC heater element provides precise temperature control
- Infrared system accurately measures distillate volume to 0.01mL during operation
- Automatic determination of initial boiling point (IBP), FBP, dry point, and barometric compensation
- Up to 32 units can be interfaced to a single PC for easy operational control and test analysis

Automatic apparatus designed to perform optimal distillation analyses of gasolines, fuels, oils, solvents, aromatics, naphthas, kerosenes, hydrocarbons, and other volatile products to ensure conformity to rigid quality control standards. Units are designed to automatically perform tests, process results, and produce standard reports according to ASTM, ISO, and related specifications. Easy-to-use PC communication software expands user capabilities for data manipulation and unit control. Distillation methods and parameters can be easily created or modified. Optional models with integrated PC and LCD display are available. High-performance, low-inertia 24V AC heater provides precise temperature control for maintaining uniform distillation rates. Powerful CFC-free cooling system allows effortless changes between distillation groups. Forced-air system begins cooling unit at the completion of a distillation run to reduce operator down time. A series of Pt-100 RTD probes monitor distillation flask, distillate vapor, condenser, and receiver compartment and mimic the response of mercury-in-glass thermometers with an accuracy of  $\pm 0.01^{\circ}\text{C}$ . Microprocessor-based control system continuously monitors test results, unit operation, safety features, and alerts user to maintenance needs or safety problems. Test results displayed in real-time and can include distillation curve and temperature with or without barometric compensation and/or evaporation correction, distillation rate, heating power curve, master curve comparison, and zoom function for high resolution of heating and temperature curves. Complete data storage of results and limited only by the hard drive capacity of external PC. Point by point comparisons of distillation results are easily performed for quality control and referencing. Automatic dry point determination, and optional dry point detector improves accuracy and repeatability. Modular design for simple maintenance operations. The in-built fire extinguishing system with optical detection for fast response ensures user and laboratory safety.

### Included Accessories

Distillation Flask, 125mL  
Ceramic Distillation Plates  
Pt-100 RTD Probe  
Special Graduated Receiver Cylinder  
Wiper for Condenser Tube



*K45603 Automatic Distillation System with LCD Display and Integrated PC*

### Specifications

Conforms to the specifications of:

ASTM D86, D285, D850, D1078; DIN 51751; ISO 3405; IP 123;  
NF M 07-002

Electrical Requirements:

115V 50/60Hz, 2300W  
230V 50/60Hz, 2300W

**Dimensions** lxxwxh,in.(cm)

21½x21¼x27½ (54½x54x70)

Net Weight: 161 lbs (73kg)

### Shipping Information

Shipping Weight: 210 lbs (95 kg)  
Dimensions: 28 Cu. ft.

### Ordering Information

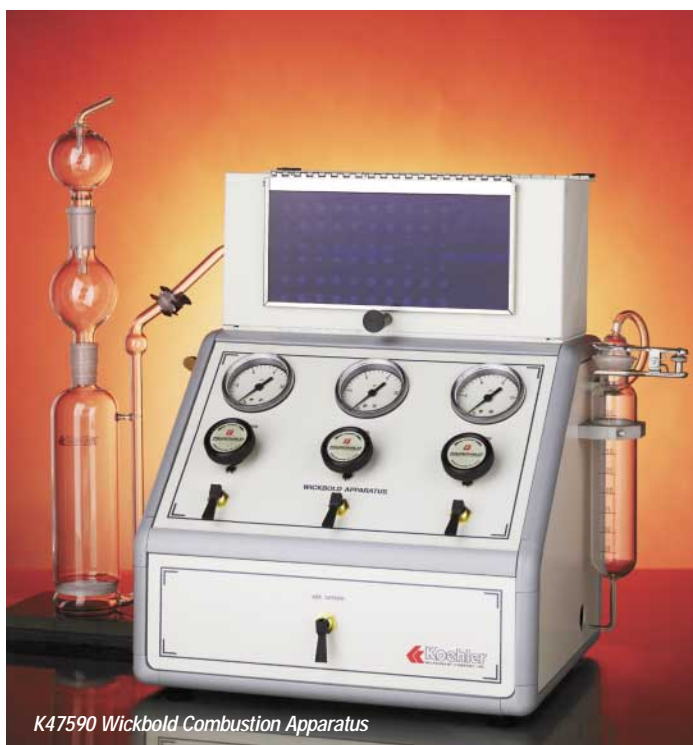
#### Catalog No.

K45601	Automatic Distillation Apparatus, 115V 50/60Hz
K45602	Automatic Distillation Apparatus, 230V 50/60Hz
K45603	Automatic Distillation Apparatus with LCD Display and Integrated PC, 115V 50/60Hz
K45604	Automatic Distillation Apparatus with LCD Display and Integrated PC, 230V 50/60Hz

#### Accessories

K45654	Automatic Dry Point Detection System
K45677-A	Dry Point Detection Board
K45627-A	PC Adapter with Software for K45601/K45602

# Sulfur, Trace Sulfur, Volatile Chlorides



K47590 Wickbold Combustion Apparatus

## Specifications

Conforms to the specifications of:

ASTM D2384, D2747, D2784,  
D2785; GPA 2140; IP 243;  
ISO 4260; DIN EN 41; NF T 60-142

## Included Accessories

Complete Glassware Set  
Sample Capillary  
Sample Reservoir  
Combustion Chamber  
Absorber  
Spray Trap  
Cooling Bulb  
Stainless Steel Burner

## Dimensions l x w x h, in. (cm)

Cabinet only: 15x13x18½ (38x33x47)  
Net Weight: 40 lbs (18.1kg)

## Shipping Information

Shipping Weight: 62 lbs (28.1kg)  
Dimensions: 11.9 Cu. ft.

## Sulfur in Liquefied Petroleum Gases (Oxy-Hydrogen Burner)

Traces of Volatile Chlorides in  
Butane-Butene Mixtures

## Trace Quantities of Total Sulfur (Wickbold Apparatus)

Sulfur in Petroleum Products  
(Wickbold Apparatus)

## Test Method

Determines total sulfur in liquefied petroleum (LP) gases and in liquid petroleum products by the Wickbold oxy-hydrogen burner method. Also suitable for burning butane-butene mixtures to determine trace amounts of volatile chlorides.

## Wickbold Combustion Apparatus

- Conforms to ASTM D2384, D2784, D2785 and related specifications

Burns samples in a stainless steel oxy-hydrogen burner to determine total sulfur in petroleum products in the 0.1 to 300ppm range. Tests samples which are viscous, highly aromatic or of high sulfur content with the use of appropriate solvents.

Combustion chamber and stainless steel burner are housed in an insulated chamber with hinged heat-resistant and glare-proof shield for viewing burner flame. To ignite flame, depress electronic spark ignitor handle at side of unit. Ignitor shuts off when handle is released. Built-in pressure regulators with gauges allow for accurate adjustment and monitoring of hydrogen, oxygen and nitrogen pressure. Burner is easily disassembled for cleaning.

Supplied with a complete set of Pyrex™ and quartz glassware, including 200mL sample reservoir, sample capillary, combustion chamber, absorber, spray trap and cooling bulb, and compression-type gas connection fittings for ¼" (6mm) O.D. tubing. Housed in a finished aluminum cabinet. For LPG, natural gas and refinery gas samples, order accessory sample adapter.

## Ordering Information

Catalog No.		Order Qty
K47500	Wickbold Apparatus, 115V 50/60Hz	1
K47590	Wickbold Apparatus, 220-240V 50/60Hz	

## Accessories

K47580	Gas Sample Adapter For burning liquefied petroleum, natural and refinery gases in the Wickbold Apparatus. Constructed entirely of stainless steel, with 150mL sample cylinder, connecting tubing and all necessary valves and couplings	1
K47510	Sample Capillary	
K47520	Sample Reservoir	
K47530	Combustion Chamber	
K47540	Absorber	
K47550	Spray Trap	
K47560	Cooling Bulb	
K47570	Stainless Steel Burner	

# Ramsbottom Carbon Residue of Petroleum Products

## Test Method

Determines the 'carbon residue' left after evaporation and pyrolysis of a sample oil in the Ramsbottom furnace, providing an indication of the deposit forming tendencies of fuels and guidelines for the processing of refinery products.

## Ramsbottom Carbon Residue Apparatus

- Conforms to ASTM D524 and related specifications
- Microprocessor temperature control with digital display and overtemperature cut-off

Thermostatically controlled coking furnace for five samples. Cast-iron block type furnace reaches the standard test temperature of 550°C (1022°F) rapidly and controls with  $\pm 1^\circ\text{C}$  stability. Microprocessor temperature control has  $^\circ\text{C}/^\circ\text{F}$  switchable digital setpoint and display. Operator and equipment are protected by an overtemperature control circuit which automatically interrupts power to the unit should block temperature exceed the programmed cut-off point. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.* Heavily insulated stainless steel cabinet with three-layer refractory top provides excellent heat retention.



K27100 Ramsbottom Carbon Residue Apparatus

### Ordering Information

Catalog No.	Description	Order Qty
K27100	Ramsbottom Carbon Residue Apparatus, 115V 50/60Hz	1
K27190	Ramsbottom Carbon Residue Apparatus, 220-240V 50/60Hz	
<b>Accessories</b>		
332-007-001	Coking Bulb Pyrex™, with capillary Conforms to ASTM D524 specifications	5
362-010-001	Sample Charging Syringe	1
382-018-001	Needle, 18 gauge, 2"	1
K27320	Coking Bulb Filling Device Convenient time saving device fills up to five coking bulbs at a time. Ideal for viscous fluids that are difficult to handle at room temperature.	1
K27200	Control Bulb Stainless steel, with IC thermocouple. May be used with a thermocouple pyrometer* to verify compliance of the furnace with ASTM performance requirements.	1
K29310	Digital Thermometer, 115V	
K29319	Digital Thermometer, 220-240V <i>*The K29310 Digital Thermometer is suitable for this purpose.</i>	

## Specifications

Conforms to the specifications of:

ASTM D524, D6074; IP 14; ISO 4262; FTM 791-5002; NF T 60-117

Furnace Type: Cast iron block

Capacity: 5 coking bulbs

Maximum Temperature: 650°C (1200°F)

Controller Sensitivity:  $\pm 1^\circ\text{C}$  ( $\pm 2^\circ\text{F}$ )

Heater: 0-2400W, ceramic band heater

Electrical Requirements:

115V 50/60Hz, Single Phase, 20.8A

220-240V 50/60Hz, Single Phase, 10.9A

## Dimensions l x w x h, in. (cm)

16x21½x14½ (41x55x37)

Net Weight: 64 lbs (29kg)

## Shipping Information

Shipping Weight: 78 lbs (35kg)

Dimensions: 8.2 Cu. ft.

## Lead in Gasoline, Acidity, Salt Content



### Lead in Gasoline by Volumetric Chromate Method Acidity (Inorganic) of Petroleum Products by Color Indicator Titration Method Salt Content of Crude Petroleum and Products

#### Test Method

Determines lead, acid or salt content of crude petroleum and products by extraction.

#### Dual Extraction Apparatus

- Conforms to ASTM D2547, IP 77, 182, 248 and ISO 2083 specifications

Consists of two sets of glassware mounted on a sturdy base/upright assembly with separate line switches, rheostats and condenser water control valves for each. Each glassware set includes 500mL boiling flask, Hopkins reflux condenser with aspirator, thistle tube, heating tube, 250W heating coil and 400mL Pyrex™ beaker.

#### Specifications

Conforms to the specifications of:  
ASTM D2547; IP 77, 182, 248;  
ISO 2083; NF M 07-014, 07-023

#### Dimensions lwxh,in.(cm)

17x11x36½ (43x28x93)  
Net Weight: 46 lbs (21kg)

#### Shipping Information

Shipping Weight: 66 lbs (30kg)

#### Ordering Information

Catalog No.		Order Qty
K46600	Dual Extraction Apparatus, 115V 50/60Hz	1
K46690	Dual Extraction Apparatus, 220-240V 50/60Hz	

## Conradson Carbon Residue of Petroleum Products

#### Test Method

Provides an indication of relative coke forming properties of petroleum oils. The residue remaining after a specified period of evaporation and pyrolysis is calculated as a percentage of the original sample.

#### Conradson Carbon Residue Apparatus

- Conforms to ASTM D189 specifications

A weighed quantity of sample is placed in a crucible and heated to a high temperature for a fixed period. The crucible and the carbonaceous residue is cooled in a desiccator and weighed. The residue remaining is calculated as a percentage of the original sample and reported as conradson carbon residue.

#### Ordering Information

Catalog No.		Order Qty
K80030	Conradson Carbon Residue Apparatus	1
<b>Accessories</b>		
250-000-08F	ASTM 8F Thermometer. Range: 30 to 760°F Recommended for testing light distillate oils	1
250-000-08C	ASTM 8C Thermometer. Range: -2 to +400°C	
K80031	Porcelain Crucible	
K80032	Skidmore Crucible, with Monel Cover	
K80033	Monel Crucible, with cover	
K80034	Monel Hood, with bridge	
K80035	Refractory Block	

For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.



#### Specifications

Conforms to the specifications of:  
ASTM D189, D6074;  
ANS Z-11.25; IP 13; ISO 6615;  
DIN 51551; FTM 791-5001;  
NF T 60-116

#### Included Accessories

Porcelain Crucible  
Skidmore Crucible, with  
Monel Cover  
Monel Crucible, with Cover  
Monel Hood, with Bridge  
Refractory Block

#### Shipping Information

Shipping Weight: 7 lbs (3.2kg)

# Sediment in Crude Oils and Fuel Oils by the Extraction Method

## Test Method

Determines sediment content of crude oil and fuel oils by extraction with toluene.

## Sediment Extraction Apparatus

- Conforms to ASTM D473 and related specifications

A test portion of the sample is placed in a refractory thimble. Toluene is gently boiled and its vapors condensed and allowed to drip into the sample funnel. The toluene washes out all of the crude oil or fuel oil leaving the insoluble residue only in the thimble. The mass of the residue is calculated as a percentage and is referred to as the sediment by extraction. Includes condenser thimble basket, water cup and extraction thimble.



K48300 Sediment Extraction Apparatus

### Ordering Information

Catalog No.		Order Qty
K48300	Sediment Extraction Apparatus	1
<b>Accessories</b>		
K42000	Powerrol Heater, 115V 50/60Hz	1
K42090	Powerrol Heater, 220-240V 50/60Hz	
K48400	Condenser	
K48500	Thimble Basket	
K48600	Water Cup	
K48700	Extraction Thimble	

### Specifications

Conforms to the specifications of:

ASTM D473; IP 53; ISO 3735; DIN 51789; FTM 791-3002; NF M 07-010

# Salts in Crude Analyzer

## Test Method

Salt content is determined by measuring the conductivity of a solution of crude oil in a polar solvent when subjected to an alternating electrical current and is obtained by comparison of the resulting conductance to a calibration curve of known salt mixtures.

## Electrometric Salt Determinator

- Conforms to ASTM D3230 test specifications
- Measures salt content, conductance, and temperature of crude oil samples, and pH measurements of aqueous samples
- Portable for field or laboratory testing with up to 8 hours of continuous operation from internal Ni-Cd rechargeable batteries (extended battery-powered operation option available)
- 18-bit analog-to-digital converter for high precision
- 24Kb RAM dedicated for data storage (about 500 test results)
- Data can be easily uploaded in a comma delimited format to a PC with Windows® 95/98/NT-based software via an RS232 serial data port

Determines the salt content, conductance, and temperature of crude oil samples according to ASTM D3230 specifications. Utilizes the latest low-voltage, synchronous detection technology for conductivity measurements and a high-accuracy thermistor array to measure sample temperature. Automatically calculates salt concentration directly from acquired temperature and conductivity values. Measures conductivity over four ranges 0-2, 2-20, 20-200, and 200-1500  $\mu$ S with automatic range selection. Self-calibration feature allows operator to adjust for any drift without re-entering standard temperature curves. Complete data storage of test results which is limited only by the hard drive capacity of external PC. Easy-to-read alpha-numeric display shows any four of the following parameters at one time as chosen by the operator: salts, conductance, conductance @ 25°C, pH, pH millivolts, temperature (°C or °F), internal and external battery voltages, date, time, logging ID, and ID increment value.



K23000 Electrometric Salt Determinator

### Dimensions

1xwxh,in.(cm)  
12x20x12 (30½x51x30½)  
Net Weight: 6 lbs (2¾kg)

### Shipping Information

Shipping Weight: 9 lbs (4kg)  
Dimensions: 2.3 Cu. ft.

### Ordering Information

Catalog No.	
K23000	Electrometric Salt Determinator, 115V 50/60Hz
K23090	Electrometric Salt Determinator, 230V 50/60Hz

# Water and Sediment in Crude Oil and Fuel Oils by Centrifuge Method

## Test Method

Centrifugation provides a convenient means of determining sediment and water content in crude oil, fuel oils, and middle distillate fuels. Also used in determining the precipitation number, demulsibility characteristics, trace sediments, and insolubles in used lubricating oils.

## Oil Test Centrifuge

- Accommodates four (4) centrifuge tubes of 6 and 8" conical ASTM types, pear-shaped tubes, and finger tubes
- Automatic control of acceleration ramp, centrifugation speed, and timing functions
- Digital speed and temperature displays
- Doubly-insulated to reduce heat loss
- Self balancing, quiet operation
- Sliding stainless steel lid

Fully automatic bench top centrifuge designed expressly for petroleum testing applications. Accommodates four (4) centrifuge tubes of ASTM conical type (6 or 8"), pear shaped (100mL), or finger tube (12.5mL) with the use of appropriate accessories. Molded PTFE supports provide for maximum protection and easy positioning of tubes. Quiet running unit features elastic suspension of the drive motor for self-balancing operation. Voltage compensating circuitry ensures constant operating speed in the event of voltage fluctuations at the main power supply. Includes automatic electronic braking system and safety interlocks.

## Specifications

Conforms to the specifications of:

ASTM D91, D96, D893, D1796, D2273, D2709, D2711, D4007; IP 75, 145, 359; API 2542, 2548; ISO 3734; DIN 51793; NF M 07-020

Capacity: Four (4) oil test centrifuge tubes (100 mL), finger tubes (12.5 mL), or pear-shaped tubes (100 mL).

Maximum Speed: 1850 rpm

Maximum RCF: 780 (Finger); 865 (Pear); 900 (short cone); 940 (long cone)

Timer: 0 to 99:99:99 (hh:mm:ss)

Set Speed: 200-1850rpm

Speed Readout: 0-1850rpm

Temperature Control: ambient to 93°C

Temperature Readout: Digital

Brake: Automatic Electronic

Safety Features: Powers off when power is interrupted; Lid stays locked when motor is spinning; Motor will not start when lid is open

## Electrical Requirements:

115V 50/60Hz, 10A

230V 50/60Hz, 5A

## Dimensions l x w x h, in.(cm)

23x30x13½ (51x76x34)

Net Weight: 93 lbs (42 kg)

## Shipping Information

Shipping Weight: 110 lbs (50 kg)

Dimensions: 11.2 Cu. ft.



K61092 Oil Test Centrifuge

## Ordering Information

### Catalog No.

- K61002** Oil Test Centrifuge, 115V 50/60Hz with integrated heating system
- K61092** Oil Test Centrifuge, 230V 50/60Hz with integrated heating system

### Accessories

- K61101** Centrifuge Tubes, Cone Shaped, 100mL, 8", marked in mL
- K61102** Centrifuge Tubes, Cone Shaped, 100mL, 6", marked in 200 parts every 4 parts above 20mL
- K61104** Centrifuge Tubes, Pear Shaped, 100mL, marked in mL
- K61105** Centrifuge Tubes, Cone Shaped, 100mL, 6", marked in mL
- K61106** Centrifuge Tubes, Cone Shaped, 100mL, 8", marked in 200 parts
- K61107** Centrifuge Tubes, Cone Shaped, 100mL, 6", marked in mL every 2mL above 10mL
- K61108** Centrifuge Tubes, Cone Shaped, 100mL, 6", marked in 200 parts
- K61109** 100 mL Trace Sediment Tubes
- K61110** Centrifuge Tubes, Cone Shaped, 100mL, 8", marked in mL every 1mL above 10mL
- K61111** Cork Stoppers for Centrifuge Tubes
- K61112** Centrifuge Tubes, Cone Shaped, 100mL, 8", marked in 200 parts every 2 parts above 20 parts

# Water and Sediment in Crude Oil and Fuel Oils by Centrifuge Method

## Portable Oil Test Centrifuge

- Portable design for remote operation with 12V DC power requirements
- Accommodates two 6" conical ASTM centrifuge tubes
- Control of acceleration ramp and centrifugation speed
- Special heating unit for sample pre-heating prior to testing
- Bowl heating system to maintain sample temperature during testing
- Doubly-insulated construction to reduce heat loss
- Self balancing, quiet operation
- Sliding stainless steel lid

Portable centrifuge designed expressly for petroleum testing applications according to ASTM D96 test method. Centrifuge accommodates two 6" conical ASTM centrifuge tubes. Molded PTFE supports provide for maximum protection and easy positioning of tubes. Quiet running unit features elastic suspension of the drive motor for self-balancing operation.

### Specifications

Conforms to the specifications of: ASTM D96  
Capacity: Two (2) oil test centrifuge tubes (100 mL)  
Maximum Speed: 2200 rpm  
Maximum RCF: 1050

**Dimensions** l x w x h, in. (cm)  
18x22½x12½ (45.75x57x31.75)  
Net Weight: 42 lbs (19kg)

**Shipping Information**  
Shipping Weight: 51 lbs (23kg)  
Dimensions: 3½ Cu. ft.



K61094 Portable Oil Test Centrifuge

### Ordering Information

<b>Catalog No.</b>	
<b>K61094</b>	Portable Oil Test Centrifuge, 12V DC

# Calibration of Liquid-in-Glass Thermometers

## Thermometer Calibration Bath

- Calibrates thermometers, temperature controllers and other temperature instruments against a factory certified thermometer traceable to NIST standards
- Verifies accuracy of routine thermometers
- For temperatures between ambient to 200°C (-30°C with the use of circulated refrigerated coolant)
- Digital temperature control with temperature uniformity of ±0.02°C
- Built-in ice bath for performing ice point calibrations
- Meets the requirements of NBS Monograph 150

Constant temperature calibration bath for liquid-in-glass thermometers, dial thermometers, digital thermometers and other temperature measuring instruments. Consists of an oil bath with digital electronic control providing temperature uniformity of ±0.02°C in the range -30°C to +200°C. Accessory Standard Thermometer is calibrated and certified traceable to NIST standards. Turntable rack inserts in bath to immerse six thermometers or temperature probes and the standard thermometer. Bath depth of 12" (30.5cm) accommodates all partial immersion thermometers and most 15" total immersion thermometers.

Features digital setpoint and display (°C/°F switchable) of bath temperature for maximum convenience, and overtemperature control to prevent accidental overheating. Built-in cooling coil permits circulation of tap water or refrigerated coolant to permit operation at sub-ambient temperatures or to facilitate rapid cool down for multi-point calibrations. Equipped with drains for oil bath and ice bath.

**Dimensions:** l x w x h, in. (cm)  
28x24x21 (71x61x53)  
Net Weight: 52½ lbs (23.9kg)

**Shipping Information**  
Shipping Weight: 66 lbs (30kg)  
Dimensions: 8.2 Cu. ft.

### Specifications

Temperature Range: -30°C to +200°C  
*For sub-ambient temperatures, refrigerated recirculating coolant is required from an external source.*  
Temperature Uniformity: ±0.02°C  
Temperature Limit Control: -16.7°C (30°F) above setpoint and 204°C (400°F) maximum  
Heater Range: 0-750W  
Circulator: ½ hp impeller  
Working Depth: Oil Bath: 12" (30.5cm)  
Ice Bath: 10½" (26.7cm)

### Ordering Information

Catalog No.		Order Qty
<b>K26500</b>	Thermometer Calibration Bath, 115V 50/60Hz	1
<b>K26590</b>	Thermometer Calibration Bath, 220-240V 50/60Hz	

### Accessories

<b>K26501</b>	Standard Thermometer, certified traceable to NIST Standards at 0, 20, 37, 56, 80, 100, 121, 140, 160, 180 and 200°C	1
<b>K26503</b>	Thermometer Magnifier(10X)	1
<b>K26502</b>	Thermometer Carrying Case, holds K26501 Standard Thermometer	1

# Un sulfonated Residue of Petroleum Plant Spray Oils



K36050 Unsulfonated Residue Tester

## Specifications

Conforms to the specifications of:  
ASTM D483; DIN 51362  
Testing Capacity: four (4) samples  
Mechanical Shaker:  
Shaking rate: 300-500 cycles/min.  
Indicators: cycle speed,  
cycle counter  
Boiling Water Bath:  
Heater Range: 0-1200W  
Electrical Requirements:  
115V 50/60Hz, 10.4A  
220-240V 50/60Hz, 5.4A

## Included Accessories

Flask Carrier

## Dimensions

l x w x h, in. (cm)  
14 x 15 x 21 (35.6 x 38.1 x 53.3)  
Net Weight: 56 lbs (25.5kg)

## Shipping Information

Shipping Weight: 70 lbs (32kg)  
Dimensions: 10.3 Cu. ft.

## Test Method

Provides an indication of the degree of refinement of petroleum plant spray oils, which is a determinant of their suitability for various applications. The volume of sample not absorbed after shaking with sulfuric acid for 10 seconds at 10 minute intervals is the unsulfonated residue in the sample.

## Unsulfonated Residue Tester

- Conforms to ASTM D483 specifications
- Variable shaking rate

Combined shaking machine and boiling water bath accommodates four sulfonation flasks. A removable carrier transfers flasks quickly between the shaker and the bath. Variable speed mechanical shaker is adjustable for shaking rates between 300-500 cycles/min. Electrically heated water bath immerses flasks at the required depth per ASTM specifications. Bath is constructed entirely of stainless steel and has a hinged cover for easy access.

## Ordering Information

Catalog No.		Order Qty
K36050	Unsulfonated Residue Tester, 115V 50/60Hz	1
K36059	Unsulfonated Residue Tester, 220-240V 50/60Hz	

## Accessories

K36010	Water Bath Accommodates four-unit flask carrier from Unsulfonated Residue Tester. Thermostatically controlled bath immerses flasks at the required depth per ASTM specifications. Built-in cooling coil permits operation at 25°C ± 0.5°C, 115V 50/60Hz	1
K36019	Water Bath, 220-240V 50/60Hz	
332-005-007	Sulfonation Flask	4
250-000-09F	ASTM 9F Thermometer Range: 20 to 230°F	1
250-000-09C	ASTM 9C Thermometer Range: -5 to +110°C	

For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.

# Rust Protection by Metal Preservatives in the Humidity Cabinet

## Test Method

Tests the ability of metal preservatives to prevent steel panels from rusting under conditions of high humidity. Polished steel panels are immersed in the sample oil and then suspended in the humidity cabinet for a specified test period.

## Humidity Cabinet

- Conforms to ASTM D1748 and FTM 791-5310 specifications

Produces a moisture saturated atmosphere with continuous condensation at a constant 120°F (48.9°C) for 33 steel test specimens. Test panels are suspended on a 1/8rpm rotating stage. Air flow and water level control systems maintain required conditions inside the cabinet per Mil. Spec. and ASTM specifications. Air temperature is maintained at 120 ±2°F (48.9 ±1.1°C) by a digital LCD electronic controller. A continuous heater circuit assists the control heater in bringing the cabinet up to temperature prior to testing. Overtemperature protection is provided by an adjustable digital thermostat which cuts off power to the cabinet in case of overheating.

Cabinet interior is stainless steel lined and all interior components are of stainless steel or chrome plated steel construction. Hinged cover consists of two layers of desized cotton cloth mounted on a metal frame. Oil and condensate dripping from the specimens are collected in a drip pan and piped to an external drain.



K35200 Humidity Cabinet

### Ordering Information

Catalog No.		Order Qty
<b>Humidity Cabinet</b>		
K35200	Humidity Cabinet, 115V 60Hz	1
K35295	Humidity Cabinet, 220-240V 50Hz	
K35296	Humidity Cabinet, 220-240V 60Hz	
<b>Accessories</b>		
K35210	Steel Test Panels Soft temper low carbon cold rolled steel, surface ground on both faces to a 10-20 micro-inch finish. 2x4x1/8" (51x102x3.2mm)	33
380-240-002	Aluminum Oxide Cloth, 240-grit For test panel preparation. Pack of 50	1
250-000-09F	ASTM 9F Thermometer Range: 20 to 230°F	1
250-000-09C	ASTM 9C Thermometer Range: -5 to +110°C	

For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.



Digital Flowmeter option is available for this unit.

## Specifications

Conforms to the specifications of:  
 ASTM D1748; FTM 791-5310  
 Capacity: 33 rust test specimens  
 Water Level Control: 8 in. (203mm)  
 Temperature Control Stability: ±2°F (± 1.1°C) (air temperature)  
 Heater Range: 0-1500W  
 Air Metering: 0.878±0.02832m³/h at standard temperature and pressure (31±1 ft³/h)  
 Air Distribution: 20-diffuser manifold  
 Rotating Stage: 1/8rpm  
 Electrical Requirements: 115V 60Hz, Single Phase, 13.0A  
 220-240V 50Hz or 60Hz, Single Phase, 6.8A

## Included Accessories

Monel Test Specimen Hooks (33 sets)

## Dimensions lwxhxh,in.(cm)

32x28x41 1/2 (81x71x105)  
 Net Weight: 206 lbs (93.4kg)

## Shipping Information

Shipping Weight: 279 lbs (126.6kg)  
 Dimensions: 41 Cu. ft.

# Sampling of Petroleum and Petroleum Products and LP Gases



## Sampling of Petroleum and Petroleum Products Sampling Liquefied Petroleum (LP) Gases

### Test Method Standards

All samplers conform to ASTM D4057 (formerly ASTM D270), D6074 or ASTM D1265 specifications.

### Sample Thief (Bacon Bomb)

- Obtains bottom samples or samples from any level
- Four different capacities
- Plated brass, stainless steel or acrylic construction
- Standard Viton O-ring seal
- Optional metal-to-metal seal

Obtains samples from storage tanks, tank cars and drums. When the thief strikes the bottom of the tank, a plunger assembly opens to admit the sample. The plunger closes again when the bomb is withdrawn, forming a tight seal. Samples can be taken at any depth with the use of a secondary trip line, or extension rods may be added for obtaining samples at levels of up to 18"(46cm) off the bottom. Equipped with plunger locking cam for tight closure during transport (except for 4 oz 1 1/8" dia. model). Special models include a 4 oz (118mL) 'pencil' model for sampling through small diameter pipes and openings, and clear acrylic samplers with plated brass plunger and end pieces. Modified samplers can be supplied for special applications – we invite your inquiries.

### Specifications and Ordering Information

Catalog No.	Capacity oz(mL)	Construction	Seal	Outside Diameter (O.D.)in.(cm.)	Overall Length in.(cm)	Shipping Weight lbs(kg)
K27700	32 (946)	plated brass	Viton O-ring	3 3/8 (8.6)	15 1/2 (38.5)	13 (5.9)
K27701	32 (946)	stainless steel	Viton O-ring	3 3/8 (8.6)	15 1/2 (38.5)	13 (5.9)
K27790	16 (473)	plated brass	Viton O-ring	2 3/4 (7)	12 1/2 (30.6)	9 (4.1)
K27795	16 (473)	plated brass	Metal Seat	2 3/4 (7)	12 1/2 (30.6)	9 (4.1)
K27791	16 (473)	stainless steel	Viton O-ring	2 3/4 (7)	12 1/2 (30.6)	8 (3.6)
K27792	16 (473)	acrylic	Viton O-ring	2 3/4 (7)	12 1/2 (30.6)	8 (3.6)
K27780	8 (237)	plated brass	Viton O-ring	2 5/8 (5.9)	10 3/2 (25.8)	5 (2.3)
K27785	8 (237)	plated brass	Metal Seat	2 5/8 (5.9)	10 3/2 (25.8)	5 (2.3)
K27781	8 (237)	stainless steel	Viton O-ring	2 5/8 (5.9)	10 3/2 (25.8)	5 (2.3)
K27782	8 (237)	acrylic	Viton O-ring	2 5/8 (5.9)	10 3/2 (25.8)	5 (2.3)
K27770	4 (118)	plated brass	Viton O-ring	1 1/8 (4.7)	9 1/16 (24.6)	4 (1.8)
K27771	4 (118)	stainless steel	Viton O-ring	1 1/8 (4.7)	9 1/16 (24.6)	4 (1.8)
K27772	4 (118)	plexiglass	Buna N O-ring	1 1/8 (4.01)	9 1/16 (24.6)	3 (1.4)
K27760	4 (118)	plated brass	Viton O-ring	1 1/8 (2.8)	13 3/4 (33.7)	3 (1.4)
K27761	4 (118)	stainless steel	Viton O-ring	1 1/8 (2.8)	13 3/4 (33.7)	3 (1.4)
K27762	4 (118)	acrylic	Viton O-ring	1 1/8 (2.8)	13 3/4 (33.7)	3 (1.4)

### Sample Thief Extension Rods

Installs in sample thief plunger assembly. Stainless steel with threaded end.

Catalog No.	Length in. (cm)	Application
K277-EXT1	1 (2.5)	
K277-EXT2	2 (5.1)	
K277-EXT3	3 (7.6)	32,16 and
K277-EXT6	6 (15.2)	8 oz models
K277-EXT12	12 (30.5)	
K277-EXT18	18 (45.7)	
K277C-EXT1	1 (2.5)	
K277C-EXT2	2 (5.1)	
K277C-EXT3	3 (7.6)	4 oz models
K277C-EXT6	6 (15.2)	
K277C-EXT12	12 (30.5)	
K277C-EXT18	18 (45.7)	

### All-Levels Sample Thief

Similar to the standard 16 oz (473mL) Sample Thief (Bacon Bomb), but equipped with an adjustable needle valve opening instead of a plunger to control rate of flow during 'all-levels' and 'running' sampling from storage tanks. Plated brass construction.

#### Ordering Information

Catalog No.  
K27800 All-Levels Sample Thief

### Adjustable-Level Sample Thief

Takes samples at depths up to 12" (30.5cm) from bottom. Similar to the standard 16 oz (473mL) Sample Thief (Bacon Bomb), but with built-in graduated extension rod adjustable between 0-12" (30.5cm). Plated brass construction.

#### Ordering Information

Catalog No.  
K27900 Adjustable Level Sample Thief

# Sampling of Petroleum and Petroleum Products and LPG

## Drum Thief (Sampling Tube)

- Choice of plated brass or stainless steel construction

For tube sampling from barrels and drums. Takes bottom samples or all-levels samples. 40" Long x 1 1/4" dia. (102x3.2cm). Maximum sample capacity of 24 oz (710mL). Shipping Weight: 6 lbs (2.7kg).

### Ordering Information

#### Catalog No.

K27400	Drum Thief, plated brass
K27401	Drum Thief, stainless steel

## Weighted Beaker

- Capacity 32 oz. (946mL)
- Choice of 3/4" or 1 1/2" (19 or 38mm) opening

For beaker sampling from tank cars, tank trucks, shore tanks, ship tanks and barge tanks. Copper construction with weighted bottom. Includes handle and chained cork. Takes all level samples, running samples, and top, upper, middle, lower and outlet samples. Select 3/4" (19mm) opening for light crude oils, light lubricating oils, kerosenes, gasolines, transparent gas oils, diesel fuels, and distillates, or 1 1/2" (38mm) for heavy crude and fuel oils, heavy lubricating oils and nontransparent gas oils. Shipping weight: 6 lbs (2.7kg).

### Ordering Information

#### Catalog No.

K27600	Weighted Beaker, with 3/4" opening
K27610	Weighted Beaker, with 1 1/2" opening



K27400  
Drum Thief



K27600  
Weighted Beaker

## LPG Sample Containers

- Two-valve type with 20% outage tube
- Built-in pressure relief valve
- Conforming to ASTM D1265 and GPA 2140 specifications

Welded stainless steel cylinders for obtaining representative samples of liquefied petroleum (LP) gases. Two-valve type (1/4 IPS), with 20% outage tube and built-in pressure relief valve factory preset between 540 to 600psi (38-42 kg/cm<sup>2</sup>).

### Ordering Information

#### Catalog No.

K27851	LPG Sample Cylinder, 150mL
K27852	LPG Sample Cylinder, 300mL
K27853	LPG Sample Cylinder, 500mL
K27854	LPG Sample Cylinder, 1000mL
K27856	LPG Sample Cylinder, 3000mL

## Tank Car Gauging Pole

- Meets ASTM D1085 specifications
- 36" or 32 1/2" in length, with 1/8" graduations

### Ordering Information

#### Catalog No.

K28000	Tank Car Gauging Pole, 36"
K28010	Tank Car Gauging Pole, 32 1/2"



K27851 Series LPG Sample Cylinder

# Freezing Point of Aqueous Engine Coolant Solution

## Test Method

Determines the freezing point of aqueous engine coolant solutions by cooling a sample with continuous agitation until a plateau is observed in a time-temperature curve.

## Freezing Point Apparatus

- Conforms to ASTM D1177 specifications

Determines freezing points of aqueous engine coolants. Includes 200mL freezing tube with drilled cork, outer flask, motorized stirrer, clamps and stand. Similar to K29700 Freezing Point Apparatus.

Ordering Information		
Catalog No.		Order Qty
K29750	Freezing Point Apparatus, 115V 60Hz	1
K29758	Freezing Point Apparatus, 220-240V 50Hz	
K29759	Freezing Point Apparatus, 220-240V 60Hz	
250-000-75F	ASTM 75F Thermometer Range: -35 to +35°F	1
250-000-76F	ASTM 76F Thermometer Range: -65 to +5°F	

For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.



K29750 Freezing Point Apparatus

# Color of Maleic and Phthalic Anhydrides

## Test Method

Molten samples of maleic or phthalic anhydride are compared with Platinum-Cobalt color standards for determining sample purity and the qualitative stability in the presence of contaminants. High color content normally indicates contamination.

## Anhydride Purity Bath

- Conforms to ASTM D3366 specifications
- Redundant overtemperature protection circuitry
- Microprocessor-based temperature controller

Electrically heated aluminum block features a microprocessor-based temperature controller with overtemperature protection circuitry and a dual LED temperature display. The heating unit provides temperature stability, heating rates, and minimal temperature gradients which exceed ASTM specifications, and is housed in an insulated steel cabinet with a chemically-resistant painted finish. Up to six samples can be tested at a time using Nessler tubes. Visual color comparisons are made against solutions of Platinum-Cobalt color standards. (Please refer to pages 44-47 for Koehler's line of color measurement and comparison instrumentation.)



K56300 Anhydride Purity Bath

**Dimensions** l x w x h, in. (cm)  
12x12x21 (31x31x54)  
Net Weight: 65 lbs (30 kg)

**Shipping Information**  
Shipping Weight: 76 lbs (35 kg)  
Dimensions: 9 Cu. ft.

## Ordering Information

Catalog No.		Order Qty
K56300	Anhydride Purity Bath, 115V 50/60Hz	1
K56390	Anhydride Purity Bath, 220-240V 50/60Hz	
K56306	Nessler Tubes	6

# Automatic Melting Point Range Apparatus

## Automatic Melting Point Range Apparatus

### Test Method

The melting point of a crystalline solid is the temperature at which the solid to liquid phase transition occurs, referenced at one atmosphere (1 ATM) of pressure.

- Conforms to BP Appendix 5 - Method 6 and GLP specifications
- Readily interchanged between automatic and manual detection of melting point ranges
- Intelligent Lamp Intensity Control with Soft Start
- Storage capacity for up to 20 sample tests
- User-interactive software and data entry, including easy alphanumeric entry of sample name, ID number, and date
- User selectable operating modes:
  - **AUTO detection mode:** Start/end of melting point range is automatically detected by a photosensing infrared device. The melting process is recorded and viewed on-screen in real-time by a CCD camera.
  - **MANUAL detection mode:** Start/end of melting point range can be selected manually with a key-press by user. Sample melting point can be determined as per BP method by 'Heat & Cool' temperature function. As above, the melting process is recorded and viewed on-screen in real-time by a CCD camera.

Melting apparatus is the latest technology for microprocessor-based determinations of melting point ranges of crystalline, powdered and polymeric materials, and is used to assess sample purity. Requires approx. 5mg of sample spread uniformly on a glass slide, covered with a glass coverslip. The slide is placed on a uniformly heated, round furnace and subjected to a heating profile as required by the user. Precise temperature control gives reproducible results to within 1%. The unit contains an automatic temperature safety cut-off feature if no melting points are detected 15°C above the expected melting point or if the oven reaches 315°C. The melting process is magnified, recorded, and viewed on-screen in real-time by a CCD camera. The change in physical appearance of the sample with respect to temperature is recorded, and the start/end of melting is observed automatically. A representation of the entire process can be printed out in graphical form for validation.

### Dimensions l x w x h, in. (cm)

Main Unit: 16½ x 12½ x 13 (42 x 31 x 33)

Monitor: 8 x 5½ x 5½ (20 x 14 x 14)

Net Weight: Main Unit: 22 lbs (10 kg)

Monitor: 1.8 lbs (0.8 kg)

### Shipping Information

Weight: 29 lbs (13 kg)

Dimensions: 3.6 Cu. ft.

### Ordering Information

Catalog No.		Order Qty
K90100	Automatic Melting Point Apparatus, 115V 60Hz	1
K90190	Automatic Melting Point Apparatus, 220V 50Hz	

### Accessories

K90104 Glass slides and cover slips (pack of 100)



K90100 Automatic Melting Point Apparatus

### Specifications

Conforms to the specifications of:

BP Appendix 5-Method 6; GLP

Visual Image: 10x magnified displayed on monitor

Temperature Range: ambient + 5 to 315°C

Heating Rates: 0.2, 0.5, 1.0, 2.0, 3.0, 6.0, 12.0°C/min

Temperature Readability: 0.1°C

Cooling Time: 20 minutes (300°C to ambient)

Temperature Accuracy: ±0.5°C (ambient + 5 to 200°C)  
±0.8°C (200 to 315°C)

Sample size: 5 mg (approx.)

Sample Holder: Glass Slide ≤1mm ±0.02mm thick

Sample Cover: Glass Coverslip ±0.17mm thick

Temperature Sensor: Pt-100 (2 wire RTD)

Test Storage: Up to 20 tests with parameters

Electrical Requirements:

115V, 60Hz, Single Phase

220V, 50Hz, Single Phase

# General Purpose Baths

## Constant Temperature Water Baths

- Three models, ranging from 3 liter to 22 liter capacity
- Microprocessor controller with LED display of setpoint and actual temperature to 0.1°C, and redundant overtemperature control
- Temperature stability within  $\pm 0.2^\circ\text{C}$
- Built-in timer with RS232 port

Economical constant temperature water baths in a range of sizes for a variety of laboratory applications. Convenient digital temperature control provides  $^\circ\text{C}/^\circ\text{F}$  switchable LED setpoint and display to 0.1°C, and temperature stability to within  $\pm 0.2^\circ\text{C}$ . A separate adjustable thermostat provides overtemperature protection. The bath reservoir is constructed of 304 series stainless steel. Utilizes water as the bath medium and the heaters will not burn out if the bath should run dry. Optional hinged, removable acrylic cover tilts to permit condensate to flow back into the bath and is gabled to accommodate sample containers of a variety of different shapes and sizes. Available flat bath covers with set of rings can be used for the evaporation of liquids and solvents and melting of solids or to accommodate sample containers of different sizes. Drain is included with all models to facilitate emptying of the bath liquid. Bath exterior is constructed of galvanized steel with an powder coating finish.

### Specifications

Temperature control: 0.1°C setpoint and C°/F° switchable LED display

Temperature stability:  $\pm 0.2^\circ\text{C}$

Temperature range: 25 to 100°C (20 to 100°C with cooling accessory)

Electronic timer: 0:01 to 9:59 hours



K33203 Constant Temperature Water Bath

### Ordering Information

Catalog No.	Capacity	Electrical Requirements	Overall Dimensions l x w x h, in. (cm)	Inside Dimensions l x w x h, in. (cm)
K33201	3-8 liter	115V 60Hz, 8.7A	11½ x 11½ x 12½	10½ x 9 x 5½
K33202	(0.8-2.1 gal)	230V 50Hz, 8.7A	(29.2 x 29.2 x 31.8)	(26.7 x 22.9 x 14)
K33203	5-12 liter	115V 60Hz, 8.7A	15¾ x 11½ x 12½	10½ x 13½ x 5½
K33204	(1.3-3.2 gal)	230V 50Hz, 8.7A	(40 x 29.2 x 31.8)	(26.7 x 34.3 x 14)
K33205	8-22 liter	115V 60Hz, 8.7A	22 x 13 x 13¾	11½ x 19½ x 7
K33206	(2.1-5.8 gal)	230V 50Hz, 8.7A	(55.9 x 33 x 34.9)	(29.2 x 49.5 x 17.8)

### Accessories

#### Acrylic Covers

K33201-0 Acrylic Cover for K33201/K33202 Baths

K33203-0 Acrylic Cover for K33203/K33204 Baths

K33205-0 Acrylic Cover for K33205/K33206 Baths

#### Cooling / Liquid Level System

K33200 Cooling / Liquid Level System

Provides counter cooling at or near ambient conditions and maintains water level at or near boiling.

#### Flat Bath Covers with Ring Sets

K33201-1 1-Hole Cover (7.5 in./19cm hole diameter) and 1 Ring Set for K33201/K33202 Baths

K33201-4 4-Hole Cover (3.6 in./9.2cm hole diameter) and 4 Ring Sets for K33201/K33202 Baths

K33203-6 6-Hole Cover (3.6 in./9.2cm hole diameter) and 6 Ring Sets for K33203/K33204 Baths

K33205-2 2-Hole Cover (7.5 in./19cm hole diameter) and 2 Ring Sets for K33205/K33206 Baths

K33205-6 6-Hole Cover (4.5 in./11.5cm hole diameter) and 6 Ring Sets for K33205/K33206 Baths

### Other General Purpose Baths Available.

Koehler also offers both Ultra Low Temperature ( $-95$  to  $0^\circ\text{C}$ ) and Heating ( $-88$  to  $+100^\circ\text{C}$ ) Circulators. These powerful systems feature dual-stage semi-hermetic compressors, full range cooling at all temperatures for faster cool down times, heavy duty refrigeration tubing, CFC-free refrigerants, high flow pressure & suction pump system designed for large external systems, adjustable high/low temperature warning and shut-off functions, low liquid level alarm, LED temperature display, and a digital RS-232 interface. Please inquire with Koehler Customer Service about any additional or ordering information.

# General Purpose Baths

## Constant Temperature Circulating Baths

- Three Models with operating ranges up to 100, 200, or 250°C
- Bath capacities ranging from 3 to 12 liters
- Redundant safety temperature control and low liquid cut-off
- Built-in cooling coil for counter cooling

**Standard Model**—Constant temperature circulating bath with analog temperature controller, large LED display, and an operating range to 100°C with  $\pm 0.03^\circ\text{C}$  stability. Choice of 3-4.5L or 7.5-12L bath capacities. Circulator has adjustable pumping speeds (3 to 15 Lpm), and hose-barb fittings for external circulation. A separate adjustable thermostat provides safety cutoff. Bath exterior is constructed of galvanized steel with an acrylic enamel finish.

**Elite Model**—Similar in design and construction to the standard model, but features a microprocessor-based temperature controller with drift compensation, an operating range to 200°C, an improved temperature stability of  $\pm 0.01^\circ\text{C}$ , an RS-232 interface, visual and audible overtemperature warning, and low liquid level protection.

**Ultra Model**—Similar in design and construction to the elite model, but features a programmable controller with self-optimizing Intelligent Cascade Control (ICC), Integrated Programmer (6 profiles, up to 60 steps), 4-line interactive LCD display, an operating range to 250°C, pumping speed up to 20 Lpm, an RS-232/485 interface, and an external port for a Pt-100 sensor.

### Specifications

Temperature Range: (with built-in counter-cooling option)

Standard model: 20°C to 100°C

Elite model: 20°C to 200°C

Ultra model: 20°C to 250°C

Temperature Stability:

Standard model:  $\pm 0.03^\circ\text{C}$     Elite and Ultra models:  $\pm 0.01^\circ\text{C}$



K33213 Constant Temperature Circulating Bath

### Ordering Information

Catalog No.	Model	Electrical Requirements	Bath Capacity	Working Dimensions lwxh, in. (cm)	Dimensions lwxh, in. (cm)	Shipping Information
K33209	Standard	115V 60Hz, 8.7A	3-4.5 liter (0.8-1.2 gal)	6x6x6 (15.2x15.2x15.2)	7x13x14 (17.8x33x35.6)	13 lbs (6kg)
K33210		230V 50Hz, 8.7A				
K33211	Elite	115V 60Hz, 8.7A	3-4.5 liter (0.8-1.2 gal)	6x5x6 (15.2x12.7x15.2)	8x15x16 (20.3x38.1x40.6)	20 lbs (9.1kg)
K33212		230V 50Hz, 8.7A				
K33213	Ultra	115V 60Hz, 8.7A	3-4.5 liter (0.8-1.2 gal)	5.9x5.1x5.9 (15x13x15)	8x15x16 (37.5x27.6x39.4)	26 lbs (11.8kg)
K33214		230V 50Hz, 8.7A				
K33215	Standard	115V 60Hz, 8.7A	7.5-12 liter (2.0-3.2 gal)	8x8.5x6 (20.3x21.6x15.2)	18x12x17 (45.7x30.5x43.2)	35 lbs (15.9kg)
K33216		230V 50Hz, 8.7A				
K33217	Elite	115V 60Hz, 8.7A	7.5-12 liter (2.0-3.2 gal)	8x8.5x6 (20.3x21.6x15.2)	18x12x17 (45.7x30.5x43.2)	35 lbs (15.9kg)
K33218		230V 50Hz, 8.7A				
K33219	Ultra	115V 60Hz, 8.7A	7.5-12 liter (2.0-3.2 gal)	8x8.5x6 (20.3x21.6x15.2)	18x12x17 (45.7x30.5x43.2)	40 lbs (18.1kg)
K33220		230V 50Hz, 8.7A				

# Water in Petroleum Products and Bituminous Materials by Distillation



K31800 Metal Still

## Dean & Stark Moisture Test Apparatus

- Conforms to ASTM D95 and related specifications
- Consists of 400mm condenser, 10mL receiver, 1000mL flask and mounting equipment.

### Ordering Information

Catalog No.	Dean & Stark Apparatus
K31830	

## Test Method

Determines the water content in petroleum products, tars, emulsified asphalts and other bituminous materials by the distillation method.

## Distillation Apparatus

- Conforms to ASTM D95, E123, D244 and related specifications
- Consists of still, ring burner, glassware and all mounting hardware.

## Specifications

Conforms to the specifications of:

ASTM D95, E123, D244, D370\*; AASHTO T55, T59; API MPMS Ch. 10.5; IP 74, 291; FTM 791-3001; ISO 3733; NF T 60-113

\*requires different glassware—information is available upon request.

## Shipping Information

K31800: Shipping Weight: 10 lbs (4.5kg)

Dimensions: 1.3 Cu. ft.

K31810/K31820: Shipping Weight: 18 lbs (8.2kg)

Dimensions: 2.8 Cu. ft.

### Ordering Information

Catalog No.		Order Qty
K31800	Metal Still Plated brass and copper, with lid and clamp assembly, gasket and O-ring seal.	1
K31910	Ring Burner, 5" (12.7cm) dia.	1
K31810	Glassware Set Includes 400mL condenser, 10mL and 25mL receiving traps	1
K31820	Mounting Equipment Consists of stand and connecting hardware	

# General Purpose Heater

## Utility Heater

- For general laboratory applications
- Precise, reproducible settings
- 750 or 1250W nichrome heater option
- Accepts flat bottom and round bottom beakers and flasks

Variable control electric heater designed for efficient, reproducible heating of flat bottom and round bottom beakers and flasks. Electronic unit control with reference dial permits fine temperature adjustment and accurate repeatable settings. Includes porcelain refractory heater with nichrome element (750 or 1250W) and refractory support plate that reverses to accept different size beakers and flasks. Polished stainless steel housing has cooling vents and two dovetail clamps to accommodate accessory support rod. Line switch and 6ft. (1.8m) three-conductor line cord and plug are included.

### Dimensions lwxh,in.(cm)

18x14x10 (46x36x25)

Net Weight: 4½ lbs (2.0kg)

### Shipping Information

Shipping Weight: 8 lbs (3.6 kg)

Dimensions: 1.5 Cu. ft.

### Ordering Information

Catalog No.	Utility Heater, 115V 50/60Hz, 750W
K42000	
K42001	Utility Heater, 115V 50/60Hz, 1250W
K42090	Utility Heater, 230V 50/60Hz, 750W
K42091	Utility Heater, 230V 50/60Hz, 1250W



K42000 General Purpose Utility Heater

# Refractive Index of Petroleum Products

## Test Method

Refractive index is a fundamental physical property that is used in conjunction with other properties to characterize pure hydrocarbons and their mixtures. It is a useful property for concentration measurements, purity determinations and chemical identification.

## Automatic Petroleum Refractometer

- Conforms to ASTM D1218 and D1747 test specifications
- Electronic heating and cooling Peltier system eliminates the need for a circulating water bath
- Automated and precise refractive index measurements
- Rugged sapphire prism
- Designed for samples ranging from clear to highly colored, dark and opaque
- Measures to the fifth decimal place refractive index or hundredths place in percent solids
- Clear graphical LCD display with on-screen instructions and full menu operation
- Multipoint calibration routines maximize accuracy
- Countdown timer insures consistent sample equilibration times
- RS232C communication ports

The Koehler Automatic Refractometer uses precision optics and superior image analysis to extend the repeatability and accuracy of refractive index measurements for petroleum products. Subjectivity is removed from tests results because no manual activities such as aligning shadowlines or reading analog scales are necessary. Opaque hydrocarbons present no problem for this unit which uses reflected light measurement technology as opposed to manual refractometers which are of the transmission type.

The refractometer incorporates numerous innovations designed to improve the accuracy of petroleum product testing. A 2600 cell linear scanned diode array shadowline sensor is sensitive enough to read even the most demanding samples. A 589 nanometer filter gives true Sodium D-Line refractive index readings. The large graphical LCD is easy to read and provides complete sample analysis documentation including the reading, temperature and scale name of the screen. Documentation is also output through two RS232C serial ports for export to either a PC or a printer. Optional Refractometer Communication Software package provides real-time output directly into Microsoft® Excel.

Set-up, diagnostic and calibration routines are displayed with easy to follow step-by-step instructions. User-developed customer calibration curves may be programmed allowing automatic temperature correction and direct percent concentration, percent reaction completion, etc. This unit has been used successfully throughout the petrochemical industry.



K27500 Automatic Refractometer

## Specifications

Measurement Scales:

- Refractive Index (RI)
- BRIX (% sucrose)
- Temperature Corrected RI
- Temperature Corrected BRIX
- Ten User-Programmable Scales

Illumination: 589nm light emitting diode with interference filter (estimated life: 100,000 hrs)

Range:

- Dissolved Solids: 0 to 95% solids
- Refractive Index: 1.32000 to 1.70000nD (nD - Sodium D-Line Refractive Index)

Readability:

- Standard Mode: 0.1% Solids 0.0001nD
- Extended Mode: 0.01% Solids 0.00001nD

Precision:

- Standard Mode:  $\pm 0.1\%$  Solids  $\pm 0.0001nD$
- Extended Display Mode: Refractive Index Standard Oils  $\pm 0.00002$   
Typical clear aqueous samples, % Solids Temperature Compensated, as sucrose  $\pm 0.02\%$

Calibration Fluid: refractive index standard oil, NIST traceable nominal value 1.495 RI, 67.61 BRIX

Sample Types: Transparent, translucent or opaque

Sample Temperature Control: Heat (cool) exchanger surrounding prism permits temperature control by an external water bath circulator from 10 to 70°C

Prism Assembly: Stainless steel, synthetic sapphire sealed with solvent-resistant epoxy

Calibration:

- 1 point - Water only
- 2 point - Water and refractive index or Brix standard

Dimensions l x w x h, in. (cm)

15½ x 10 x 4½ (39½ x 25½ x 11½)

Net Weight: 23 lbs (10½ kg)

## Shipping Information

Shipping Weight: 30 lbs (14 kg)

Dimensions: 5 Cu. ft.

## Ordering Information

### Catalog No.

K27500 Automatic Petroleum Refractometer,  
115V 50/60Hz

K27501 Automatic Petroleum Refractometer,  
220-240V 50/60Hz

### Accessories

K27504 Calibration Fluid,  
Certificate of NIST traceability included.

K27505 Refractometer Communication Software Package,  
with real-time data export into Microsoft® Excel.

# Remaining Useful Life Evaluation for Oil Condition Monitoring

## Test Method

The portable Remaining Useful Life Evaluation Routine (RULER®) instrument measures the oxidative resistance levels of mineral and synthetic hydrocarbon oils, ester-based and biodegradable oils. Utilizing voltammetric techniques, the RULER® quantitatively analyzes the relative concentrations of antioxidants in new and used oils in order to monitor the depletion rates of the antioxidant protection package in the oil. The RULER® can be used proactively in order to determine proper oil change intervals and to extend oil change intervals through timely antioxidant additive replenishments. In addition, the RULER® can be used to quantify antioxidant levels of incoming and stored oil supplies and to detect abnormal operating conditions prior to equipment failure signalled by abrupt antioxidant depletion rates.

## Remaining Useful Life Evaluation Routine (RULER®)

- Patented electrochemical measurement technique
- Conforms to ASTM Draft Method
- Compact and completely portable hand-held unit
- Windows® CE-based simple touch screen operation
- Durable for use in harsh and industrial environments
- 320 x 240 pixel LCD backlit touch screen with automatic contrast
- Stores over 100 tests in memory
- Wireless infrared (IR) communication link to laptop and desktop computers
- Integrated charge status/low-battery indicator with intelligent fast charge
- Long-life lithium-ion battery with power backup

### The RULER® Instrument

The patented RULER® technology is a portable oil analysis instrument that quickly measures the levels of antioxidants in petroleum- and synthetic-based oils, greases, and industrial fluids. Designed to provide rapid and accurate evaluations of lubricant oxidation stability and remaining antioxidant concentration, the RULER® is ideal for field testing, maintenance facilities, and oil analysis laboratories as part of a proactive oil condition monitoring program.

### The Role of Antioxidants

The antioxidants added to lubricants are vital to fluid integrity and are specially formulated for each type of application, accounting for the various exposures to heat, atmospheric oxygen, and water. Under normal machine operating conditions, radical oxidation would typically degrade any lubricant without a protective additive package. This could result in sludge and deposit formation, filter blockages, oil thickening, and an increase in oil acidity. The antioxidants present in the additive package will significantly limit oil degradation from occurring but will be depleted in the process. Therefore, it is imperative to know the status of the antioxidants in oils being used in service.

### Conventional Measurement Techniques

Many conventional laboratory techniques such as kinematic viscosity, total acid number (TAN), infrared (IR) data, and wear metal analysis are used for measuring the extent of oil degradation. These techniques only begin to show significant changes in the physical and chemical properties of the oils when a majority of the antioxidants have been depleted and the oil has begun to substantially degrade, approaching the end of its useful life. This is a point where machine wear and failure may become a severe problem. However, to ensure that a lubricant is not used past the end of its useful life, periodic oil changes are inherently conservative which results in discarding lubricant that is still suitable for use.



### The RULER® Measurement Technology

The RULER® instrument quantitatively determines the remaining utility of the lubricant by measuring the remaining concentrations of the antioxidants. The rate of antioxidant depletion over time can be monitored and used to predict proper oil change intervals as well as detect abnormal equipment operation prior to machine breakdown. These important assessments can be easily made by field personnel from the data acquired and analyzed by the RULER® instrument. The results are then presented directly on the touch screen. In addition, the RULER® Data Management Software (R-DMS®) system, which is part of the RULER® package, enhances this monitoring process and can be utilized on a desktop or laptop computer.

The measurement principal of the RULER® is based upon linear voltammetry, where this patented electrochemistry technique can evaluate a wide range of antioxidants without any interference from water, fuel, soot, dirt, metal, silt, or other contaminants. The analysis of an oil sample requires the addition of less than 0.5 mL of oil to an electrolytic test solution and insertion of the RULER® probe into the solution. The instrument applies a voltage ramp across the three-electrode sensing system in the probe. At specific voltage values, the antioxidants will become chemically excited and create an oxidation current that is recorded by the instrument. A plot of oxidation current versus voltage, known as a voltammogram, is displayed on the touch screen. The results can then be readily analyzed using the RULER® instrument software and interpreted by the field operator to determine if any immediate maintenance action is necessary or to plan for the next appropriate oil change interval.

### The RULER® Data Management Software (R-DMS®)

Utilizing the RULER® Data Management Software (R-DMS®) on a desktop or laptop computer, the resulting data for each test site can be easily tracked over time, enabling the user to identify normal trends for any given piece of equipment. Variations from these trends can be indicative of changes in system operating conditions causing the accelerated oxidation of the lubricant. The R-DMS® software package can maintain a large database of test results, display multiple test results, export data to other formats, and incorporate trending data from other techniques such as viscosity, acid number, infrared (IR) data, and wear metal analysis to provide a complete condition monitoring package. Therefore, with complete information about lubricant quality, determinations can be easily made regarding oil change intervals or additive reinforcement to extend the life of the lubricant.

# Remaining Useful Life Evaluation for Oil Condition Monitoring

## The RULER® Test Solutions

The *patented* test solutions formulated specifically for RULER® analysis optimize the measurement of specific antioxidants in any given class of oils. These RULER® test solutions are provided in 7mL glass vials which attach easily to the RULER® test probe, have been identified by different colored caps, and are convenient for field and remote testing. Each vial contains 5mL of a specific test solution and 1g of specially prepared sand. After an oil sample is added to the test solution and the vial is shaken, the oil and debris will adhere to the sand and the antioxidants will remain in the solution for RULER® analysis. The shelf life of the RULER® solutions is at least one year from the date of manufacture.

The RULER® test solutions are available in four main classes: **red**, **green**, **blue**, and **yellow**. The **red** solutions have been designed for aviation oil applications, which includes ester-based turbine oils. The **green** solutions have been designed for general applications, which include phosphate ester-based oils, gear, compressor and hydraulic oils, greases, and transformer oils. The **blue** solutions have been designed for combustion engine applications, which include gear oils, gasoline and diesel crankcase oils, and marine oils. The **yellow** solutions have been designed for rust and oxidation applications, which include mineral-based steam and gas turbine oils, phosphate ester-based oils, gear oils, compressor and hydraulic oils, gasoline and diesel crankcase oils, marine oils, greases, and transformer oils.

## Specifications

CE certified

Communication Ports:

- High-speed 4MBPS IrDA port on RULER® instrument
- Standard RS-232 port on docking cradle

Operating Temperature Range:

- 30°C to +50°C
- 22°F to +122°F

Power Supply:

- Rechargeable lithium-ion battery pack
- Rechargeable lithium-manganese backup battery pack

Electrical Requirements:

- 120V 50/60Hz
- 220V 50/60Hz

## Included Accessories

- Docking Cradle, Cable, and Communication Software
- R-DMS® Software Package (RULER® Data Management Software)
- RULER® Probe
- Carrying Case for RULER® instrument and accessories (but does not accommodate docking cradle)
- Micropipettor with disposable tips
- Alcohol pads
- Tissue Wipes
- Instruction Manual

**Dimensions:** l x w x h, in. (cm)

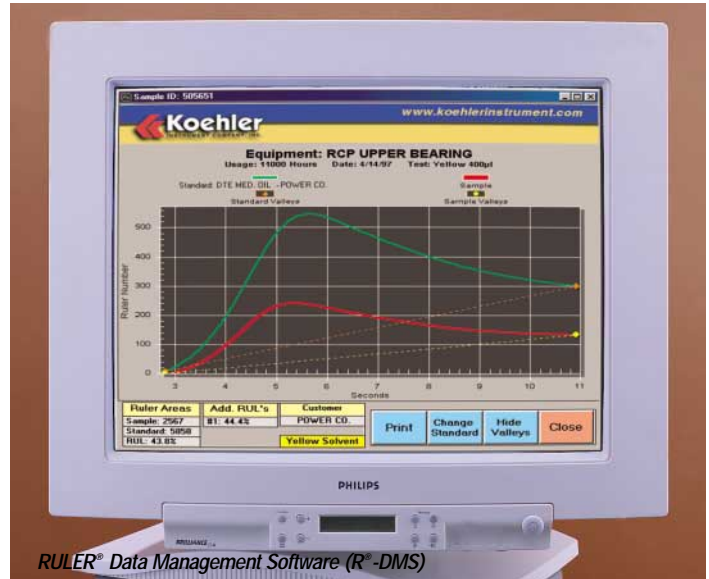
24.8 x 10.4 x 6.1 (9.75 x 4.1 x 2.4)

Net Weight: 1.9 lbs (0.85kg)

## Shipping Information

Shipping Weight: 10 lbs (4.5kg)

Dimensions: 2 Cu. ft.



## Ordering Information

Catalog No.		Order Qty
<b>RULER® Instrument</b>		
K320S-200	RULER® Instrument, 115V 50/60Hz	1
K320S-290	RULER® Instrument, 220V 50/60Hz	

## Accessories

### RULER® Test Solutions - Vials

One case of RULER® test solution vials consists of 144 glass vials filled with 1g of sand and 5mL of the test solution. Choose from the following solutions based upon your application. Please contact Koehler Customer Service with any questions about ordering the test solutions.

K131-144	Red - Aviation Applications	1
K132-144	Green - General Applications	
K133-144	Blue - Combustion Engine Applications	
K134-144	Yellow - Rust and Oxidation Applications	

### RULER® Test Solutions - Bottles

The RULER® test solutions are also available in 500mL bottles. Glass vials filled with 1g of sand are also needed to perform the proper analysis. Choose from the following solutions based upon your application. Please contact Koehler Customer Service with any questions about ordering the test solutions.

K131-500	Red - Aviation Applications	1
K132-500	Green - General Applications	
K133-500	Blue - Combustion Engine Applications	
K134-500	Yellow - Rust and Oxidation Applications	
K144SW	Glass vials with sand, box of 100	1

## Optional Accessories

K144C	Alcohol pads, 1000 individually sealed pads	1
K115	Tissue wipes, box of 300	1
K120-50	Micropipettor, 50µL	1
K120-200	Micropipettor, 200µL	
K121-50	Disposable 50µL micropipettor tips, pack of 250	1
K121-200	Disposable 200µL micropipettor tips, pack of 250	

# Field Test Kits for Oil Condition Monitoring



K86020 Power Plant Oil Test Laboratory

## Field Test Kits for Condition Monitoring Programs

- Rugged systems designed to support on-site oil condition monitoring and predictive maintenance programs
- Comprehensive quality control for monitoring lubricating and fuel oils for gas and diesel engines, gas and steam turbines, compressors, hydraulic systems and gearboxes
- Complete on-site lab for sampling, testing and managing of oil test data

A comprehensive range of sophisticated field test kits provide rapid and accurate testing of lubricating and fuel oils for a single and complete solution of oil analysis at the operator level. Designed for use in harsh marine and industrial environments, these test kits provide a means to easily monitor oil condition, identify in-service problems, and prevent expensive equipment failures. Housed in rugged casings, portable or wall mounted, they offer the flexibility for testing lubricating and fuel oil at delivery and in-service. Laboratory grade electronic test equipment provides accurate results for several key physical oil parameters, and the variety of tests can be performed either on field location or in the laboratory. Test data has been independently correlated against standard ASTM and IP laboratory procedures, while every test kit has been designed to be easily used by staff members that may be unfamiliar with standard test procedures. Kits are supplied as complete systems: samplers, test equipment, training manuals and comprehensive oil monitoring information are supplied as standard equipment.

Custom test centers and oil analysis software for tracking and managing test data are available as options. *Please contact Koehler customer service to discuss how our full line of field test equipment will meet your testing needs.*

The field test kits consist of a suite of electronic and/or manual oil test equipment covering tests for diesel engines, gas and steam turbines, compressors, hydraulics, gearboxes, aviation lubes, fuel oils, and much more. Please refer below to the tests you need to conduct and the chart to help determine your best solution for testing.

**Density** - range: 800-1010 kg/m<sup>3</sup> at 15°C in vacuum

Quality control of fuel oil purchase and delivery will produce major cost savings. Density measurements are critical for confirming the correct quantities and grades delivered. The combustion performance (CCAI) can be estimated, and viscosities in cP can be converted to cSt. Densities are corrected to standard reference conditions of 15°C in vacuum.

**Compatibility** - range: as per ASTM D4740

Mixing residual fuel oils can cause precipitation of asphaltenes leading to blockage of filters and purifiers, resulting in serious combustion problems. The compatibility test will determine fuel stability during storage, identify possible stability problems before mixing fuels, and alert to possible sludge formation before any failure to fuel handling systems and costly engine damage.



K86055 Combined Oil Test Kit

## Electronic Test Equipment

Note: E = Electronic Option, M = Manual Option

Please ask your Koehler Representative for any special requirements or options.

Name	Catalog No.	Density	Viscosity	Compatibility	Pour Point	Water in Oil	Salt	TBN	TAN	Insolubles
Power Plant Station Oil Test Laboratory	K86020	E	E, heated	E	M	E	M	E		E
Fuel & Lube Oil Test Cabinet	K86010	E	E, heated		M	M	M	M		M
Oil Test Center – Diesel Engines	K86000		E, unheated			E, 0-2.5%		E		E
Oil Test Center – Gas Engines	K86001		E, unheated			E, 0-6000ppm			E	
Oil Test Center – Aviation	K86002		E, unheated			E, 0-6000ppm			E	E
Density Meter	K86075	E								
Fuel & Lube Oil Viscometer	K86070		E, heated							
Fuel Oil Compatibility Test	K86080			E						

# Field Test Kits for Oil Condition Monitoring

## Viscosity - range: 15-810 cSt at 40 and 50°C

Viscosity is the prime quality of fuel and lube oils, and is used to confirm fuel grade and estimate combustion performance. It is fundamental to maintaining the integrity of a lube oil film, preventing metallic contact, scuffing, microwelding, and wear of sliding surfaces. Viscosity can increase due to insolubles, oxidation, or water contamination, and decrease with distillate fuel contamination. Three options are available:

- 1) Heated viscometer for accurately measuring viscosity in cSt of lube and residual fuel oils at 40 and 50°C, and predicting viscosity at 100°C.
- 2) Unheated viscometer for lube oil will accurately predict viscosity at 40°C. Test time is less than 2 minutes! (15-500 cSt at 40°C)
- 3) Viscosity stick for a comparative assessment of new and used oil viscosity.

## Pour Point - range: -5 to 50°C

Pour point is a simple test and an indicator of the lowest temperature of utility for fuel and lube oils. The lowest temperature at which movement of the sample is observed is recorded as the pour point. Used to predict the need for heating fuels in storage and supplied free with the Fuel & Lube Oil and Power Plant Laboratory.

## Water in Oil - range: 0-6000 ppm to 15%

Water is present in every lube oil and fuel system and originates from many sources. High water levels increase oil viscosity, catalyze system corrosion, promote cavitation, and cause instability of the lubricant additive package. Water contamination represents a direct financial loss, potential corrosion, and microbiological growth problems. Two testing options are available:

- 1) 0-1.2% or 0-15% test using a manually operated test cell.
- 2) 0-2.5% and 0-6000 ppm test using an electronically operated test cell.

## Salt Water - range: pass/fail

Salt water cannot be tolerated in fuel or lubricating oils. The presence of salt will cause severe and rapid corrosion in any lubricating oil, fuel, and hydraulic system. This simple test provides a pass/fail indication of salt contamination in any system.

## Total Base Number (TBN) - range: 0-50 mg KOH

The TBN of an oil is the measure of the alkaline reserve or the ability of the oil to neutralize acids formed during combustion. Severe TBN depletion will lead to acidic corrosion and fouling in diesel engine systems. Additionally, low TBN is indicative of reduced oil detergency.



## Total Acid Number (TAN) - range: 0-6 mg KOH

The TAN of an oil is the measure of the acids present in an oil (some are additives!). All oils will slowly oxidize during use, which can be accelerated by high operating temperatures or hydrolysis of synthetic lubricants. High TAN is indicative of oil oxidation and is often accompanied by viscosity increase, formation of lacquers, and acidic attack of mechanical components. Monitoring TAN in aviation, gas engine, turbine and gear systems provides a good indication of system conditions and remaining oil life.

## Insolubles - range: 0-3.5%

Insolubles build up in engine oils from carbon, dust, spent additives, oxidation products, and wear debris. High levels of insolubles cause wear and fouling. This test provides an indication of insolubles levels in lubricants. Two options are available:

1. A manual test for basis pass/fail type indication
2. An electronic test for very accurate quantitative readings.

## Other Test Kits Available

Please inquire about our wide range of test kits available for determination of Acidity, Alkalinity, Aluminum, Ammonia, Calcium, Chlorine, Chromate, Conductivity, Copper, Fluoride, Hydrazine, Hydrogen Peroxide, Iron, Manganese, Molybdate, Nitrates, Ozone, pH, Phosphates, Silica, Zinc, and other multiparameter kits.

## Manual Test Equipment

Note: E = Electronic Option, M = Manual Option; some manual options are also offered in electronic test equipment. Please ask your Koehler Representative for any special requirements or options.

Name	Catalog No.	Viscosity	Water in Oil	Salt	TBN	TAN	Insolubles
Water in Oil	K86050		M, 0-1.2%				
Basic Oil Test Kit	K86051	M	M, 0-1.2%	M			M
Total Base Number	K86052						
Salt Water Contamination Kit	K86053			M			
Water in Oil 0-15%	K86054		M, 0-15%				
Combined Oil Test Kit	K86055	M	M, 0-1.2%	M	M		M
Viscosity Test Kit	K86056	M					
Insolubles in Lube Oil Test Kit	K86057						M
Industrial Test Kit	K86058	M	M, 0-1.2%		M		M
Field Test Kit	K86059	M	M, 0-1.2%		M	M	M

## Additional Accessories

Additional equipment, materials and/or reagents are required to perform some of the test procedures in the preceding pages. Please refer to the applicable test method for further information, or contact Koehler for assistance.

### Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents .... Pages 42-43

ASTM D611; IP 2, ISO 2977; DIN 51775; FTM 791-3601

Pipets, 10mL and 5mL  
Laboratory Balance  
Oven  
Rubber Suction Bulb  
Safety Goggles  
Plastic Gloves  
Aniline  
Calcium Sulfate or Sodium Sulfate, anhydrous  
n-Heptane  
Air Supply (for Automatic Aniline Apparatus)

### Saybolt Color of Petroleum Products ..... Pages 44, 46-47

ASTM D156; DIN 51411; FTM 791-101

Acetone or other Solvent  
Soap  
Qualitative Filter Papers  
Distilled Water

### ASTM Color of Petroleum Products (ASTM Color Scale) ..... Pages 45-47

ASTM D1500; IP 196; ISO 2049; FTM 791-102

Solvent Kerosene (for dark samples)  
Distilled Water

### Distillation of Petroleum Products at Reduced Pressures ..... Pages 52-54

ASTM D1160

Toluene	Nitrogen
Cyclohexane	Balance
n-Tetradecane	Air or Carbon Dioxide Supply
1L Beaker	Calcium Chloride
Boiling Chips	Silicone Fluids
n-Hexadecane	

### Sulfur in Liquefied Petroleum Gases (Oxy-Hydrogen Burner) ..... Page 58

ASTM D2784

Oxygen	Hydrogen
Nitrogen	Sulfuric Acid
Acetone	Isopropanol
Hydrogen Peroxide	Glycerin
Methylene Blue	Vacuum Source
Alcohol	Distilled Water
Thorin	Carbon Dioxide
Perchloric Acid	Barium Chloride Dihydrate
Spectrophotometer	Denatured Ethyl Alcohol
Sodium Hydroxide	Hydrochloric Acid
Low Sulfur Acetone	Barium Perchlorate
Safety Shield	Fleisher's Methyl Purple Indicator

### Traces of Volatile Chlorides in Butane-Butene Mixtures ..... Page 58

ASTM D2384

Mercuric Thiocyanate	Nitrogen
Potassium Nitrate	Nitric Acid
Saturated Calomel Electrolyte	Iron Wire
Mercury-Calomel Mixture	Hydrogen
Silver Nitrate	Hydrogen Peroxide
Gelatin	Bromthymol Blue Indicator
Acetone	Sodium Carbonate
Hydrochloric Acid	Titration Equipment
Perchloric Acid	Oxygen
Agar Powder	Vacuum Source

### Ramsbottom Carbon Residue of Petroleum Products ..... Page 59

ASTM D524; IP 14; ISO 4262; FTM 791-5002

Desiccator  
Strainer (100-mesh)  
Analytical Balance  
Calcium Chloride  
Syringe

### Sediment in Crude Oils and Fuel Oils by the Extraction Method ..... Page 61

ASTM D473; IP 53; ISO 3735; DIN 51789; FTM 791-3002

Desiccator  
Toluene  
Analytical Balance

### Unsulfonated Residue of Petroleum Plant Spray Oils ..... Page 64

ASTM D483; DIN 51362

Meniscus Viewing Lens	Balance
Centrifuge	Distilled Water
Sulfuric Acid, fuming	10mL Buret
Sulfuric Acid, concentrated	Shaking Machine

### Rust Protection by Metal Preservatives in the Humidity Cabinet ..... Page 65

ASTM D1748; FTM 791-5310

Silica Sand  
Petroleum Naphtha  
Precipitation Naphtha  
Methyl Alcohol  
Air Supply  
Water Supply

### Freezing Point of Aqueous Engine Coolant Solution ... Page 68

ASTM D1177

Glass Wool  
Solid Carbon Dioxide  
Liquid Nitrogen

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