

## PETROLEUM TESTING EQUIPMENT



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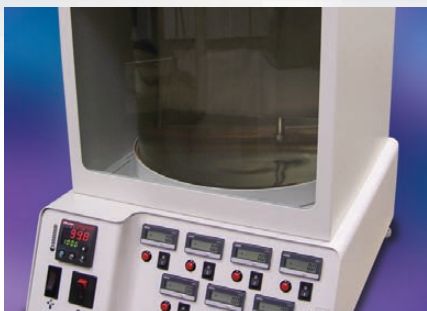
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## HOW TO ORDER

For most of the ASTM, ISO, FTM and international standards featured in this catalog, you will find a complete offering of the equipment needed to perform the test. Many instruments are available in several different configurations to enable you to tailor your selections to your individual requirements. Certain standard laboratory items have not been listed but are available on special order. Our Customer Service representatives can answer any questions you may have and provide you with information you may require.

Please be sure to use the Koehler catalog number for the instrument model which is compatible with your local power service. Consult individual product listings for complete information on electrical requirements. All of our products listed in this catalog can be ordered by phone, fax or e-mail. Orders may also be placed using your Visa, Mastercard, American Express, or Discover Card.

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*Koehler offers laboratory reference standards for our full line of testing equipment. Each test standard comes with original certification listing the ASTM test method, the name and ISO status of each testing laboratory, and the average test result and standard deviation. Please inquire with Koehler's Customer Service Department about ordering these reference standards for your testing needs.*

# VISCOSITY

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# KINEMATIC VISCOSITY



K23702 Constant Temperature Kinematic Viscosity Bath (KV4000) - page 4

## Kinematic Viscosity of Transparent and Opaque Liquids

## Kinematic Viscosity of Asphalts (Bitumens)

## Viscosity of Asphalts by Vacuum Capillary Viscometer

## Viscosity and Viscosity Change After Standing at Low Temperature of Aircraft Turbine Lubricants

## Test Method

Kinematic viscosity is of primary importance in the design and selection of a wide range of petroleum products. Calibrated capillary viscometers are used to measure flow under gravity or vacuum at precisely controlled temperatures.

## Kinematic Viscosity Test Equipment

- Constant temperature baths for the full range of viscosity applications, from low temperature to high temperature
- Calibrated glass capillary kinematic viscometers
- Viscosity standards
- Viscometer cleaning and drying apparatus
- Kinematic viscosity thermometers



Cannon®-Fenske  
Routine



Cannon®-Fenske  
Opaque



Ubbelohde



Viscosity Reference Standards - pages 18-19

## KINEMATIC VISCOSITY



*K23376 Digital Constant Temperature Bath*

### KV1000 Digital Constant Temperature Kinematic Viscosity Bath

- Accommodates six capillary viscometers
- Variable temperature limit control
- Conforms to ASTM D445 and related specifications

Constant temperature bath for kinematic viscosity testing of petroleum products. Accommodates six round 2" (51mm) dia. viscometer holders. Bath temperature stabilizes within  $\pm 0.5^{\circ}\text{C}$  ( $\pm 1^{\circ}\text{F}$ ) of setting, and final adjustment to within  $\pm 0.01^{\circ}\text{C}$  ( $\pm 0.02^{\circ}\text{F}$ ) can be made. Test temperatures of up to  $150^{\circ}\text{C}$  ( $302^{\circ}\text{F}$ ) can be selected. Temperature limit control permits the operator to select an overtemperature cutoff point to protect against accidental overheating. Control unit includes immersion heater, circulating stirrer and temperature probe. Composition top plate rests on a 12x12" (30.5x30.5cm) or 12x18" (30.5x46cm) Borosilicate Glass jar. Order capillary viscometers, viscometer holders and thermometer separately.

#### Specifications

Conforms to the specifications of:

ASTM D445, D6074, D6158; IP 71; ISO 3104; DIN 51550;

FTM 791-305; NF T 60-100

Capacity: Six (6) glass capillary viscometers

Bath Medium: water or white technical oil

#### Included Accessories

Port Covers, stainless steel (6)

#### Ordering Information

| Catalog No.                                                                                                                                                 | Model  | Electrical Requirements C €        | Bath Depth    | Bath Capacity   | Dimensions diaxh,in.(cm) | Net Weight      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------------------|---------------|-----------------|--------------------------|-----------------|
| K23376-00000                                                                                                                                                | KV1000 | 115V 60Hz, single phase 10.2A      | 12" (30.5 cm) | 5.8 gal (22L)   | 13½x20 (34.6x50.8)       | 25 lbs (11.3kg) |
| K23371-00000                                                                                                                                                | KV1000 |                                    | 18" (46 cm)   | 8.9 gal (33.7L) | 19½x23 (49.5x58.4)       | 38 lbs (17.2kg) |
| K23377-00000                                                                                                                                                | KV1000 | 220-240V 50/60Hz single phase 5.3A | 12" (30.5 cm) | 5.8 gal (22L)   | 13½x20 (34.6x50.8)       | 25 lbs (11.3kg) |
| K23378-00000                                                                                                                                                | KV1000 |                                    | 18" (46 cm)   | 8.9 gal (33.7L) | 19½x23 (49.5x58.4)       | 38 lbs (17.2kg) |
| K23377-01000 Cooling Coil Assembly. Permits circulation of water or refrigerated coolant for operation at near ambient temperatures. Installs in top plate. |        |                                    |               |                 |                          |                 |

# KINEMATIC VISCOSITY

## KV3000 and KV4000 Constant Temperature Baths with Integrated Digital Timing

- Microprocessor temperature control between ambient and 150°C (302°F)
- Integrated digital timing for easy measurement of sample efflux times
- KV4000 permits entry of viscometer constants for automatic calculation and display in viscosity units or seconds
- Dual digital displays show setpoint and actual bath temperature
- Selectable temperature scale - Fahrenheit or Celsius
- Integrated redundant overtemperature and low liquid level cut-off circuitry
- Conforms to ASTM D445, D2170 and related specifications

Constant temperature bath series with advanced temperature control circuitry and integrated timing features for convenient, accurate glass capillary viscometry determinations. Microprocessor PID circuitry assures precise, reliable temperature control within ASTM specified tolerances throughout the operating range of the bath. Simple push-button controls and dual digital displays permit easy setting and monitoring of bath temperature. Two place calibration offset capability is provided. Baths accommodate seven glass capillary viscometers of various types - see pages 10-13 for complete selection. Viewing the viscometers is made easy by glare-free fluorescent illumination inside the bath and a baffle that provides a background for easy viewing. Temperature control uniformity is assured by means of motorized stirrer which provides complete circulation without turbulence. Connection of the built-in cooling coil to tap water or a recirculating water chiller facilitates temperature control at ambient or below ambient temperatures. *Communications software (RS232, etc.) ramp-to-set, and other enhanced features are available at additional cost. Contact your Koehler representative for additional information.*

**Integrated Timing Features** - KV3000 incorporates seven digital timers on the front control panel for convenient timing and monitoring of the efflux interval for each viscometer. On KV4000, the user can enter the viscosity constant for each viscometer on the front LCD control/display, and then get the test result in both efflux time and viscosity units automatically after stopping each timer. All timing functions are displayed in 0.01 or 0.1 second resolution and are accurate within 0.01%.

**Bath Construction and Safety Features** - Bath chamber is a clear borosilicate glass vessel enclosed in a polyester-epoxy finished steel housing. Top working surface has seven 2" (51mm) viscometer ports. Front viewing window assures safe, distortion-free viewing. Microprocessor temperature controller incorporates safety circuitry that interrupts power to the heaters in the event of an overtemperature condition or disconnection of the primary probe. For added safety, an adjustable redundant controller with separate sensor probe interrupts power if an overtemperature situation occurs. An integrated low-liquid sensor prevents operation of the bath if the bath liquid is not filled to the proper level, and cuts off power should it fall below during operation. Both overtemperature and low liquid level circuits will latch and prevent further operation of the bath until the fault is removed.

**Dimensions** l x w x h, in. (cm)  
 12" Kinematic Viscosity Bath:  
 20½ x 15½ x 24½ (51 x 39 x 62)  
 Net Weight: 78 lbs (35.5kg)  
 18" Kinematic Viscosity Bath:  
 20½ x 15½ x 30½ (51 x 39 x 77)  
 Net Weight: 90 lbs (41kg)

**Bath Capacity:**  
 12": 5.8 gal (22L)  
 18": 8.9 gal (33.7L)

**Included Accessories**  
 Port covers, Delrin® (7)  
 Thermometer holder

 **Software compatible, inquire with Koehler Customer Service.**



**K23700 Constant Temperature Kinematic Viscosity Bath (KV3000)**

## Specifications

Conforms to the specifications of:

ASTM D445, D2170, D6074, D6158; IP 71, 319; ISO 3104; DIN 51550;  
 FTM 791-305; NF T 60-100

**Temperature Control**

Range: ambient to 150°C (302°F); sub-ambient to 10°C with external cooling

Display: 0.1°C/0.1°F resolution, calibrate to 0.01°C/0.01°F

Control accuracy and uniformity: Exceeds ASTM requirements throughout the operating range

**Integrated timing**

KV3000: Seven individual start/stop timers with displays to 0.1 seconds, accurate to within 0.01%

KV4000: Integrated LCD microcomputer with start/stop buttons and retention of viscometer tube constants, automatic calculation and display in viscosity units or seconds to 0.1s, within 0.01% accuracy.

Communication: RS232 port included with KV4000 (optional for KV3000)

Viscometer ports: Seven round 2" (51mm) ports

Bath Medium: Water or suitable heat transfer fluid - please refer to page 8

## Ordering Information

| Catalog No. | Model  | Electrical Requirements             | € | Bath Depth    |
|-------------|--------|-------------------------------------|---|---------------|
| K23700      | KV3000 | 115V 60Hz, single phase 12.6A       |   | 12" (30.5 cm) |
| K23702      | KV4000 |                                     |   |               |
| K23790      | KV3000 | 220-240V 50/60Hz, single phase 7.2A |   | 18" (46 cm)   |
| K23792      | KV4000 |                                     |   |               |
| K23706      | KV3000 | 115V 60Hz, single phase 12.6A       |   | 18" (46 cm)   |
| K23708      | KV4000 |                                     |   |               |
| K23796      | KV3000 | 220-240V 50/60Hz, single phase 7.2A |   |               |
| K23798      | KV4000 |                                     |   |               |

# KINEMATIC VISCOSITY

## KV5000 Kinematic Viscosity Bath

Koehler KV5000 series kinematic viscosity baths with the optical flow detection system provides automatic viscosity measurements of petroleum and petrochemical products. Includes communication and power ports for each optical detection assembly, and can utilize up to five optical assemblies. Two additional positions are available for manual viscosity measurements, and all positions can be used in the manual mode. The interchangeable Ubbelohde, Cannon® Fenske, and Reverse Flow viscometer tubes are quickly installed and removed from the detection assemblies for cleaning and simple tube changes. Allows automatic viscosity measurements and results calculation without an external PC. Motorized stirrer provides complete circulation without turbulence. Microprocessor PID circuitry assures precise, reliable temperature control within ASTM specified tolerances throughout the operating range. Simple push-button controls and dual digital displays permit easy setting and monitoring of temperature. Two place calibration offset capability is provided. Built-in cooling coil facilitates temperature control at ambient or below ambient temperatures.

### Viscosity Software

Software automatically downloads test data and calculates final test results from sample efflux times. Also included is a database for storing test data, determining test averages, standard deviations, and ASTM test repeatability as well as providing a method for tracking both instrument and viscometer tube calibrations.

- Complete instrument and data acquisition system exclusively designed for conducting D445, IP71 and related test methods
- Optical sensor detection system accurately measures sample flow and automatically calculates kinematic viscosity results
- Powerful software system for PC platforms operating in Windows® 98 SE, 2000, NT, ME, and XP environments
- Option wireless data acquisition package available
- Automatic calculation and display of results in viscosity units or seconds
- Accommodates Ubbelohde, Cannon® Fenske, and Reverse Flow viscometers
- High accuracy temperature control with dual digital displays show setpoint and actual bath temperature with selectable scale (°C or °F)
- Stand alone feature provides for automated testing without an external PC
- Integrated redundant overtemperature and low liquid level cut-off circuitry
- Software exports test data with graphs and test parameters direct to Microsoft® Excel or in ASCII file format for use with LIMS or any other spreadsheet program
- Integrated digital timing for easy measurement of sample efflux times



**K23702-OS Kinematic Viscosity Bath (KV5000)  
with K23780-CF Optical Sensor and CF Routine Tube 378-025-C02-OS**

### Specifications

Conforms to the specifications of:

ASTM D445, D2170, D6074, D6158; IP 71, 319; ISO 3104; DIN 51550; FTM 791-305; NF T 60-100

Temperature range: Ambient to 150°C (302°F); sub-ambient to 10°C with external cooling

Temperature display: digital with 0.1 °C/°F resolution, calibrate to 0.01 °C/°F

Temperature control accuracy and uniformity: Exceeds ASTM requirements

**Fully Automated Viscosity and Houillon Viscosity Instruments Available,  
Inquire with Koehler Customer Service.**



Software compatible, inquire  
with Koehler Customer Service.

### Ordering Information

| Catalog No.                           | Model  | Description                                                                         | Electrical Requirements C € | Order Qty |
|---------------------------------------|--------|-------------------------------------------------------------------------------------|-----------------------------|-----------|
| K23702-OS                             | KV5000 | 12" Kinematic Viscosity Bath                                                        | 115V 60Hz                   | 1         |
| K23792-OS                             | KV5000 | 12" Kinematic Viscosity Bath                                                        | 220-240V 50/60Hz            |           |
| K23708-OS                             | KV5000 | 18" Kinematic Viscosity Bath                                                        | 115V 60Hz                   |           |
| K23798-OS                             | KV5000 | 18" Kinematic Viscosity Bath                                                        | 220-240V 50/60Hz            |           |
| K23780-SFW                            | KV5000 | Kinematic Viscosity Software Package                                                |                             | 1         |
| K23780-WLS                            | KV5000 | Kinematic Viscosity Software Package Wireless                                       |                             |           |
| K23780-CF                             |        | Optical Sensor for Cannon® Fenske viscometers                                       |                             | 1-5       |
| 378-025-C01-OS<br>thru 378-700-C01-OS |        | Cannon® Fenske Routine Viscometers Size 25 thru 700<br>(Specify Size when ordering) |                             | 1-5       |
| K23780-RF                             |        | Optical Sensor for Opaque Reverse Flow viscometers                                  |                             | 1-5       |
| 378-025-C02-OS<br>thru 378-700-C02-OS |        | Cannon® Fenske Opaque Viscometers Size 25 thru 700<br>(Specify Size when ordering)  |                             | 1-5       |
| K23780-UB                             |        | Optical Sensor for Ubbelohde viscometers                                            |                             | 1-5       |
| 378-000-C03-OS<br>thru 378-005-C03-OS |        | Ubbelohde Viscometers Size 0 thru 5<br>(Specify Size when ordering)                 |                             | 1-5       |

## KINEMATIC VISCOSITY

### HKV3000 and HKV4000 High Temperature Baths with Integrated Digital Timing

- Microprocessor temperature control between ambient and 232°C (450°F)
- Integrated digital timing for convenient measurement of sample efflux times
- HKV4000 model permits entry of viscometer constants for automatic calculation and display in viscosity units or seconds
- Dual digital displays show setpoint and actual bath temperature
- Selectable temperature scale - Fahrenheit or Celsius
- Integrated redundant overtemperature and low liquid level cut-off circuitry
- Conforms to ASTM D445, D2170 and related specifications

High temperature baths with advanced temperature control circuitry and integrated timing features for convenient, accurate glass capillary viscometry determinations. Microprocessor PID circuitry assures precise, reliable temperature control within ASTM specified tolerances throughout the operating range of the bath. Simple push-button controls and dual digital displays permit easy setting and monitoring of bath temperature. Two place calibration offset capability is provided. Baths accommodate seven glass capillary viscometers of various types - see pages 10-13 for complete selection of viscometers and holders. Viewing the viscometers is made easy by glare-free fluorescent illumination inside the bath and a baffle that provides a background for easy viewing. Temperature control uniformity is assured by means of motorized stirrer which provides complete circulation without turbulence. Connection of the built-in cooling coil to tap water or a recirculating water chiller facilitates temperature control at ambient or below ambient temperatures. *Communications software (RS232, etc.) ramp-to-set, and other enhanced features are available at additional cost. Contact your Koehler representative for additional information.*

**Integrated Timing Features** - HKV3000 incorporates seven digital timers on the front control panel for convenient timing and monitoring of the efflux interval for each viscometer. On HKV4000, the user can enter the viscosity constant for each viscometer on the front control/display, and then get the test result in both efflux time and viscosity units automatically after stopping each timer. All timing functions are displayed in 0.01 or 0.1 second resolution and are accurate within 0.01%.

**Bath Construction and Safety Features** - Bath chamber is a clear borosilicate glass vessel enclosed in an insulated polyester-epoxy finished steel housing. Top working surface has seven 2" (51mm) viscometer ports. Front viewing window assures safe, distortion-free viewing. Microprocessor temperature controller incorporates safety circuitry that interrupts power to the heaters in the event of an overtemperature condition or disconnection of the primary probe. For added safety, an adjustable redundant controller with separate sensor probe interrupts power if an overtemperature situation occurs. An integrated low-liquid sensor prevents operation of the bath if the bath liquid is not filled to the proper level and cuts off power should it fall below during operation. Both overtemperature and low liquid level circuits will latch and prevent further operation of the bath until the fault is removed.



**K23802 Digital High Temperature Kinematic Viscosity Bath (HKV4000)**

### Specifications

Conforms to the specifications of:

ASTM D445, D2170, D6074, D6158; IP 71, 319; ISO 3104; DIN 51550; FTM 791-305; NF T 60-100

#### Temperature Control

Range: ambient to 232°C (450°F); sub-ambient to 10°C with external cooling

Display: 0.1°C/0.1°F resolution, calibrate to 0.01°C/0.01°F

Control accuracy and uniformity: Exceeds ASTM requirements throughout the operating range

#### Integrated timing

HKV3000: Seven individual start/stop timers with displays to 0.1s, accurate to within 0.01%

HKV4000: Integrated LCD microcomputer with start/stop buttons and retention of viscometer tube constants, automatic calculation and display in viscosity units or seconds to 0.1s, within 0.01% accuracy.

Communication: RS232 port included with HKV4000 (optional for HKV3000)

Viscometer ports: Seven round 2" (51mm) ports

Bath Medium: water or suitable heat transfer fluid - please refer to page 8

### Included Accessories

Port covers, Delrin® (7)

Thermometer holder



Software compatible, inquire with Koehler Customer Service.

### Ordering Information

| Catalog No. | Model   | Electrical Requirements C €         | Bath Depth    | Bath Capacity | Dimensions lwxh, in. (cm) | Net Weight    |
|-------------|---------|-------------------------------------|---------------|---------------|---------------------------|---------------|
| K23800      | HKV3000 | 115V 60Hz, single phase 12.7A       | 12" (30.5 cm) | 5.8 gal (22L) | 20½x15½x24½ (51x39x62)    | 84 lbs (38kg) |
| K23802      | HKV4000 |                                     |               |               |                           |               |
| K23890      | HKV3000 | 220-240V 50/60Hz, single phase 7.3A |               |               |                           |               |
| K23892      | HKV4000 |                                     |               |               |                           |               |

# KINEMATIC VISCOSITY

## LKV3000 and LKV4000 Refrigerated Constant Temperature Baths

- Improved design with enhanced performance and safety features
- Standard -30°C (-22°F) LKV3000 model, and extended range -70°C (-94°F) LKV4000 model
- Microprocessor PID temperature control with two decimal calibration offset
- Dual digital displays show setpoint and actual bath temperature
- Selectable temperature scale - Fahrenheit or Celsius
- Conformity to ASTM D445 and related specifications

Refrigerated constant temperature bath series with improvements in operating features, safety and cabinetry. Advanced temperature control circuitry includes microprocessor PID design and two decimal calibration offset. Simple push-button controls and dual digital displays permit easy setting and monitoring of bath temperature. Baths accommodate four glass capillary viscometers using 2" (51mm) round holders (rectangular ports are available on special order) - see separate listing on pages 10-13 for complete selection of viscometers and holders. Bath medium is contained in a clear, evacuated Dewar flask, and glare-free fluorescent backlighting provides excellent visibility when working with the viscometers.

**Standard and extended range models** - Standard LKV3000 model operates at temperatures from ambient to -30°C (-22°F). Extended range LKV4000 model operates at temperatures as low as -70°C (-94°F). Both models exceed ASTM temperature control accuracy and uniformity requirements throughout the operating range. Air-cooled hermetic compressors provide efficient operation with the use of CFC-free refrigerants.

**Bath construction and safety features** - Insulated steel cabinet has an attractive polyester-epoxy finish and is mounted on adjustable leveling feet. Chemical resistant working (top) surface has four round ports for 2" (51mm) viscometer holders and one port for a thermometer holder. Front viewing window provides clear, distortion-free visibility.

Microprocessor controller incorporates circuitry that interrupts power to the heater in the event of an overtemperature condition or disconnection of the primary probe. A redundant adjustable controller and sensor probe provide added overtemperature protection, and an integrated low liquid level sensor cuts power to the heaters if the bath liquid is not filled to the proper level or falls below during operation. Both overtemperature and low liquid level circuits will latch and prevent further operation of the bath until the fault is removed.

## LKV5000 Refrigerated Constant Temperature Baths with Optical Detection

Koehler LKV5000 series kinematic viscosity baths with the optical flow detection system provides automatic viscosity measurements of petroleum and petrochemical products. Includes communication and power ports for each optical detection assembly, and can utilize up to four optical assemblies. Optical sensors and viscometer tubes to be ordered separately.



**K22754-OS Digital Refrigerated Kinematic Viscosity Bath**

### Included Accessories

Four (4) Delrin® viscometer port covers with handles  
Thermometer holder

### Specifications

Conforms to the specifications of:

ASTM D445, D2532, D6074, D6158; IP 71; ISO 3104; DIN 51550;  
FTM 791-305; NF T 60-100

Testing Capacity: Four (4) glass capillary viscometers

Viscometer Ports: Four (4) round 2" (51mm) ports

Bath Dimensions: 9½" dia x 12" deep (24x30cm)

Bath Capacity: 3.7 gal (14L)

Temperature Control:

Display: 0.1°C/0.1°F resolution, calibrate to 0.01°C/0.01°F

Control accuracy and uniformity: Exceeds ASTM requirements throughout the operating range

### Dimensions lwxwxh,in.(cm)

42x35x36 (107x89x91)

Net Weight: 176 lbs (80kg)



Software compatible, inquire with Koehler Customer Service.

### Ordering Information

| Catalog No. | Model   | Temperature Range         | Electrical Requirements C €        | Net Weight      | Shipping Weight  |
|-------------|---------|---------------------------|------------------------------------|-----------------|------------------|
| K22753      | LKV3000 | 15 to -30°C (59 to -22°F) | 115V 60Hz, Single Phase, 20.1A     | 176 lbs (80 kg) | 300 lbs (136 kg) |
| K22753-OS   | LKV5000 | 15 to -30°C (59 to -22°F) | 115V 60Hz, Single Phase, 20.1A     | 176 lbs (80 kg) | 300 lbs (136 kg) |
| K22754      | LKV3000 | 15 to -30°C (59 to -22°F) | 220-240V 50Hz, Single Phase, 10.6A | 176 lbs (80 kg) | 300 lbs (136 kg) |
| K22754-OS   | LKV5000 | 15 to -30°C (59 to -22°F) | 220-240V 50Hz, Single Phase, 10.6A | 176 lbs (80 kg) | 300 lbs (136 kg) |
| K22751      | LKV4000 | 15 to -70°C (59 to -94°F) | 115V 60Hz, Single Phase, 26.9A     | 176 lbs (80 kg) | 300 lbs (136 kg) |
| K22751-OS   | LKV5000 | 15 to -70°C (59 to -94°F) | 115V 60Hz, Single Phase, 26.9A     | 176 lbs (80 kg) | 300 lbs (136 kg) |
| K22752      | LKV4000 | 15 to -70°C (59 to -94°F) | 220-240V 50Hz, Single Phase, 14.5A | 176 lbs (80 kg) | 300 lbs (136 kg) |
| K22752-OS   | LKV5000 | 15 to -70°C (59 to -94°F) | 220-240V 50Hz, Single Phase, 14.5A | 176 lbs (80 kg) | 300 lbs (136 kg) |

## KINEMATIC VISCOSITY

### Viscometer Holders

- For use with glass capillary viscometers

| Ordering Information                                   |                          |
|--------------------------------------------------------|--------------------------|
| Viscometer Type                                        | Round Holder Catalog No. |
| Cannon®-Fenske Routine                                 |                          |
| Cannon®-Fenske Opaque                                  | K23381                   |
| Cannon®-Manning Semi-Micro                             |                          |
| Ubbelohde                                              | K23382                   |
| Cannon®-Ubbelohde                                      |                          |
| Cannon®-Ubbelohde Semi-Micro                           | K23384                   |
| <i>(Also - Dilution and Semi-Micro Dilution types)</i> |                          |
| Cross-Arm                                              | K23383                   |
| BS/IP/RF U-Tube                                        | K23387                   |
| Cannon®-Manning Vacuum                                 | K23388                   |
| Asphalt Institute                                      |                          |
| Modified Koppers                                       | K23363                   |

### High Temperature Viscometer Holders

- For use with HKV baths for temperature up to 232°C (450°F)

| Ordering Information       |                          |
|----------------------------|--------------------------|
| Viscometer Type            | Round Holder Catalog No. |
| Cannon®-Fenske Routine     |                          |
| Cannon®-Fenske Opaque      | K23381-HT                |
| Cannon®-Manning Semi-Micro |                          |
| Ubbelohde                  | K23382-HT                |

### Universal Tube Holders

Can be used interchangeably with Cannon®-Fenske, Cannon®-Manning, Cross-Arm and Ubbelohde type capillary viscometers. Choice of round (2" dia.) plastic holders or rectangular metal holders.

| Ordering Information |                                          |
|----------------------|------------------------------------------|
| Catalog No.          |                                          |
| K23351               | Universal Viscometer Holder, Round       |
| K23350               | Universal Viscometer Holder, Rectangular |

### Digital Stopwatch

- Accurate to 0.0003%
- Calibration certificate traceable to NIST

Solid-state LCD digital stopwatch with a full range of features, including single action timing, cumulative split, interval split and more. Housed in a rugged high impact case with 40" (102cm) lanyard. Supplied with 4-year battery and calibration certificate traceable to NIST.

| Ordering Information |                   |
|----------------------|-------------------|
| Catalog No.          |                   |
| K23462               | Digital Stopwatch |



### Bath Oil

- White mineral oil for routine applications
- Silicone fluid for high temperature applications

**White Mineral Oil**—Highly refined white technical oil for use in constant temperature baths. Contains an oxidation inhibitor to limit clouding at higher temperatures. Suitable for use at temperatures of up to 230°F (110°C).

**Silicone Fluid**—Clear heat transfer fluid with high oxidation resistance and low volatility. Recommended for constant temperature bath applications above 240°F (116°C).

### Specifications

|                                                                | White Mineral Oil    | Silicone Fluid |
|----------------------------------------------------------------|----------------------|----------------|
| Nominal Viscosity                                              | 14.2-17.0 cSt @ 40°C | 100 cSt @ 25°C |
| Minimum Flash Point                                            | 248°F (120°C)        | 392°F (200°C)  |
| Specific Gravity @ 25°C                                        | 0.839-0.855          | 0.964          |
| <i>Shipped in 1 gal (3.785L) or 5 gal (18.925L) containers</i> |                      |                |

| Ordering Information |                                                  |
|----------------------|--------------------------------------------------|
| Catalog No.          |                                                  |
| 355-001-001          | White Mineral Oil, 1 Gallon Container            |
| 355-001-003          | White Mineral Oil, 5 Gallon Container            |
| 355-001-002          | Silicone Heat Transfer Fluid, 1 Gallon Container |
| 355-001-004          | Silicone Heat Transfer Fluid, 5 Gallon Container |

## KINEMATIC VISCOSITY

### Viscometer Cleaning and Drying Apparatus

- Six tube capacity
- For all types of capillary viscometers

Cleans and dries glass capillary viscometers using solvent and pressurized filtered air. Use for all types of kinematic viscometers. Cleans as many as six tubes at a time. Place tubes on solvent/air jets and open the valve for each jet. Turn selector dial to 'solvent' to rinse tubes, and then to 'air' to evaporate any remaining solvent. Use adjustable drainage rack to drain excess sample oil from tubes prior to cleaning. Drainage trough connects to a suitable waste container or chemical drain for removal of waste oil and solvent. Built-in air filter removes particles from the air stream. Available solvent tank has tubing with fittings for connection to apparatus. Requires pressurized air source (150psi maximum).

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

without solvent tank

16x7x12 1/2

(40.6x17.8x31.7)

Net Weight: K34000: 34 lbs (15.4kg)

K34010: 15 lbs (6.8kg)

#### Shipping Information:

Shipping Weight:

K34000: 44 lbs (20kg)

K34010: 18 lbs (8.2kg)

Dimensions:

K34000: 8.2 Cu. ft.

K34010: 2.6 Cu. ft.



K34010 Cleaning and Drying Apparatus

#### Ordering Information

##### Catalog No.

K34000

Viscometer Cleaning and Drying Apparatus  
with Solvent Tank

K34010

Viscometer Cleaning and Drying Apparatus  
without Solvent Tank

## KINEMATIC VISCOSITY THERMOMETERS

| Catalog No.  | Thermometer | Test Temperature |              | IP Reference |
|--------------|-------------|------------------|--------------|--------------|
|              |             | °F               | °C           |              |
| 250-000-74F  | ASTM 74F    | -65°F            | —            | 69F          |
| 250-000-74C  | ASTM 74C    | —                | -53.9°C      | 69C          |
| 250-000-43F  | ASTM 43F    | -61 to -29°F     | —            | 65F          |
| 250-000-43C  | ASTM 43C    | —                | -51 to -34°C | 65C          |
| 250-000-73F  | ASTM 73F    | -40°F            | —            | 68F          |
| 250-000-73C  | ASTM 73C    | —                | -40°C        | 68C          |
| 250-000-126F | ASTM 126F   | -15°F            | —            | 71F          |
| 250-000-126C | ASTM 126C   | —                | -26°C        | 71C          |
| 250-000-127C | ASTM 127C   | —                | -20°C        | 99C          |
| 250-000-72F  | ASTM 72F    | 0°F              | —            | 67F          |
| 250-000-72C  | ASTM 72C    | —                | -17.8°C      | 67C          |
| 250-000-128F | ASTM 128F   | 32°F             | —            | 33F          |
| 250-000-128C | ASTM 128C   | —                | 0°C          | 33C          |
| 250-000-44F  | ASTM 44F    | 68°F             | —            | 29F          |
| 250-000-44C  | ASTM 44C    | —                | 20°C         | 29C          |
| 250-000-45F  | ASTM 45F    | 77°F             | —            | 30F          |
| 250-000-45C  | ASTM 45C    | —                | 25°C         | 30C          |
| 250-000-118F | ASTM 118F   | 86°F             | —            | —            |
| 250-000-118C | ASTM 118C   | —                | 30°C         | —            |

| Catalog No.  | Thermometer | Test Temperature |        | IP Reference |
|--------------|-------------|------------------|--------|--------------|
|              |             | °F               | °C     |              |
| 250-000-28F  | ASTM 28F    | 100°F            | —      | 31F          |
| 250-000-28C  | ASTM 28C    | —                | 37.8°C | 31C          |
| 250-000-120C | ASTM 120C   | —                | 40°C   | 92C          |
| 250-000-46F  | ASTM 46F    | 122°F            | —      | 66F          |
| 250-000-46C  | ASTM 46C    | —                | 50°C   | 66C          |
| 250-000-29F  | ASTM 29F    | 130°F            | —      | —            |
| 250-000-29C  | ASTM 29C    | —                | 54.4°C | 34C          |
| 250-000-47F  | ASTM 47F    | 140°F            | —      | 35F          |
| 250-000-47C  | ASTM 47C    | —                | 60°C   | 35C          |
| 250-000-48F  | ASTM 48F    | 180°F            | —      | 90F          |
| 250-000-48C  | ASTM 48C    | —                | 82.2°C | 90C          |
| 250-000-129F | ASTM 129F   | 200°F            | —      | 36F          |
| 250-000-129C | ASTM 129C   | —                | 93.3°C | 36C          |
| 250-000-30F  | ASTM 30F    | 210°F            | —      | 32F          |
| 250-000-121C | ASTM 121C   | —                | 100°C  | 32C          |
| 250-000-110F | ASTM 110F   | 275°F            | —      | —            |
| 250-000-110C | ASTM 110C   | —                | 135°C  | 93C          |

Please note: ASTM D445 recommends calibrated kinematic viscosity thermometers.

Please refer to the ASTM thermometer section on pages 184 through 191.

## KINEMATIC VISCOSITY

### Calibrated Glass Capillary Kinematic Viscometers

Koehler offers a full selection of glass capillary viscometers for measuring kinematic viscosity of liquid petroleum products in accordance with ASTM D445 and related standard test methods. All types of viscometers conform to ASTM D446 and related standard specifications for glass capillary kinematic viscometers. Each viscometer is supplied with a calibration certificate, and holders should be ordered separately. Please refer to the following brief descriptions for determining which viscometer is best suited for your particular application.

#### Cannon®-Fenske Routine Viscometers

The Cannon®-Fenske Routine viscometer is a rugged and inexpensive viscometer that works well if the sample is transparent or translucent. Other viscometers for transparent samples in this catalog include the Cross Arm and BS/U-Tube viscometers.

#### Ubbelohde Viscometers

The Ubbelohde viscometer and other suspended level viscometers are used to measure transparent liquids. Unlike the Cannon®-Fenske Routine viscometer, suspended level viscometers maintain the same viscometer constant at all temperatures, advantageous when samples are to be measured at different temperatures. Other suspended level viscometers in this catalog include the BS/IP/SL, BP/IP/SL(S), and BP/IP/MSL viscometers.

#### Reverse Flow Viscometers

The Cannon®-Fenske Opaque, Cross Arm, and BS/IP/RF U-Tube viscometers have been designed for testing opaque liquids. These viscometers wet the timing section of the viscometer capillary only during the actual measurement and must be cleaned, dried and refilled before a repeat measurement can be made. By contrast, other viscometer types commonly used to measure transparent liquids allow the sample to be repeatedly drawn up into the capillary, permitting duplicate measurements.

#### Small Volume Viscometers

Several semi-micro viscometers have been designed which require one milliliter or less of liquid, which include the Cannon®-Manning Semi-Micro, Cannon®-Manning Semi-Micro Extra Low Charge, and Cannon®-Ubbelohde Semi-Micro viscometers.

#### Dilution Viscometers

Estimates of the molecular size and shape of large polymers molecules can be obtained from kinematic viscosity measurements of dilute solutions. The Cannon®-Ubbelohde Dilution viscometer has an extra large reservoir which allows polymer solutions to be diluted several times and measures viscosities at four different shear rates. Dilute polymer solutions frequently appear to exhibit changes in kinematic viscosity when the shear rate is changed.

#### Vacuum Viscometers

In most glass capillary viscometers, the samples flow under gravity. When liquids are too viscous to flow readily under gravity, vacuum viscometers may be used to measure viscosity. A vacuum is applied to one end of the viscometer to pull the liquid through the capillary into the timing bulb. Koehler offers the Cannon®-Manning Vacuum, the Asphalt Institute Vacuum, and the Modified Koppers Vacuum reverse flow viscometer tubes. These vacuum viscometers require an accurately controlled vacuum regulator for proper measurement. Please refer to page 13 for information about the Koehler Vacuum Regulator.



Cannon®-Fenske  
Routine



Cannon®-Fenske  
Opaque



Ubbelohde

#### Cannon®-Fenske Routine

For kinematic viscosity of transparent liquids up to 100,000cSt. Requires a sample of approximately 7mL. Use with K23310 and K23350 rectangular metal holders or K23381 and K23351 round plastic holders. Length: 250mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-025-C01 | 25   | 0.002                       | 0.5 to 2                       |
| 378-050-C01 | 50   | 0.004                       | 0.8 to 4                       |
| 378-075-C01 | 75   | 0.008                       | 1.6 to 8                       |
| 378-100-C01 | 100  | 0.015                       | 3 to 15                        |
| 378-150-C01 | 150  | 0.035                       | 7 to 35                        |
| 378-200-C01 | 200  | 0.1                         | 20 to 100                      |
| 378-300-C01 | 300  | 0.25                        | 50 to 250                      |
| 378-350-C01 | 350  | 0.5                         | 100 to 500                     |
| 378-400-C01 | 400  | 1.2                         | 240 to 1,200                   |
| 378-450-C01 | 450  | 2.5                         | 500 to 2,500                   |
| 378-500-C01 | 500  | 8.0                         | 1,600 to 8,000                 |
| 378-600-C01 | 600  | 20.0                        | 4,000 to 20,000                |
| 378-650-C01 | 650  | 45.0                        | 9,000 to 45,000                |
| 378-700-C01 | 700  | 100.0                       | 20,000 to 100,000              |

**Koehler supplies a wide range of viscosity reference standards used for calibration and verification of kinematic and dynamic viscosity test equipment. Please refer to pages 18-19 or contact Koehler Customer Service for additional information.**

## KINEMATIC VISCOSITY

### Cannon®-Fenske Opaque

Reverse-flow viscometer for measurement of transparent and dark liquids having kinematic viscosities of up to 100,000cSt. Requires a sample of approximately 12mL. Allows timing of samples whose thin films are opaque and are thus not suitable for modified Ostwald and suspended-level type viscometers. Can be used for kinematic viscosities of asphalts by ASTM D2170 method. Use with K23310 and K23350 rectangular metal holders or K23381 and K23351 round plastic holders. Length: 295mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-025-C02 | 25   | 0.002                       | 0.4 to 2                       |
| 378-050-C02 | 50   | 0.004                       | 0.8 to 4                       |
| 378-075-C02 | 75   | 0.008                       | 1.6 to 8                       |
| 378-100-C02 | 100  | 0.015                       | 3 to 15                        |
| 378-150-C02 | 150  | 0.035                       | 7 to 35                        |
| 378-200-C02 | 200  | 0.1                         | 20 to 100                      |
| 378-300-C02 | 300  | 0.25                        | 50 to 250                      |
| 378-350-C02 | 350  | 0.5                         | 100 to 500                     |
| 378-400-C02 | 400  | 1.2                         | 240 to 1,200                   |
| 378-450-C02 | 450  | 2.5                         | 500 to 2,500                   |
| 378-500-C02 | 500  | 8.0                         | 1,600 to 8,000                 |
| 378-600-C02 | 600  | 20.0                        | 4,000 to 20,000                |
| 378-650-C02 | 650  | 45.0                        | 9,000 to 45,000                |
| 378-700-C02 | 700  | 100.0                       | 20,000 to 100,000              |

### Ubbelohde

Suspended-level type viscometer for kinematic viscosities of transparent liquids of up to 100,000cSt. Requires a sample volume of approximately 11mL. Use with K23320 and K23350 rectangular metal holders or K23382 and K23351 round plastic holders. Length: 283mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-000-C03 | 0    | 0.001                       | 0.3 to 1                       |
| 378-00C-C03 | 0C   | 0.003                       | 0.6 to 3                       |
| 378-00B-C03 | 0B   | 0.005                       | 1 to 5                         |
| 378-001-C03 | 1    | 0.01                        | 2 to 10                        |
| 378-01C-C03 | 1C   | 0.03                        | 6 to 30                        |
| 378-01B-C03 | 1B   | 0.05                        | 10 to 50                       |
| 378-002-C03 | 2    | 0.1                         | 20 to 100                      |
| 378-02C-C03 | 2C   | 0.3                         | 60 to 300                      |
| 378-02B-C03 | 2B   | 0.5                         | 100 to 500                     |
| 378-003-C03 | 3    | 1.0                         | 200 to 1,000                   |
| 378-03C-C03 | 3C   | 3.0                         | 600 to 3,000                   |
| 378-03B-C03 | 3B   | 5.0                         | 1,000 to 5,000                 |
| 378-004-C03 | 4    | 10.0                        | 2,000 to 10,000                |
| 378-04C-C03 | 4C   | 30.0                        | 6,000 to 30,000                |
| 378-04B-C03 | 4B   | 50.0                        | 10,000 to 50,000               |
| 378-005-C03 | 5    | 100.0                       | 20,000 to 100,000              |

### Cannon®-Ubbelohde Four-Bulb Shear Dilution

Suspended level viscometer for the measurement of intrinsic viscosity extrapolated to zero shear rate. Provides five-fold range of shear rates. Requires approximately 20mL of sample. Use with K23361 rectangular holder or K23384 round holder. Length: 280 mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-025-C16 | 25   | 0.002                       | 0.5 to 2                       |
| 378-050-C16 | 50   | 0.004                       | 0.8 to 4                       |
| 378-075-C16 | 75   | 0.008                       | 1.6 to 8                       |
| 378-100-C16 | 100  | 0.015                       | 3 to 15                        |
| 378-150-C16 | 150  | 0.035                       | 7 to 35                        |

### Cannon®-Ubbelohde

Suspended level viscometer for transparent liquids. Requires approximately 11mL of sample. Use with K23361 rectangular holder or K23384 round holder. Length: 335mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-025-C11 | 25   | 0.002                       | 0.5 to 2                       |
| 378-050-C11 | 50   | 0.004                       | 0.8 to 4                       |
| 378-075-C11 | 75   | 0.008                       | 1.6 to 8                       |
| 378-100-C11 | 100  | 0.015                       | 3 to 15                        |
| 378-150-C11 | 150  | 0.035                       | 7 to 35                        |
| 378-200-C11 | 200  | 0.1                         | 20 to 100                      |
| 378-300-C11 | 300  | 0.25                        | 50 to 200                      |
| 378-350-C11 | 350  | 0.5                         | 100 to 500                     |
| 378-400-C11 | 400  | 1.2                         | 240 to 1,200                   |
| 378-450-C11 | 450  | 2.5                         | 500 to 2,500                   |
| 378-500-C11 | 500  | 8.0                         | 1,600 to 8,000                 |
| 378-600-C11 | 600  | 20.0                        | 4,000 to 20,000                |
| 378-650-C11 | 650  | 45.0                        | 9,000 to 45,000                |
| 378-700-C11 | 700  | 100.0                       | 20,000 to 100,000              |

### Cannon®-Ubbelohde Dilution

Suspended level viscometer for the measurement of intrinsic viscosity of transparent liquids. Requires approximately 8mL of sample. Use with K23361 rectangular holder or K23384 round holder. Length: 385mm. Note: 18" Depth bath required to accommodate tubes.

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-025-C15 | 25   | 0.002                       | 0.5 to 2                       |
| 378-050-C15 | 50   | 0.004                       | 0.8 to 4                       |
| 378-075-C15 | 75   | 0.008                       | 1.6 to 8                       |
| 378-100-C15 | 100  | 0.015                       | 3 to 15                        |
| 378-150-C15 | 150  | 0.035                       | 7 to 35                        |
| 378-200-C15 | 200  | 0.1                         | 20 to 100                      |
| 378-300-C15 | 300  | 0.25                        | 50 to 200                      |
| 378-350-C15 | 350  | 0.5                         | 100 to 500                     |
| 378-400-C15 | 400  | 1.2                         | 240 to 1,200                   |
| 378-450-C15 | 450  | 2.5                         | 500 to 2,500                   |
| 378-500-C15 | 500  | 8.0                         | 1,600 to 8,000                 |
| 378-600-C15 | 600  | 20.0                        | 4,000 to 20,000                |

### Cannon®-Ubbelohde Semi-Micro

For transparent liquids. Requires approximately 1.0mL of sample. Use with K23361 rectangular holder or K23384 round holder. Length: 335mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-025-C12 | 25   | 0.002                       | 0.5 to 2                       |
| 378-050-C12 | 50   | 0.004                       | 0.8 to 4                       |
| 378-075-C12 | 75   | 0.008                       | 1.6 to 8                       |
| 378-100-C12 | 100  | 0.015                       | 3 to 15                        |
| 378-150-C12 | 150  | 0.035                       | 7 to 35                        |
| 378-200-C12 | 200  | 0.1                         | 20 to 100                      |
| 378-300-C12 | 300  | 0.25                        | 50 to 200                      |
| 378-350-C12 | 350  | 0.5                         | 100 to 500                     |
| 378-400-C12 | 400  | 1.2                         | 240 to 1,200                   |
| 378-450-C12 | 450  | 2.5                         | 500 to 2,500                   |
| 378-500-C12 | 500  | 8.0                         | 1,600 to 8,000                 |
| 378-600-C12 | 600  | 20.0                        | 4,000 to 20,000                |

## KINEMATIC VISCOSITY

### Cannon®-Manning Semi-Micro

For transparent liquids. Requires a sample of approximately 1.0mL. Use with K23310 and K23350 rectangular holders or K23381 and K23351 round holders. Length: 275mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-025-C10 | 25   | 0.002                       | 0.5 to 2                       |
| 378-050-C10 | 50   | 0.004                       | 0.8 to 4                       |
| 378-075-C10 | 75   | 0.008                       | 1.6 to 8                       |
| 378-100-C10 | 100  | 0.015                       | 3 to 15                        |
| 378-150-C10 | 150  | 0.035                       | 7 to 35                        |
| 378-200-C10 | 200  | 0.1                         | 20 to 100                      |
| 378-300-C10 | 300  | 0.25                        | 50 to 200                      |
| 378-350-C10 | 350  | 0.5                         | 100 to 500                     |
| 378-400-C10 | 400  | 1.2                         | 240 to 1,200                   |
| 378-450-C10 | 450  | 2.5                         | 500 to 2,500                   |
| 378-500-C10 | 500  | 8.0                         | 1,600 to 8,000                 |
| 378-600-C10 | 600  | 20.0                        | 4,000 to 20,000                |

### Cannon®-Manning Semi-Micro Extra Low Charge

For transparent liquids. Requires a sample of approximately 0.5mL. Use with K23350 rectangular holders or K23351 round holders. Length: 200mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-025-C17 | 25   | 0.002                       | 0.5 to 2                       |
| 378-050-C17 | 50   | 0.004                       | 0.8 to 4                       |
| 378-075-C17 | 75   | 0.008                       | 1.6 to 8                       |
| 378-100-C17 | 100  | 0.015                       | 3 to 15                        |
| 378-150-C17 | 150  | 0.035                       | 7 to 35                        |
| 378-200-C17 | 200  | 0.1                         | 20 to 100                      |
| 378-300-C17 | 300  | 0.25                        | 50 to 200                      |
| 378-350-C17 | 350  | 0.5                         | 100 to 500                     |
| 378-400-C17 | 400  | 1.2                         | 240 to 1,200                   |
| 378-450-C17 | 450  | 2.5                         | 500 to 2,500                   |
| 378-500-C17 | 500  | 8.0                         | 1,600 to 8,000                 |
| 378-600-C17 | 600  | 20.0                        | 4,000 to 20,000                |

### Cross-Arm

Reverse-flow type viscometer for transparent and dark liquids having kinematic viscosities of up to 100,000cSt. Requires a sample of approximately 1-3mL. Use with K23362 and K23350 rectangular metal holders or K23383 and K23351 round plastic holders. Length: 305mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-001-C09 | 1    | 0.003                       | 0.6 to 3                       |
| 378-002-C09 | 2    | 0.01                        | 2 to 10                        |
| 378-003-C09 | 3    | 0.03                        | 6 to 30                        |
| 378-004-C09 | 4    | 0.1                         | 20 to 100                      |
| 378-005-C09 | 5    | 0.3                         | 60 to 300                      |
| 378-006-C09 | 6    | 1.0                         | 200 to 1,000                   |
| 378-007-C09 | 7    | 3.0                         | 600 to 3,000                   |
| 378-008-C09 | 8    | 10.0                        | 2,000 to 10,000                |
| 378-009-C09 | 9    | 30.0                        | 6,000 to 30,000                |
| 378-010-C09 | 10   | 100.0                       | 20,000 to 100,000              |

*Koehler supplies a wide range of viscosity reference standards used for calibration and verification of kinematic and dynamic viscosity test equipment. Please refer to pages 18-19 or contact Koehler Customer Service for additional information.*

### BS/IP/RF U-Tube Opaque

Reverse-flow viscometer for opaque liquids having kinematic viscosities of up to 300,000cSt. Requires a sample of 12-25mL. Use with K23330 rectangular metal holders or K23387 round plastic holders. Length: 275mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-001-C08 | 1    | 0.003                       | 0.6 to 3                       |
| 378-002-C08 | 2    | 0.01                        | 2 to 10                        |
| 378-003-C08 | 3    | 0.03                        | 6 to 30                        |
| 378-004-C08 | 4    | 0.1                         | 20 to 100                      |
| 378-005-C08 | 5    | 0.3                         | 60 to 300                      |
| 378-006-C08 | 6    | 1.0                         | 200 to 1,000                   |
| 378-007-C08 | 7    | 3.0                         | 600 to 3,000                   |
| 378-008-C08 | 8    | 10.0                        | 2,000 to 10,000                |
| 378-009-C08 | 9    | 30.0                        | 6,000 to 30,000                |
| 378-010-C08 | 10   | 100.0                       | 20,000 to 100,000              |
| 378-011-C08 | 11   | 300.0                       | 60,000 to 300,000              |

### BS/U-Tube Transparent

U-Tube viscometer for transparent liquids having kinematic viscosities of up to 10,000cSt. Requires a sample of 7-23mL. Length: 300mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-00A-C08 | A    | 0.003                       | 0.9 to 3                       |
| 378-00B-C08 | B    | 0.01                        | 2.0 to 10                      |
| 378-00C-C08 | C    | 0.03                        | 6 to 30                        |
| 378-00D-C08 | D    | 0.1                         | 20 to 100                      |
| 378-00E-C08 | E    | 0.3                         | 60 to 300                      |
| 378-00F-C08 | F    | 1.0                         | 200 to 1,000                   |
| 378-00G-C08 | G    | 3.0                         | 600 to 3,000                   |
| 378-00H-C08 | H    | 10.0                        | 2,000 to 10,000                |

### BS/U/M Miniature U-Tube

Miniature U-Tube viscometer for transparent liquids having kinematic viscosities of up to 100cSt. Requires a sample of 2mL. Length: 250mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-0M1-C18 | M1   | 0.001                       | 0.2 to 1                       |
| 378-0M2-C18 | M2   | 0.005                       | 1 to 5                         |
| 378-0M3-C18 | M3   | 0.015                       | 3 to 15                        |
| 378-0M4-C18 | M4   | 0.04                        | 8 to 40                        |
| 378-0M5-C18 | M5   | 0.1                         | 20 to 100                      |

### Vacuum Manifold

Designed for use with Koehler capillary-type viscometer tube baths and vacuum regulator. Manifold includes seven position valves and tubing for applying vacuum or pressure as per ASTM D2171.

| Ordering Information |                 |
|----------------------|-----------------|
| Catalog No.          |                 |
| K23467               | Vacuum Manifold |

## KINEMATIC VISCOSITY

### BS/IP/MSL Miniature Suspended Level

Miniature suspended level viscometer for transparent liquids having kinematic viscosities of up to 3,000cSt. Requires a sample of 4mL. Length: 345mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-001-C19 | 1    | 0.003                       | 0.6 to 3                       |
| 378-002-C19 | 2    | 0.01                        | 2 to 10                        |
| 378-003-C19 | 3    | 0.03                        | 6 to 30                        |
| 378-004-C19 | 4    | 0.1                         | 20 to 100                      |
| 378-005-C19 | 5    | 0.3                         | 60 to 300                      |
| 378-006-C19 | 6    | 1.0                         | 200 to 1,000                   |
| 378-007-C19 | 7    | 3.0                         | 600 to 3,000                   |

### BS/IP/SL Suspended Level

Suspended level viscometer for transparent liquids having kinematic viscosities of up to 100,000cSt. Requires a sample of 11mL. Length: 250mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-001-C20 | 1    | 0.01                        | 3.5 to 10                      |
| 378-01A-C20 | 1A   | 0.03                        | 6 to 30                        |
| 378-002-C20 | 2    | 0.1                         | 20 to 100                      |
| 378-02A-C20 | 2A   | 0.3                         | 60 to 300                      |
| 378-003-C20 | 3    | 1.0                         | 200 to 1,000                   |
| 378-03A-C20 | 3A   | 3.0                         | 600 to 3,000                   |
| 378-004-C20 | 4    | 10.0                        | 2,000 to 10,000                |
| 378-04A-C20 | 4A   | 30.0                        | 6,000 to 30,000                |
| 378-005-C20 | 5    | 100.0                       | 20,000 to 100,000              |

### BS/IP/SL(S) Suspended Level

Shortened suspended level viscometer for transparent liquids having kinematic viscosities of up to 100,000cSt. Requires a sample of 10mL. Length: 255mm

| Catalog No. | Size | Approximate Constant, cSt/s | Kinematic Viscosity Range, cSt |
|-------------|------|-----------------------------|--------------------------------|
| 378-001-C21 | 1    | 0.0008                      | 3.5 to 10                      |
| 378-002-C21 | 2    | 0.003                       | 6 to 30                        |
| 378-003-C21 | 3    | 0.01                        | 20 to 100                      |
| 378-004-C21 | 4    | 0.03                        | 60 to 300                      |
| 378-005-C21 | 5    | 0.1                         | 200 to 1,000                   |
| 378-006-C21 | 6    | 0.3                         | 600 to 3,000                   |
| 378-007-C21 | 7    | 1.0                         | 2,000 to 10,000                |
| 378-008-C21 | 8    | 3.0                         | 6,000 to 30,000                |
| 378-009-C21 | 9    | 10.0                        | 20,000 to 100,000              |

### Cannon®-Manning Vacuum

For highly viscous materials, including asphalt cement at 140°F (60°C) in accordance with ASTM D2171. Requires approximately 6mL of sample. Use with K23360 rectangular holder or K23388 round holder. Length: 230-260mm

|             |      | Approximate Constant at 300mm Hg vacuum, poise/second |        | Viscosity Range, Poise |
|-------------|------|-------------------------------------------------------|--------|------------------------|
| Catalog No. | Size | Bulb B                                                | Bulb C |                        |
| 378-004-C13 | 4    | 0.0002                                                | 0.0006 | 0.36 to 0.8            |
| 378-005-C13 | 5    | 0.006                                                 | 0.002  | 0.12 to 2.4            |
| 378-006-C13 | 6    | 0.02                                                  | 0.006  | 0.36 to 8              |
| 378-007-C13 | 7    | 0.06                                                  | 0.02   | 1.2 to 24              |
| 378-008-C13 | 8    | 0.2                                                   | 0.06   | 3.6 to 80              |
| 378-009-C13 | 9    | 0.6                                                   | 0.2    | 12 to 240              |
| 378-010-C13 | 10   | 2                                                     | 0.6    | 36 to 800              |
| 378-011-C13 | 11   | 6                                                     | 2      | 120 to 2,400           |
| 378-012-C13 | 12   | 20                                                    | 6      | 360 to 8,000           |
| 378-013-C13 | 13   | 60                                                    | 20     | 1,200 to 24,000        |
| 378-014-C13 | 14   | 200                                                   | 60     | 3,600 to 80,000        |

### Asphalt Institute Vacuum

Similar to Cannon®-Manning Vacuum type, but with graduated capillary instead of two timing bulbs. Requires a sample of approximately 4mL. Use with K23360 rectangular holder or K23388 round holder. Length: 230-260mm

|             |      | Approximate Constant at 300mm Hg vacuum, poise/second |        | Viscosity Range, Poise |
|-------------|------|-------------------------------------------------------|--------|------------------------|
| Catalog No. | Size | Bulb B                                                | Bulb C |                        |
| 378-025-C14 | 25   | 2                                                     | 1      | 0.7                    |
| 378-050-C14 | 50   | 8                                                     | 4      | 3                      |
| 378-100-C14 | 100  | 32                                                    | 16     | 10                     |
| 378-200-C14 | 200  | 128                                                   | 64     | 40                     |
| 378-400-C14 | 400  | 500                                                   | 250    | 160                    |

### Modified Koppers Vacuum

For highly viscous materials in accordance with ASTM D2171. Requires a sample of 2mL. Use with K23364 rectangular holder or K23363 round holder. Length: 270mm

|             |      | Approximate Constant at 300mm Hg vacuum, poise/second |        | Viscosity Range, Poise |
|-------------|------|-------------------------------------------------------|--------|------------------------|
| Catalog No. | Size | Bulb B                                                | Bulb C |                        |
| 378-025-C06 | 25   | 2                                                     | 1      | 0.7                    |
| 378-050-C06 | 50   | 8                                                     | 4      | 3                      |
| 378-100-C06 | 100  | 32                                                    | 16     | 10                     |
| 378-200-C06 | 200  | 128                                                   | 64     | 40                     |
| 378-400-C06 | 400  | 500                                                   | 250    | 160                    |

## VACUUM REGULATOR

### Vacuum Regulator

For ASTM D2171, "Viscosity of Asphalts by Vacuum Capillary Viscometers." Precisely controls vacuum from 28 to 411 mm Hg below atmospheric pressure to an accuracy of  $\pm 0.5$  mm Hg. Recommended for use with Cannon®-Manning, Asphalt Institute or Modified Koppers vacuum viscometers. All solid-state—contains no mercury. Amount of vacuum is shown on digital display. Ten different units of vacuum measurement may be selected through keypad on the meter.

#### Ordering Information

| Catalog No. |                                                             |
|-------------|-------------------------------------------------------------|
| K23463      | Vacuum Regulator (vertical orientation), 115V 60Hz          |
| K23464      | Vacuum Regulator (vertical orientation), 220-240V 50/60Hz   |
| K23465      | Vacuum Regulator (horizontal orientation), 115V 60Hz        |
| K23466      | Vacuum Regulator (horizontal orientation), 220-240V 50/60Hz |

# LOW TEMPERATURE VISCOSITY MEASURED BY ROTATIONAL VISCOMETER



## Test Method

Determines the low temperature, low shear rate viscosities of gear oils, automatic transmission fluids, hydraulic oils and other fluid lubricants by use of a rotational viscometer.

## New BVS4000 Brookfield Viscosity Air Bath System

- Conforms to ASTM D2983 and related specifications
- Mechanically refrigerated with digital indicating temperature control
- Operating range to  $-50^{\circ}\text{C}$
- Sixteen sample capacity

Mechanically refrigerated cold cabinet prepares samples for dynamic viscosity determinations on petroleum lubricants. A built-in turntable rotates the samples at 4rpm per specifications. Cooling system maintains cabinet temperature within  $\pm 0.1^{\circ}\text{C}$  at temperatures as low as  $-50^{\circ}\text{C}$ . Cabinet temperature is displayed in digital format on the front panel. Cabinet accommodates sixteen (16) sample cells with cell carriers. Includes insulated cover.

## Specifications

Conforms to the specifications of:

ASTM D2983; IP 267 Method A; ISO 9262; CEC-L-18A

Capacity: 16 sample cells with cell carriers

Temperature Range:  $+10^{\circ}\text{C}$  to  $-50^{\circ}\text{C}$

Temperature control accuracy:  $\pm 0.1^{\circ}\text{C}$

Sample Rotation: 4rpm

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 16A

220-240V 50 or 60Hz, Single Phase, 12A

## New BVS3000 Brookfield Viscosity Liquid Bath System

- Permits viscosity measurements without the risk of temperature increase
- 10 sample turntable
- Mechanically refrigerated with digital indicating temperature control
- Operating range to  $-55^{\circ}\text{C}$

Constant temperature liquid bath permits testing of samples without the risk of sample temperature rise. After cooling in the air bath, the sample must be transferred to the balsa cell carrier for testing with the Rotational viscometer. If the sample is not tested quickly, there is the risk of sample temperature rise. The Brookfield Viscosity Liquid Bath System eliminates this risk by permitting the sample to be tested in a constant temperature environment. The Rotational viscometer mounts directly on the bath and the samples are rotated into position under the spindle by means of a built-in turntable. Cooling system maintains temperature with  $\pm 0.05^{\circ}\text{C}$  stability in the range of  $+10^{\circ}\text{C}$  to  $-55^{\circ}\text{C}$ . Bath temperature is displayed in digital format.

## Specifications

Conforms to the specifications of: ASTM D2983

Sample Capacity: 10 samples

Temperature Range:  $+10^{\circ}\text{C}$  to  $-55^{\circ}\text{C}$

Temperature Control Stability:  $\pm 0.05^{\circ}\text{C}$

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 16A

220-240V 50 or 60Hz, Single Phase, 12A

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

17x24x25(43x61x25)

Net Weight: 265 lbs (120kg)

## Shipping Information

Shipping Weight: 300 lbs (136kg)

Dimensions: 13.9 Cu. ft.

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

36x28x43 (91x71x109)

Net Weight: 315 lbs (143kg)

## Shipping Information

Shipping Weight: 380 lbs (172kg)

Dimensions: 38.9 Cu. ft.

## Ordering Information

### Catalog No.

|               |                                                                  |
|---------------|------------------------------------------------------------------|
| <b>K34710</b> | BVS3000 Brookfield Viscosity Liquid Bath System<br>115V 60Hz     |
| <b>K34711</b> | BVS3000 Brookfield Viscosity Liquid Bath System<br>220-240V 50Hz |
| <b>K34712</b> | BVS3000 Brookfield Viscosity Liquid Bath System<br>220-240V 60Hz |
| <b>K34700</b> | BVS4000 Brookfield Viscosity Air Bath System<br>115V 60Hz        |
| <b>K34701</b> | BVS4000 Brookfield Viscosity Air Bath System<br>220-240V 50Hz    |
| <b>K34702</b> | BVS4000 Brookfield Viscosity Air Bath System<br>220-240V 60Hz    |



Software compatible, inquire  
with Koehler Customer Service.

# LOW TEMPERATURE VISCOSITY MEASURED BY ROTATIONAL VISCOMETER

## BVS5000 Programmable Brookfield Viscosity Liquid Bath System

- Sample soaking and testing in a single bath, eliminating the need for an air bath and the risk of sample temperature rise during transfer
- Redesigned for improved control of sample movement and handling during testing
- Microprocessor PID temperature control duplicates the sample cooling rates in ASTM D2983
- Up to 40 cooling/testing temperature profiles can be stored in memory

Redesigned programmable baths with improved features for sample handling and testing. Bath accommodates 10 samples for Dynamic Viscosity testing. Sample cells are immersed in a liquid bath for the entire soaking and testing period, eliminating the need to transfer cells from an air bath to a liquid bath with insulated balsa wood carriers. Also eliminated is the inherent risk of sample temperature rise during transfer. The programmable microprocessor PID controller stores up to 40 temperature profiles that duplicate the sample cooling rates found in ASTM D2983. Steady state temperature accuracy and uniformity exceed ASTM requirements throughout the operating range from ambient to -55°C. Air-cooled hermetic compressors provide efficient operation with the use of CFC-free refrigerants.

The mounting position for the Rotational Viscometer has been changed to permit easier access to the samples and viscometer controls. Cabinet has a front window and glare-free fluorescent lighting for distortion free viewing of the sample cells. Cabinet construction is polyester-epoxy finished steel with a chemical-resistant composite top surface. A removable insulated cover with handle is included. Bath rests on adjustable leveling feet. Safety features include a probe fault detection circuit in the primary temperature controller and a redundant latching controller and probe for temperature fault protection.

### Specifications

Conforms to the specifications of:

ASTM D2983 - Note 2 and Note 10; IP 267 Method B; CEC-L-18A-30; ISO 9262

Sample capacity: 10 samples

Temperature control: Microprocessor PID digital-indicating programmable controller with  $\pm 0.05^\circ\text{C}$  steady state stability

Operating Range: ambient to  $-55^\circ\text{C}$

Electrical Requirements: **CE**

220-240V 50 or 60Hz, Single Phase, 12.6A

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

41x34x38 (104x86.5x96.5)

Net Weight: 327 lbs (148.5kg)

### Shipping Information

Shipping Weight: 497 lbs (226kg)

Dimensions: 41.5 Cu. ft.



**K34715 Programmable Brookfield Viscosity Liquid Bath System**

### Accessories

| Catalog No.         |                                                                                                    | Order Qty |
|---------------------|----------------------------------------------------------------------------------------------------|-----------|
| <b>K447-BL</b>      | Rotational Viscometer, Bold Series L<br>100-240V 50/60Hz                                           | 1         |
| <b>K447-PL</b>      | Rotational Viscometer, Power Series L<br>100-240V 50/60Hz                                          | 1         |
| <b>K34706</b>       | Insulated Spindle No.4B2                                                                           | 1         |
| <b>K447-SP-L4</b>   | L4 Spindle                                                                                         | 1         |
| <b>K2983-2</b>      | Cell Stopper (For K34706 Only)                                                                     | 1         |
| <b>K34707</b>       | Cell Stopper                                                                                       | 12        |
| <b>K34779</b>       | Spindle Support Clips                                                                              | 12        |
| <b>K34708</b>       | Insulated Cell Carrier (for Air Bath)                                                              | 1         |
| <b>K34709</b>       | Test Cell - Round Bottom (pack of 12)                                                              | 1         |
| <b>K34770</b>       | Test Cell - Flat Bottom (pack of 12)                                                               | 1         |
| <b>250-000-122C</b> | ASTM 122C/IP94C Thermometer<br>Range $-45$ to $-35^\circ\text{C}$                                  | 1         |
| <b>250-000-123C</b> | ASTM 123C/IP95C Thermometer<br>Range $-35$ to $-25^\circ\text{C}$                                  | 1         |
| <b>250-000-124C</b> | ASTM 124C/IP96C Thermometer<br>Range $-25$ to $-15^\circ\text{C}$                                  | 1         |
| <b>250-000-125C</b> | ASTM 125C/IP97C Thermometer<br>Range $-15$ to $-5^\circ\text{C}$                                   | 1         |
| <b>355-005-027</b>  | Viscosity Standard N27B<br>Viscosities in centipoise at $-40, -30, -20, -15, -10, 0^\circ\text{F}$ | 1         |
| <b>355-005-115</b>  | Viscosity Standard N115B<br>Viscosity in centipoise at $-20, -15, -10, 0, +10, 20^\circ\text{F}$   | 1         |

### Ordering Information

#### Catalog No.

**K34715** BVS5000 Programmable Brookfield Viscosity Liquid Bath System, 220-240V 50Hz

**K34716** BVS5000 Programmable Brookfield Viscosity Liquid Bath System, 220-240V 60Hz



Software compatible, inquire with Koehler Customer Service.

## SAYBOLT VISCOSITY



K21414 Saybolt Viscosity Bath (SV4000) with K21404 Auto Viscosity Timers

### Ordering Information

| Catalog No.                                                                                                   |                                                             | Order Qty |
|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------|
| <b>SV3000 Saybolt Viscosity Bath</b>                                                                          |                                                             |           |
| K21410                                                                                                        | SV3000 Saybolt Viscosity Bath, 115V 60Hz                    | 1         |
| K21420                                                                                                        | SV3000 Saybolt Viscosity Bath, 220-240V 50/60Hz             |           |
| <b>SV4000 Saybolt Viscosity Bath for Automatic Viscosity Timing</b>                                           |                                                             |           |
| K21414                                                                                                        | SV4000 Saybolt Viscosity Bath, 115V 60Hz                    | 1         |
| K21424                                                                                                        | SV4000 Saybolt Viscosity Bath, 220-240V 50/60Hz             |           |
| <b>Automatic Saybolt Viscosity Timing Sensor</b>                                                              |                                                             |           |
| K21404                                                                                                        | Automatic Saybolt Viscosity Timing Sensor, 115V 60Hz        | 1-4       |
| K21494                                                                                                        | Automatic Saybolt Viscosity Timing Sensor, 220-240V 50/60Hz | 1-4       |
| <i>Each port can accommodate one sensor for automatic timing operation on SV4000 Saybolt Viscosity Baths.</i> |                                                             |           |
| <b>Accessories</b>                                                                                            |                                                             |           |
| 355-001-002                                                                                                   | Silicone Heat Transfer Fluid, 1 Gallon Container            | 5         |
| 355-001-004                                                                                                   | Silicone Heat Transfer Fluid, 5 Gallon Container            | 1         |
| <i>minimum flash point 620°F (326°C)</i>                                                                      |                                                             |           |
| <i>Please refer to separate listing on page 8 for specifications.</i>                                         |                                                             |           |

**Please contact Koehler Customer Service about the retrofitting of SV3000 Series Saybolt Viscosity Baths with the new K21404 Automatic Saybolt Viscosity Timing Sensors.**

 Software compatible, inquire with Koehler Customer Service.

### Test Method

Determines the time required for 60mL of sample to flow through a calibrated orifice under precisely controlled conditions. Saybolt Universal Seconds (SUS) is the standard measurement for lubricants, insulating oils and lighter fuel grades, and Saybolt Furol Seconds (SFS) is used for heavier oils and bitumens.

### SV3000 Saybolt Viscosity Bath and New SV4000 Saybolt Viscosity Bath for Automatic Viscosity Timing

- Microprocessor control of temperature between ambient and 240°C (464°F)
- Four tube capacity
- Dual digital displays show setpoint and actual temperature
- Selectable temperature scale - Celsius or Fahrenheit
- Automatic timing option for simplified, accurate measurement of efflux times
- Conforms to ASTM D88, D244, E102, and related specifications

Constant temperature bath with available automatic timing feature for viscosity determinations using Saybolt viscometer tubes and orifices. Microprocessor PID circuitry assures precise temperature control within ASTM specified tolerances throughout the operating range of the bath. Simple push-button controls and dual digital displays permit easy setting and monitoring of bath temperature. Two place calibration offset is provided. Accommodates four viscometers and four 60mL receiving flasks. Sliding draft shields and a chemical-resistant alignment plate facilitate handling of the flasks, and glare-free fluorescent backlighting is provided for easy viewing of the samples. *Communications software (RS232, etc.) ramp-to-set, and other enhanced features are available at additional cost. Contact your Koehler representative for additional information.*

**Automatic Timing Option** – At the push of a button, the automatic timer starts the sample flow, senses the 60mL end point, and digitally records and displays the efflux time in 0.1 seconds resolution with an accuracy of 0.05%. Automatic timing improves testing accuracy and convenience, eliminating the chain and cork assembly and the need to manually time each sample. Timer installation is available in any configuration from 1 to 4 positions.

**Bath Construction and Safety Features** – Insulated bath interior is constructed entirely of heavy gauge stainless steel. A built-in overflow pipe and drain valve simplifies filling of the bath fluid to the proper level. Chemical resistant top plate provides excellent insulation and is easily removed to allow for cleaning of the bath interior. A cooling coil for tap water or refrigerated coolant is provided for operation at near-ambient temperatures. Steel cabinet has leveling feet and a chemical resistant polyurethane-epoxy finish.

### Specifications

Conforms to the specifications of:  
ASTM D88, D244, E102; AASHTO T72; FTM 791-304  
Capacity: 4 viscometer tubes  
Temperature Range: ambient to 464°F (240°C)  
Temperature Stability:  $\pm 0.05^\circ\text{F}$  ( $\pm 0.03^\circ\text{C}$ )  
Bath Capacity: 5 gal (19L)  
Recommended Bath Medium: water or suitable heat transfer fluid  
Electrical Requirements: **CE**  
115V 60Hz, single phase, 12.3A  
220-240V 50/60Hz, single phase, 6.4A

### Included Accessories

Cleaning Plunger      Chained Corks  
Oil Strainer              Withdrawal Tube  
Tube Nut Wrench        Orifice Wrench  
Port Closures           Port Covers  
Thermometer Supports

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

29x25x33 (74x63½x84)  
Net Weight: 65 lbs (29½kg)

### Shipping Information

Shipping Weight: 82 lbs (37kg)  
Dimensions: 10 Cu. ft.

## SAYBOLT VISCOSITY

### Saybolt Viscometer Tubes and Orifices

- Conforming to ASTM D88, E102 and related specifications
- Choice of brass or stainless steel tubes

**Viscometer Tubes**—Precisely machined brass and stainless steel tubes meeting ASTM requirements. Tubes mount vertically in Saybolt Viscometer Baths and accommodate stainless steel orifices interchangeably. Supplied with mounting hardware.



**Orifices**—Stainless Steel Universal and Furol Orifices meeting ASTM specifications. Orifices insert in viscometer tubes using K22030 Orifice Wrench (supplied with viscometer baths). Also available - Kansas Road Oil Orifice (requires K22039 wrench). Universal and Furol Orifices are available with a calibration certificate.

### Ordering Information

#### Catalog No.

#### Viscometer Tubes

- K22009** Saybolt Viscometer Tube, Brass  
**K22309** Saybolt Viscometer Tube, Stainless Steel

#### Orifices

- K22010** Saybolt Universal Orifice  
**K22010-C/F** Saybolt Universal Orifice with calibration certificate  
**K22020** Furol Orifice  
**K22020-C/F** Saybolt Furol Orifice with calibration certificate  
**K22029** Kansas Road Oil Orifice

#### Accessories

- 332-003-003** Borosilicate Glass Receiving Flask, 60mL for SV3000  
**332-003-014** Borosilicate Glass Receiving Flask, 60mL for SV4000  
**K22030** Orifice Wrench for Universal and Furol Orifices  
**K22039** Orifice Wrench for Kansas Road Oil Orifices  
**K22050** Socket Wrench  
**K22060** Oil Strainer  
**K22070** Cleaning Plunger  
**K22080** Displacement Ring. Insert in viscometer tube galley for bituminous materials testing. Meets ASTM E102 specifications.  
**K22090** Withdrawal Tube  
**K22011** Thermometer Support

## SAYBOLT VISCOSITY THERMOMETERS

| Catalog Number     | Thermometer | Test Temperature °F | Test Temperature °C | Range        |
|--------------------|-------------|---------------------|---------------------|--------------|
| <b>250-000-17F</b> | ASTM 17F    | 66 to 80°F          | —                   | 66 to 80°F   |
| <b>250-000-17C</b> | ASTM 17C    | —                   | 19 to 27°C          | 19 to 27°C   |
| <b>250-000-18F</b> | ASTM 18F    | 100°F               | —                   | 94 to 108°F  |
| <b>250-000-18C</b> | ASTM 18C    | —                   | 34 to 42°C          | 34 to 42°C   |
| <b>250-000-19F</b> | ASTM 19F    | 122 and 130°F       | —                   | 120 to 134°F |
| <b>250-000-19C</b> | ASTM 19C    | —                   | 50 and 54.4°C       | 49 to 57°C   |
| <b>250-000-20F</b> | ASTM 20F    | 140°F               | —                   | 134 to 148°F |
| <b>250-000-20C</b> | ASTM 20C    | —                   | 60°C                | 57 to 65°C   |
| <b>250-000-21F</b> | ASTM 21F    | 180°F               | —                   | 174 to 188°F |
| <b>250-000-21C</b> | ASTM 21C    | —                   | 82.2°C              | 79 to 87°C   |

| Catalog Number      | Thermometer | Test Temperature °F | Test Temperature °C | Range        |
|---------------------|-------------|---------------------|---------------------|--------------|
| <b>250-000-22F</b>  | ASTM 22F    | 210°F               | —                   | 204 to 218°F |
| <b>250-000-22C</b>  | ASTM 22C    | —                   | 98.9°C              | 95 to 103°C  |
| <b>250-000-77F</b>  | ASTM 77F    | 250°F               | 121°C               | 245 to 265°F |
| <b>250-000-108F</b> | ASTM 108F   | 275°F               | 135°C               | 270 to 290°F |
| <b>250-000-78F</b>  | ASTM 78F    | 300°F               | 149°C               | 295 to 315°F |
| <b>250-000-109F</b> | ASTM 109F   | 325°F               | 163°C               | 320 to 340°F |
| <b>250-000-79F</b>  | ASTM 79F    | 350°F               | 177°C               | 345 to 365°F |
| <b>250-000-80F</b>  | ASTM 80F    | 400°F               | 204°C               | 395 to 415°F |
| <b>250-000-81F</b>  | ASTM 81F    | 450°F               | 232°C               | 445 to 465°F |

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

#### Test apparatus for lubricants, insulating oils, and heater fuel grades:

| Catalog No.                                                            | Order Qty |
|------------------------------------------------------------------------|-----------|
| <b>K21410</b> Saybolt Viscometer Bath                                  | 1         |
| <b>K22009</b> Viscometer Tube                                          | 4         |
| <b>K22010</b> Universal Orifice                                        | 4         |
| <b>332-003-003</b> Receiving Flask (SV3000)                            | 4         |
| <b>332-003-014</b> Borosilicate Glass Receiving Flask, 60mL for SV4000 | 4         |
| <b>355-001-001</b> White Technical Oil                                 | 5         |
| <b>250-000-17F</b> Series ASTM Thermometers or                         |           |
| <b>250-000-17C</b> Series ASTM Thermometers                            |           |

#### Test apparatus for bituminous materials:

| Catalog No.                                                            | Order Qty |
|------------------------------------------------------------------------|-----------|
| <b>K21410</b> Saybolt Viscometer Bath                                  | 1         |
| <b>K22009</b> Viscometer Tube                                          | 4         |
| <b>K22020</b> Furol Orifice                                            | 4         |
| <b>K22080</b> Displacement Ring                                        | 4         |
| <b>332-003-003</b> Receiving Flask (SV3000)                            | 4         |
| <b>332-003-014</b> Borosilicate Glass Receiving Flask, 60mL for SV4000 | 4         |
| <b>355-001-002</b> High Temperature Heat Transfer Fluid                | 5         |
| <b>250-000-17F</b> Series ASTM Thermometers or                         |           |
| <b>250-000-17C</b> Series ASTM Thermometers                            |           |

# VISCOSITY STANDARDS

## Viscosity Reference Standards

- Manufactured and certified according to ASTM D2162, the primary method for viscosity reference standards
- Supplied with an *ISO/IEC 17025 Certification Report*
- Fully compliant to ASTM and related test procedures
- Custom standards available

Koehler viscosity reference standards are used for calibration and verification of kinematic and dynamic viscosity test equipment, both manual and automatic. All viscosity standards are based upon the National Institute of Standards and Technology (NIST) value of 1.0034 cSt (Centistokes) for water at 20°C (68°F). All standards are traceable to National Standards and are manufactured and certified according to ASTM D2162, the internationally recognized *primary* method for viscosity reference standards, under *ISO/IEC 17025* guidelines. Standards are calibrated to a precision of  $\pm 0.2\%$  for the viscosity and kinematic viscosity. Nominal or approximate values are listed in the following tables. With each standard, actual certified values for kinematic viscosity (cSt), dynamic viscosity (cP), and density (g/mL) according to ASTM D1480 are provided at each temperature point of calibration along with uncertainty measurements. Each standard is calibrated at a minimum of five temperatures and supplied in a 500mL quantity in an amber-colored bottle complete with full certification and a Material Data Safety Sheet (MSDS).

In addition to the many viscosity standards described in this catalog, we can supply custom viscosity standards made specifically to meet your individual needs including high volume supply used for Statistical Quality Check and Statistical Process Control (SQC/SPC) applications.



Viscosity Reference Standards

## VISCOSITY STANDARDS CONFORMING TO ASTM STANDARDS

| Catalog No. | Viscosity Standard | Approximate Kinematic Viscosity in mm <sup>2</sup> /s (Centistokes) |              |                 |               |               |               |                 |                | Saybolt Viscosity |              |              |
|-------------|--------------------|---------------------------------------------------------------------|--------------|-----------------|---------------|---------------|---------------|-----------------|----------------|-------------------|--------------|--------------|
|             |                    | 20°C<br>68°F                                                        | 25°C<br>77°F | 37.8°C<br>100°F | 40°C<br>104°F | 50°C<br>122°F | 60°C<br>140°F | 98.9°C<br>210°F | 100°C<br>212°F | SUS<br>100°F      | SUS<br>210°F | SFS<br>122°F |
| 355-004-004 | N.4                | 0.47                                                                | 0.45         | 0.41            | 0.40          | —             | —             | —               | —              | —                 | —            | —            |
| 355-004-008 | N.8                | 0.95                                                                | 0.89         | 0.77            | 0.75          | —             | —             | —               | —              | —                 | —            | —            |
| 355-004-001 | N1.0               | 1.3                                                                 | 1.2          | 1.0             | 0.97          | —             | —             | —               | —              | —                 | —            | —            |
| 355-002-003 | S3                 | 4.6                                                                 | 4.0          | 3.0             | 2.9           | 2.4           | —             | 1.2             | 1.2            | —                 | —            | —            |
| 355-003-005 | D5                 | 7.0                                                                 | 6.1          | —               | 4.2           | 3.4           | —             | —               | 1.5            | —                 | —            | —            |
| 355-002-006 | S6                 | 10                                                                  | 8.7          | 6.0             | 5.7           | 4.5           | —             | 1.9             | 1.9            | —                 | —            | —            |
| 355-003-010 | D10                | 14                                                                  | 12           | 8.0             | 7.5           | 5.8           | —             | 2.3             | 2.3            | —                 | —            | —            |
| 355-004-010 | N10                | 21                                                                  | 17           | 11              | 10            | 7.3           | —             | 2.7             | 2.7            | —                 | —            | —            |
| 355-002-020 | S20                | 43                                                                  | 34           | 20              | 18            | 13            | —             | 4.0             | 3.9            | 96.6              | —            | —            |
| 355-004-035 | N35                | 77                                                                  | 59           | 35              | 29            | 20            | —             | 5.3             | 5.2            | 152.1             | —            | —            |
| 355-002-060 | S60                | 165                                                                 | 121          | 60              | 54            | 35            | —             | 7.7             | 7.5            | 281               | —            | —            |
| 355-004-100 | N100               | 372                                                                 | 268          | 128             | 114           | 70            | —             | 13              | 13             | 592               | —            | —            |
| 355-002-200 | S200               | 672                                                                 | 468          | 200             | 181           | 107           | —             | 18              | 17             | 955               | 88.2         | —            |
| 355-003-500 | D500               | 825                                                                 | 578          | —               | 226           | 133           | —             | —               | 21             | —                 | —            | —            |
| 355-004-350 | N350               | 1,255                                                               | 865          | 371             | 324           | 186           | —             | 28              | 27             | —                 | 131.5        | —            |
| 355-003-103 | D1000              | 1,689                                                               | 1,151        | —               | 418           | 236           | —             | —               | 32             | —                 | —            | —            |
| 355-002-600 | S600               | 2,184                                                               | 1,472        | 600             | 518           | 286           | —             | 37              | 36             | —                 | 174          | 135.2        |
| 355-004-103 | N1000              | 4,678                                                               | 3,089        | —               | 1020          | 542           | 350           | —               | 57             | —                 | —            | —            |
| 355-002-203 | S2000              | 8,323                                                               | 5,422        | 2,000           | 1,719         | 889           | —             | 87              | 83.3           | —                 | 405          | —            |
| 355-003-503 | D5000              | 8,800                                                               | 5,700        | 2,150           | 1,850         | 950           | —             | —               | 88             | —                 | —            | —            |
| 355-003-752 | D7500              | 13,296                                                              | 8,609        | 2,681           | —             | 1,365         | —             | —               | 118            | —                 | —            | —            |
| 355-004-403 | N4000              | 17,889                                                              | 11,470       | —               | 3,448         | 1,720         | 850           | —               | 137            | —                 | —            | —            |
| 355-002-803 | S8000              | 34,931                                                              | 22,383       | 8,000           | 6,710         | 3,317         | —             | —               | 242            | —                 | —            | —            |
| 355-004-153 | N15000             | 79,423                                                              | 49,714       | —               | 13,994        | 6,650         | 3,000         | —               | 406            | —                 | —            | —            |
| 355-002-304 | S30000             | —                                                                   | 84,687       | 28,079          | 23,570        | 11,058        | —             | —               | 628            | —                 | —            | —            |

## VISCOSITY STANDARDS

### Important Information About Viscosity Standards

All Koehler certified viscosity standards are Newtonian fluids manufactured from high stability base oils and polybutenes. The standards have an expiration date on the label at least twelve months or longer from the date of purchase. With time, changes resulting from slow oxidation or loss of volatiles may occur. These changes can be minimized by storing the standard

in the closed bottle at ambient laboratory temperatures and out of sunlight. The expiration date on the label is part of Koehler's program of total quality control and is intended to ensure that the standard will be utilized while the certified viscosity data remains valid.

### COLD-CRANKING SIMULATOR VISCOSITY STANDARDS

| Approximate Kinematic Viscosity in mPa•s (Centipoise) |                    |              |               |              |               |                |                |                |
|-------------------------------------------------------|--------------------|--------------|---------------|--------------|---------------|----------------|----------------|----------------|
| Catalog No.                                           | Viscosity Standard | -5°C<br>23°F | -10°C<br>14°F | -15°C<br>5°F | -20°C<br>-4°F | -25°C<br>-13°F | -30°C<br>-22°F | -35°C<br>-31°F |
| 355-005-010                                           | CL10               | —            | —             | —            | —             | —              | —              | 1,700          |
| 355-005-012                                           | CL12               | —            | —             | —            | —             | 800            | 1,600          | 3,200          |
| 355-005-014                                           | CL14               | —            | —             | —            | —             | 1,600          | 3,250          | 7,000          |
| 355-005-016                                           | CL16               | —            | —             | —            | —             | 2,500          | 5,500          | 11,000         |
| 355-005-019                                           | CL19               | —            | —             | —            | 1,800         | 3,500          | 7,400          | 17,000         |
| 355-005-022                                           | CL22               | —            | —             | 1,300        | 2,500         | 5,100          | 11,100         | —              |
| 355-005-025                                           | CL25               | —            | —             | 1,800        | 3,500         | 7,400          | 17,200         | —              |
| 355-005-028                                           | CL28               | —            | 1,200         | 2,500        | 5,000         | 9,300          | —              | —              |
| 355-005-032                                           | CL32               | —            | 1,800         | 3,500        | 7,300         | 15,900         | —              | —              |
| 355-005-038                                           | CL38               | —            | 2,900         | 5,800        | 13,000        | —              | —              | —              |
| 355-005-048                                           | CL48               | 2,300        | 4,500         | 9,500        | 21,000        | —              | —              | —              |
| 355-005-060                                           | CL60               | 3,700        | 7,400         | 15,600       | —             | —              | —              | —              |
| 355-005-074                                           | CL74               | 6,000        | 11,600        | —            | —             | —              | —              | —              |

### LOW TEMPERATURE VISCOSITY STANDARDS

| Catalog No. | Viscosity Standard |                                                           |
|-------------|--------------------|-----------------------------------------------------------|
| 355-005-027 | N27B               | Viscosities in centipoise at -40, -30, -20, -15, -10, 0°F |
| 355-005-115 | N115B              | Viscosities in centipoise at -20, -15, -10, 0, +10, 20°F  |

### HIGH VISCOSITY STANDARDS (FOR ASPHALTS AND POLYMERS)

| Approximate Viscosity |                    |              |              |               | Kinematic Viscosity |                |
|-----------------------|--------------------|--------------|--------------|---------------|---------------------|----------------|
| Catalog No.           | Viscosity Standard | 20°C<br>68°F | 25°C<br>77°F | 60°C<br>140°F | 60°C<br>140°F       | 135°C<br>275°F |
|                       |                    | Centipoise   | Centipoise   | Centipoise    | Centistokes         | Centistokes    |
| 355-004-600           | N600               | —            | 1,400        | 140           | 160                 | 12             |
| 355-004-103           | N1000              | —            | 2,000        | 280           | 350                 | —              |
| 355-004-203           | N2000              | —            | 4,900        | 380           | 440                 | 26             |
| 355-004-403           | N4000              | —            | 11,000       | 730           | 850                 | —              |
| 355-004-803           | N8000              | —            | 20,000       | 1,400         | 1,600               | —              |
| 355-004-153           | N15000             | —            | 41,000       | 2,600         | 3,000               | —              |
| 355-004-304           | N30000             | 130,000      | 80,000       | 4,700         | 5,400               | —              |
| 355-004-623           | N62000             | —            | 200,000      | 13,000        | —                   | —              |
| 355-004-154           | N150000            | —            | 420,000      | 24,000        | —                   | —              |
| 355-004-194           | N190000            | 900,000      | 520,000      | 33,000        | —                   | —              |
| 355-004-454           | N450000            | —            | 1,600,000    | 100,000       | —                   | —              |
| 355-004-275           | N2700000           | —            | 5,300,000    | 340,000       | —                   | —              |

# DYNAMIC VISCOSITY BY ROTATIONAL VISCOMETER

## Test Method

Determines the dynamic viscosity of a substance by the rotation of a specified spindle within the sample at the speed giving the maximum torque reading on the viscometer. The resulting torque reading is used to calculate the viscosity of the substance

## Master Series Rotational Viscometer

- Master Series viscometers, monitored by Master Series Rotational Viscometer Software, offer a wider and unique range of rheological applications.
- Touch key board with 12 keys
- Direct readout on a graphic display
- Data displayed
  - Selected speed: r.p.m.
  - Selected spindle: SP
  - Viscosity Reading: cP (mPa-s) or cSt
  - Percentage of full scale: %
  - Sample temperature: °C or °F
  - Shear Rate (with coaxial spindles): SR (s-1)
  - Shear Stress (with coaxial spindles): SS (N/m<sup>2</sup>)
  - Density (introduced by the user): g/cm<sup>3</sup>
  - Step Program Status
  - Analyze & visual characteristics (flow curves)
- Viscosity reading: dynamic viscosity (cP or mPa-s) or kinematic viscosity (cSt)
- Program features:
  - Time to torque: target torque pre-setting device
  - Time to stop: target time pre-setting device
  - 10 working memories
  - Customizable options
  - Programmable
  - Multistep
  - Ramp
- AUTO-TEST with sound and visual malfunction alarm
- AUTO-RANGE function
- Temperature reading by PT100
- User-enabled viscosity and temperature calibration
- 10 language options
- AISI 316 stainless steel spindles
- Speed: 0.01 - 250 r.p.m.
- Number of speeds: 2,600

## Specifications (for all Series)

Precision:  $\pm 1\%$  of full scale

Resolution:

With low viscosity adapter: 0.01

For lower than 10,000 viscosity cP: 0.1

For viscosity equal to or above 10,000 cP: 1

Repeatability: 0.2%

Thermometer features: (Not Applicable to Bold Series)

Temperature margins: 0°C to +100°C

32°F to 212.0°F

Resolution: 0.1°C/0.1722°F

Precision:  $\pm 0.1^\circ\text{C}$

Type of Probe: PT100

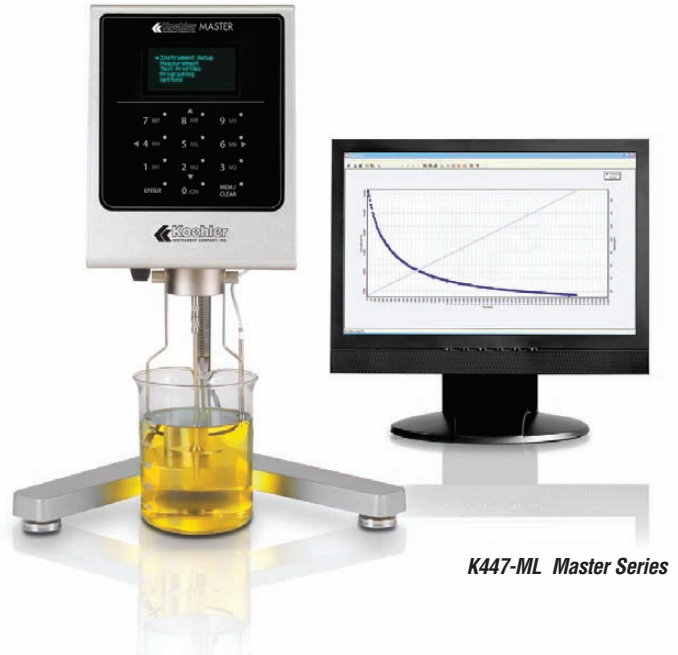
Electrical Requirements: 100-240V, 50/60Hz **CE**

Measuring Range:

Series L: 20-2,000,000 cP

Series R: 100-13,000,000 cP

Series H: 200-106,000,000 cP



## Master Series Rotational Viscosity Software

- Complete viscometer control
- Easy to use. All programs eliminate user errors when programming the instrument to collect data.
- Provides instantaneous viscosity flow curves when performing new experiments, with definable parameters
- Clear view of program options using flanges
- Definable graphics and zoom function
- Different types of experiments can be programmed: simple curves, ramps, and multi-step
- All experiments are recorded in different databases to be able to consult them anytime
- Experiment documentation with name, number, and additional data
- In order to compare different flow curves, up to 4 experiments can be plotted simultaneously
- Over 12 different charts can be obtained

The Master Series Rotational Viscosity Software is designed to program the Master Series Viscometer and is a powerful key to document and study the viscosity behavior of fluids. The Master Series Rotational Viscosity Software is capable of graphing simple curves, ramps and "multi-step" curves allowing the user to study trends and the behavior of different materials. A powerful graph key assists the user to easily design flow curves required.

## Included Accessories (for all Series)

Standard Spindles (4 for L model, 6 for R and H model)

Viscometer Stand

Spindle Protector

Carrying Case (Not Applicable to Bold Series)

USB Cable (Not Applicable to Bold Series)

Datalogger Software (Not Applicable to Bold Series)

# DYNAMIC VISCOSITY BY ROTATIONAL VISCOMETER

## Sharp Series Rotational Viscometer

- Indispensable in QC and R&D laboratories.
- Touch key board with 6 keys
- Direct readout on graphic display
- Data displayed
  - Selected speed: r.p.m.
  - Selected spindle: SP
  - Viscosity reading: cP (mPa-s) or cSt
  - Percentage of full scale: %
  - Sample temperature: °C or °F (optional)
  - Shear rate (with coaxial spindles): SR (s-1)
  - Shear stress (with coaxial spindles): SS (N/m<sup>2</sup>)
  - Density (introduced by the user): g/cm<sup>3</sup>
- Viscosity reading: dynamic viscosity (cP or mPa-s) or kinematic viscosity (cSt)
- Unit converter SI to CGS
- Program features:
  - Time to torque: target torque pre-setting device
  - Time to stop: target time pre-setting device
  - 10 working memories
- AUTO-TEST with sound and visual malfunction alarm
- AUTO-RANGE function
- Temperature reading by PT100 (optional)
- User-enabled viscosity and temperature (optional) calibration
- 10 language options
- Interface: USB
- Datalogger Software: USB allows data transfer to a PC Excel format
- AISI 316 stainless steel spindles
- Speed: 0.3 - 100 r.p.m
- Number of speeds: 18

## Power Series Rotational Viscometer

- Touch key board with 12 keys
- Direct readout on a graphic display
- Data displayed
  - Selected speed: r.p.m.
  - Selected spindle: SP
  - Viscosity reading: cP (mPa-s) or cSt
  - Percentage of full scale: %
  - Sample temperature: °C or °F
  - Shear Rate (with coaxial spindles): SR (s-1)
  - Shear Stress (with coaxial spindles): SS (N/m<sup>2</sup>)
  - Density (introduced by the user): g/cm<sup>3</sup>
- Unit converter SI to CGS
- Program features:
  - Time to torque: target torque pre-setting device
  - Time to stop: target time pre-setting device
  - 10 working memories
  - Customizable options
  - Programmable
  - Multistep
  - Ramp
- AUTO-TEST with sound and visual malfunction alarm
- AUTO-RANGE function
- Temperature reading by PT100
- User-enabled viscosity and temperature calibration
- 10 language options
- Interface: USB
- Datalogger Software: USB allows data transfer to a PC Excel format
- AISI 316 Stainless steel spindles
- Speed: 0.01 - 200 r.p.m.
- Number of speeds: 54

### Ordering Information

| Catalog No.        |                                                       |
|--------------------|-------------------------------------------------------|
| <b>K447-ML</b>     | Master Series L Rotational Viscometer                 |
| <b>K447-MR</b>     | Master Series R Rotational Viscometer                 |
| <b>K447-MH</b>     | Master Series H Rotational Viscometer                 |
| <b>K447-ML-SFW</b> | Master Series L Rotational Viscometer with Software   |
| <b>K447-MR-SFW</b> | Master Series R Rotational Viscometer with Software   |
| <b>K447-MH-SFW</b> | Master Series H Rotational Viscometer with Software   |
| <b>K447-PL</b>     | Power Series L Rotational Viscometer                  |
| <b>K447-PR</b>     | Power Series R Rotational Viscometer                  |
| <b>K447-PH</b>     | Power Series H Rotational Viscometer                  |
| <b>K447-SL</b>     | Sharp Series L Rotational Viscometer                  |
| <b>K447-SR</b>     | Sharp Series R Rotational Viscometer                  |
| <b>K447-SH</b>     | Sharp Series H Rotational Viscometer                  |
| <b>K447-SL-PT</b>  | Sharp Series L Rotational Viscometer with PT100 Probe |
| <b>K447-SR-PT</b>  | Sharp Series R Rotational Viscometer with PT100 Probe |
| <b>K447-SH-PT</b>  | Sharp Series H Rotational Viscometer with PT100 Probe |
| <b>K447-BL</b>     | Bold Series L Rotational Viscometer                   |
| <b>K447-BR</b>     | Bold Series R Rotational Viscometer                   |
| <b>K447-BH</b>     | Bold Series H Rotational Viscometer                   |

### Accessories

|                       |                                                                                         |
|-----------------------|-----------------------------------------------------------------------------------------|
| <b>K447-SSA-CJ</b>    | Small Sample Adapter w/circulation jacket (without spindles)                            |
| <b>K447-SSA</b>       | Small Sample Adapter without circulation jacket (without spindles)                      |
| <b>K447-SSP-SETL</b>  | Set of special spindles (L5, L6, L7) for small sample adapters (L Model)                |
| <b>K447-SSP-SETRH</b> | Set of special spindles (RH8, RH9, RH10, RH11) for small sample adapters (R & H Models) |
| <b>K447-LVA-CJ</b>    | Low Viscosity Adapter w/circulation jacket                                              |
| <b>K447-LVA</b>       | Low Viscosity Adapter without circulation jacket                                        |
| <b>K447-SP-LVA</b>    | Spindle for Low Viscosity Adapter                                                       |
| <b>K447-HDU</b>       | Helix Drive Unit, Heldal                                                                |

## Bold Series Rotational Viscometer

- Bold series viscometers allow fast and accurate viscosity readings.
- They are low budget and easy to use.
- Data Displayed
  - Selected speed: r.p.m.
  - Selected spindle: SP
  - Viscosity Reading: cP (mPa-s)
  - Percentage of full scale: %
- Relative and absolute viscosity
- Unit converter SI to CGS
- AUTO-TEST with sound and visual malfunction alarm
- AUTO-RANGE function
- User-enabled calibration
- 10 language options
- AISI 316 stainless steel spindles
- Speed: 0.3 - 100 r.p.m.
- Number of speeds: 18

## 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.

### **Kinematic Viscosity** . . . . . **Pages 2-13**

ASTM D445, D2170, D6074, D6158; IP 71, 319; ISO 3104; DIN 51550; FTM 791-305

Petroleum Ether  
Chromic Acid  
Petroleum Spirit  
Toluene  
Plumb Line or Spirit Level  
Petroleum Naphtha  
Xylene  
Acetone  
Distilled Water

### **Saybolt Viscosity** . . . . . **Pages 16-17**

ASTM D88, D244, E102; AASHTO T72; FTM 791-304

Balance  
No. 50 (300- $\mu$ m) Sieve  
Condenser – Water Cooled Reflex Glass-tube  
Xylol  
No. 20 (850- $\mu$ m) Sieve  
Filter Funnel  
Hot Plate (E102)

# PENETRATION

## Test Methods

**Penetration of Bituminous Materials** ASTM D5; IP 49; DIN 52010

**Cone Penetration of Lubricating Grease** ASTM D217; IP 50;  
ISO 2137; DIN 51804; FTM 791-311, FTM 791-313

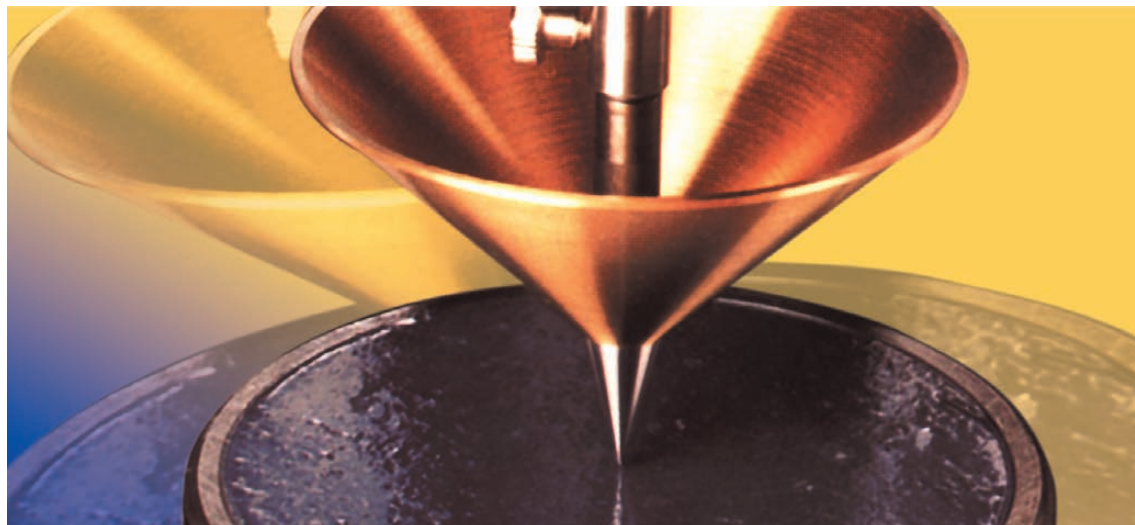
**Cone Penetration of Petrolatum** ASTM D937; IP 179;  
ISO 2137; DIN 51580

**Needle Penetration of Petroleum Waxes** ASTM D1321;  
IP 376; DIN 51579

**Cone Penetration of Lubricating Grease Using One-Quarter and  
One-Half Scale Cone Equipment** ASTM D1403; IP 310; ISO 2137;  
DIN 51804

**Yield Stress of Heterogeneous Propellants by Cone Penetration  
Method** ASTM D2884

**Roll Stability of Lubricating Grease** ASTM D1831



## PENETRATION



*K19500 Penetrometer with K20800 Penetration Cone*

### Ordering Information

|                    |                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Catalog No.</b> |                                                                                                                          |
| <b>K19500</b>      | Penetrometer                                                                                                             |
| <b>Accessories</b> |                                                                                                                          |
| <b>K19552</b>      | Calibration Kit<br>Consists of 0.500, 1.000 and 2.000" gauge blocks with calibration certificate traceable to NIST       |
| <b>K19553</b>      | Calibration Kit, Metric<br>Consists of 12.5mm, 25mm and 45mm gauge blocks with calibration certificate traceable to NIST |
| <b>K19520</b>      | Plunger, 15g<br>For use with K20200, K19800 and K20300 Cones                                                             |
| <b>K20910</b>      | Plunger, 6.9g<br>For use with K20900 Cone                                                                                |
| <b>K19525</b>      | Plunger, 47.5g                                                                                                           |
| <b>K19510</b>      | Auxiliary Weight Set<br>Includes one each 2.5g, 5g and 10g weights and two 20g weights                                   |
| <b>K19535</b>      | Loading Weight, 50g                                                                                                      |
| <b>K19536</b>      | Loading Weight, 100g                                                                                                     |

### Penetration of Bituminous Materials

#### Cone Penetration of Lubricating Grease

#### Cone Penetration of Petrolatum

#### Needle Penetration of Petroleum Waxes

#### Cone Penetration of Lubricating Grease Using One-Quarter and One-Half Scale Cone Equipment

#### Yield Stress of Heterogeneous Propellants by Cone Penetration Method

### Test Method

Penetration tests are performed on petroleum products to determine consistency and shear stability (lubricating greases) for design, quality control and identification purposes. A standard cone or needle is released from a penetrometer and allowed to drop freely into the sample for 5 seconds (or a different specified interval) at constant temperature. The depth of penetration of the cone or needle into the sample is measured in tenths of a millimeter by the penetrometer.

### Penetrometer

- Conforms to ASTM and related specifications for penetrometers
- Suitable for laboratory or field use

Designed for ASTM penetration tests on petroleum products and for consistency tests on a wide range of food products, cosmetics, pastes and other solid to semi-solid products. Precision machined and assembled to exacting specifications, and ruggedly constructed to insure long service life in both laboratory and field applications. Features a full penetration range of 0-62.0mm with  $\frac{1}{60}$ mm subdivisions (0-620 penetration scale). Accommodates cones and needles to perform all of the ASTM tests on lubricating greases, asphalts, petroleum waxes and petrolatums. Compact design facilitates transport for field use. Head assembly adjusts for accurate placement of the tip of the needle or cone on the surface of the sample. Sturdy cast iron base provides excellent support and has a built-in spirit level and leveling screws to insure proper alignment of the penetrometer during testing. Supplied with 50 and 100 gram weights and standard 47.5g plunger assembly. Order test cones, needles and lightweight plunger (where applicable) separately.

### Specifications

Conforms to the specifications of:

ASTM D5, D217, D937, D1321, D1403, D2884, D4950, D5329; IP 49, 50, 179, 310; ISO 2137; DIN 51579, 51580, 51804; FTM 791-311, 791-312, 791-313; AOCs Cc 16-60; AACC 58-14; NFT 60-119, 60-123, 60-132, 66-004

### Included Accessories

Plunger, 47.5g  
Weights, 50 and 100g

### Dimensions lwxh,in.(cm)

6x6x18 (15x15x46)  
Net Weight: 12 lbs (5.4kg)

### Shipping Information

Shipping Weight: 15 lbs (6.8kg)  
Dimensions: 1.7 Cu. ft.

# PENETRATION

## Microprocessor Based Digital Penetrometer

- Tests the consistency of lubricating greases, petroleum waxes, bitumens, pastes, creams and other solid to semi-solid products
- Automatically timed operator programmable penetration measurements
- Motorized placement of penetrator on sample surface
- Large LCD to display all functions
- RS232 port for data transfer
- Full measurement range of 0-620 in  $\frac{1}{100}$ mm scale or  $\frac{1}{1000}$ mm scale
- Rechargeable battery or AC operation
- Large, removable base accommodates grease worker cups and other ASTM and non-standard sample containers
- Complete selection of penetrometer cones, needles and accessories for petroleum products testing and for a wide range of other applications
- Conforms to all ASTM, IP, ISO 9001 and related specifications for penetrometers

Microprocessor based penetrometer loaded with advanced features to provide ease of operation and highly reproducible consistency measurements of petroleum products. Microprocessor control provides a full range of measurement and reporting options, and operation is simplified by four user programmable presets that facilitate lowering the penetrator tip to the sample surface.

**Automatically timed penetrations**—The penetrometer defaults to the standard ASTM interval of 5.0 seconds, or the operator may conveniently program a different interval in the range between 0.1 and 9999.9 seconds (in 0.1 second increments). A curing or temperature stabilization period may also be programmed by the operator (to delay the release of the penetrator into the sample) and for added convenience all selected parameters are retained in memory and automatically repeated in subsequent tests until changed by the operator. Separate keypad controls for each parameter simplify operation. Penetration and delay intervals count down on a large, easy to read LCD on the head of the unit.

**Convenient measurement and reporting options**—Penetration measurements in the full range of 0 - 620 in  $\frac{1}{100}$ mm scale are reported in either  $\frac{1}{100}$ mm or  $\frac{1}{1000}$ mm increments at the operator's option. For quality control testing, a penetration range can be entered into memory prior to testing. If a test result falls outside of the programmed range, an audible signal and visual error message alert the operator of a failed sample. Test results are displayed in digital format on a large LCD readout on the head of the penetrometer and can be communicated to a printer or computer via a built-in RS232 interface.

**Simplified penetrator tip placement**—Correct placement of the penetrator tip on the sample surface is essential for accurate penetration test results. The Koehler Digital Penetrometer has four operator programmable presets that lower the penetrator to the sample surface height at the touch of a button, greatly simplifying the process to ensure reproducibility. A fine adjustment button permits slight adjustments as needed. Full manual operation is also available with the use of coarse and fine push button controls and built-in magnifier and illuminator arms. When testing electrically conductive samples, a built-in circuit senses the sample surface for automatic placement. After testing, the penetrometer head returns to a raised position at the touch of a button to facilitate cleaning of the penetrator and changing of the sample.

**More convenience features**—The detachable machined base provides a large platform to accommodate a wide range of sample containers and constant temperature cylinders. It removes easily to permit the head assembly to be reversed (for use with a constant temperature bath) or mounted directly to a bath housing or other location. A built-in rechargeable battery pack permits field operation and provides back-up in the event of power interruption. Battery recharges automatically during operation of the penetrometer on standard AC electrical service.

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



K95500 Digital Penetrometer

## Specifications

Conforms to the specifications of: ASTM D5, D217, D937, D1321, D1403, D2884, D4950, D5329; IP 49, 50, 179, 310; ISO 2137; DIN 51579, 51580, 51804; FTM 791-311, 791-312, 791-313; AOCs Cc 16-60; AACC 58-14; NFT 60-119, 60-123, 60-132, 66-004

Penetration Range: 0-62.0mm (0-620 penetration scale) in  $\frac{1}{100}$ mm or  $\frac{1}{1000}$ mm  
Penetration Interval: Operator variable from 0.1 to 9999.9 seconds with automatic repeat function and 5.0 second default

Electrical Requirements: **CE**  
115V 60Hz  
220-240V 50/60Hz

## Included Accessories

Standard Plunger, 47.5g  
Weights, 50 and 100g

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

Base: 12 $\frac{1}{2}$ x14 (31.7x35.6)  
Overall: 12 $\frac{1}{2}$ x14x18 (31.7x35.6x45.7)  
Net Weight: 21 lbs (9.5kg)

## Shipping Information

Shipping Weight: 27 lbs (12.3kg)  
Dimensions: 2 Cu. ft.

## Ordering Information

| Catalog No.        |                                                                                                                         | Order Qty |
|--------------------|-------------------------------------------------------------------------------------------------------------------------|-----------|
| K95500-00000       | Digital Penetrometer, 115V, 60Hz                                                                                        | 1         |
| K95590-00000       | Digital Penetrometer, 220-240V, 50/60Hz                                                                                 |           |
| <b>Accessories</b> |                                                                                                                         |           |
| K19552             | Calibration Kit - Consists of 0.500, 1.000 and 2.000" gauge blocks with calibration certificate traceable to NIST       |           |
| K19553             | Calibration Kit, Metric - Consists of 12.5mm, 25mm and 45mm gauge blocks with calibration certificate traceable to NIST |           |
| K95573-00000       | Plunger, 15g - For use with K20200, K19800 and K20300 Cones                                                             |           |
| K95519-00000       | Plunger, 6.9g - For use with K20900 Cone                                                                                |           |
| K95577             | Standard Plunger, 47.5g                                                                                                 |           |
| K19587             | Loading Weight, 50g                                                                                                     |           |
| K19588             | Loading Weight, 100g                                                                                                    |           |

## PENETRATION

### Penetrometer Cones, Needles and Accessories

- Precision machined cones and needles for ASTM and related methods
- Sample containers
- Constant temperature baths
- Grease workers and accessories
- Roll stability testers
- USDA and AOCS penetrometer cones

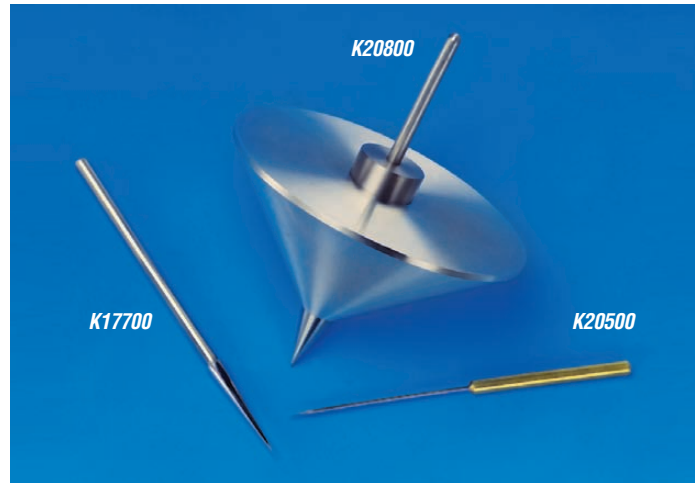
Use together with K19500 and K95500 series penetrometers to determine the consistency of petroleum products. Please call or write for information on non-petroleum test applications.

### Needle Penetration of Petroleum Waxes

#### Test Method Standards

ASTM D1321; IP 376; DIN 51579

|               |                                                                                                     |
|---------------|-----------------------------------------------------------------------------------------------------|
| <b>K17700</b> | Needle, Stainless Steel, 2.5g                                                                       |
| <b>K17770</b> | Needle, Stainless Steel, 2.5g, NIST Certified                                                       |
| <b>K17710</b> | Wax Specimen Container<br>Brass cylinder with base plate<br>conforming to ASTM D1321 specifications |
| <b>K95600</b> | Penetration Bath, 115V, 60Hz                                                                        |
| <b>K95690</b> | Penetration Bath, 230V, 50/60Hz                                                                     |



### Penetration of Bituminous Materials

#### Test Method Standards

ASTM D5; IP 49; DIN 52010

|                     |                                                                                    |
|---------------------|------------------------------------------------------------------------------------|
| <b>K20500-00000</b> | Needle.<br>Stainless steel with brass ferrule, 2.5g                                |
| <b>K20570-00000</b> | Needle.<br>Similar to K20500, NIST certified, 2.5g                                 |
| <b>K20600-00000</b> | Needle.<br>Stainless steel with stainless steel ferrule, 2.5g                      |
| <b>K20670-00000</b> | Needle.<br>Similar to K20600, NIST certified, 2.5g                                 |
| <b>388-001-003</b>  | Sample Container,<br>55mm dia. x 35mm depth for penetrations below 200             |
| <b>388-001-006</b>  | Sample Container,<br>70mm dia. x 45mm depth for penetrations<br>between 200 to 350 |
| <b>357-000-001</b>  | Transfer Dish<br>Submerges sample container per ASTM specifications                |
| <b>K95600</b>       | Penetration Bath, 115V, 60Hz                                                       |
| <b>K95690</b>       | Penetration Bath, 230V, 50/60Hz                                                    |

### Cone Penetration of Lubricating Greases

#### Test Method Standards

ASTM D217; IP 50; ISO 2137; DIN 51804; FTM 791-311, FTM 791-313

|               |                                                                                             |
|---------------|---------------------------------------------------------------------------------------------|
| <b>K20800</b> | Cone, Magnesium<br>With hardened stainless steel tip, 102.5g<br>Standard cone per ASTM D217 |
| <b>K20000</b> | Cone, Brass<br>With hardened stainless steel tip, 102.5g<br>Optional cone per ASTM D217     |
| <b>K18100</b> | Grease Worker series. Refer to page 28 for<br>specifications and ordering information       |
| <b>K19100</b> | Grease Cutter<br>For 'block penetration' tests                                              |
| <b>K95600</b> | Penetration Bath, 115V, 60Hz                                                                |
| <b>K95690</b> | Penetration Bath, 230V, 50/60Hz                                                             |

*Please inquire with Koehler Customer Service about accessories for food, cosmetics, paints, soaps, and other consistency measurement applications utilizing the Penetrometer.*

## PENETRATION



### Cone Penetration of Lubricating Grease Using One-Quarter and One-Half Scale Cone Equipment

#### Test Method Standards

ASTM D1403; IP 310; ISO 2137; DIN 51804

|                     |                                                                                                                   |
|---------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>K20900</b>       | Quarter-Scale Cone, Aluminum, 2.48g                                                                               |
| <b>K95519-00000</b> | Plunger, 6.9g<br>For use with K95500 series Digital Penetrometer                                                  |
| <b>K20910</b>       | Plunger, 6.9g<br>For use with K19500 series Penetrometer                                                          |
| <b>K21000</b>       | Quarter-Scale Grease Worker<br>Consists of cup and cover assembly with plunger plate, shaft, handle and valve     |
| <b>K21002</b>       | Retaining Base Plate<br>Mounts on bench or wall to retain Quarter-Scale Grease Worker when working heavy greases. |
| <b>K21001</b>       | Blank Lid<br>With seal, for Quarter-Scale Grease Worker. Use when heating samples prior to test.                  |
| <b>K20200</b>       | Half-Scale Cone. Stainless Steel, 22.5g                                                                           |
| <b>K95573-00000</b> | Plunger, 15g<br>For use with K95500 series Digital Penetrometer                                                   |
| <b>K19520</b>       | Plunger, 15g<br>For use with K19500 Penetrometer                                                                  |
| <b>K20210</b>       | Half-Scale Grease Worker                                                                                          |
| <b>K95600</b>       | Penetration Bath, 115V, 60Hz                                                                                      |
| <b>K95690</b>       | Penetration Bath, 230V, 50/60Hz                                                                                   |

### Cone Penetration of Petrolatum

#### Test Method Standards

ASTM D937; IP 179; ISO 2137; DIN 51580

|               |                                                                      |
|---------------|----------------------------------------------------------------------|
| <b>K20800</b> | Cone, Magnesium<br>With hardened stainless steel tip, 102.5g         |
| <b>K20700</b> | Sample Container<br>With cover, conforms to ASTM D937 specifications |
| <b>K95600</b> | Penetration Bath, 115V, 60Hz                                         |
| <b>K95690</b> | Penetration Bath, 230V, 50/60Hz                                      |

### Roll Stability of Lubricating Grease

#### Test Method Standard

ASTM D1831

|               |                                                                       |
|---------------|-----------------------------------------------------------------------|
| <b>K18300</b> | Roll Stability Tester series (page 156)                               |
| <b>K20900</b> | Cone Penetration Test Equipment, One-Quarter or One-Half Scale series |

### Additional Penetration Cones

|               |                                                                                                                     |
|---------------|---------------------------------------------------------------------------------------------------------------------|
| <b>K19800</b> | Magnesium Cone, 15g<br>For ASTM D2884 testing of Heterogeneous Propellants                                          |
| <b>K19900</b> | Aluminum Cone, 45g<br>For AOCS CC 16-60 testing of fats, butter, margarine                                          |
| <b>K20090</b> | Aluminum Cone, 35g<br>For USDA testing of pastes                                                                    |
| <b>K20300</b> | Aluminum Micro-Cone, 5g<br>For lubricating greases, cosmetic creams. Use together with K20310 Sample Cup and Collar |



*K20300 Aluminum Micro Cone*



*K19900 Aluminum Cone*

## PENETRATION



K18190 Mechanical Grease Worker

### Grease Workers

- Conform to ASTM D217 and related specifications
- Mechanical and manually operated types
- Single and double-unit models

**Mechanical Grease Workers**—For “worked penetration” and “prolonged worked penetration” tests to determine consistency of lubricating greases. Consists of single or dual steel ASTM grease workers mounted on a sturdy base and driven by a powerful gear reduction motor. Meets ASTM specifications for stroke length and rate. Equipped with a presetting electronic counter that automatically shuts off the drive motor after any desired number of strokes up to 99,999. Steel grease workers have threaded cup and cover, and steel plunger plate with shaft and handle that connects to eccentric cam on drive unit. Accessory dial thermometer inserts in plated vent cock. Spring loaded tightening clamps hold grease workers securely on base, and steel pins in base facilitate disassembly of grease workers after testing.

**Manually Operated Grease Worker**—Hand lever operated grease working machine designed for short duration “worked penetration” tests on lubricating greases. Consists of one steel ASTM grease worker with hand lever mechanism mounted on a sturdy steel base. Spring loaded tightening clamps hold grease worker securely on base, and steel pins in hand lever upright support facilitate disassembly of grease worker. Base plate is drilled at corners to allow for bolting to table top.

### Ordering Information

#### Catalog No.

#### Mechanical Grease Workers

|        |                                  |
|--------|----------------------------------|
| K18100 | Single-Unit Model, 115V 60Hz     |
| K18110 | Single-Unit Model, 220-240V 50Hz |
| K18119 | Single-Unit Model, 220-240V 60Hz |
| K18190 | Double-Unit Model, 115V 60Hz     |
| K18191 | Double-Unit Model, 220-240V 50Hz |
| K18192 | Double-Unit Model, 220-240V 60Hz |

#### Manually Operated Model

|        |                        |
|--------|------------------------|
| K18000 | Grease Working Machine |
|--------|------------------------|

For Quarter-Scale and Half-Scale Grease Workers, refer to page 27.

### Accessories

|        |                                                                                                                               |
|--------|-------------------------------------------------------------------------------------------------------------------------------|
| K18022 | Dial Thermometer<br>Inserts in petcock of steel grease worker.<br>Supplied with adapter.                                      |
| K18021 | Overflow Ring<br>Collects displaced grease during<br>penetration measurements.                                                |
| K18020 | Steel Grease Worker<br>Complete per ASTM specifications.<br>Consists of cup, cover, plunger and vent cock.                    |
| K18030 | Steel Grease Worker<br>Similar to K18020 above, but with 270-hole plunger<br>plate per FTM 791-313 (AN-G-15) specifications.  |
| K18028 | Cover Assembly<br>Replacement cover assembly for steel grease worker.<br>Includes vent cock, plunger plate, shaft and handle. |
| K18029 | Grease Cup                                                                                                                    |
| K18023 | Blank Lid, with seal<br>For ASTM Steel Grease Worker.<br>Use when heating samples prior to test.                              |

### Specifications

Conforms to the specifications of:

ASTM D217, D4950; IP 50; ISO 2137; DIN 51804; FTM 791-311, 791-313\*

\*Requires substitution of 270-hole grease worker (K18030)

Drive Motor: fan cooled gear reduction type, 1/8hp (single-unit model)  
or 1/2 hp (dual-unit model)

Electrical Requirements: **C** **E**

Mechanical Grease Workers:

115V 60Hz, Single Phase, 3A

220-240V 50/60Hz, Single Phase, 1.5A

### Included Accessories

Mechanical ASTM Steel Grease Worker (1 or 2)

### Dimensions lwxhxh,in.(cm)

Mechanical Grease Workers:

Single-Unit: 10x13½x14¼ (25x34x37)

Double-Unit: 14x13½x14¼ (36x34x37)

Manually Operated Grease Worker: 30x10x15½ (76x25x39)

Net Weight:

Mechanical Single-Unit: 106 lbs (48.1kg)

Mechanical Double-Unit: 139½ lbs (63.3kg)

Manual: 21 lbs (9.6kg)

### Shipping Information

Shipping Weight: Single-Unit: 141 lbs (64.0kg)

Mechanical Double-Unit: 171 lbs (77.6kg)

Manual: 28 lbs (12.7kg)

Dimensions: Mechanical: 4.2 Cu. ft.; Manual: 2.7 Cu. ft.

## PENETRATION

### Penetrometer Bath

- Conforms to ASTM and related specifications
- Conditions petroleum samples and others requiring close temperature control prior to or during testing
- For use with manual and microprocessor penetrometer models
- Digital temperature control with low-liquid and overtemperature safety cut off

Constant temperature water bath for conditioning samples prior to a penetration test. Full visibility bath has a large shelf to accommodate a wide range of sample containers, including all containers used in ASTM tests. Sample containers can be left in the bath during the penetration test if required. The base of the Koehler manual penetrometer can be placed directly on the shelf of the bath, or the head assembly of the digital automatic model can be reversed to overhang the bath. Microprocessor digital temperature control maintains bath liquid temperature with  $\pm 0.05^{\circ}\text{C}$  stability throughout the operating range. A large LED provides bath temperature readout in switchable  $^{\circ}\text{C}/^{\circ}\text{F}$  format and a dual-speed circulating pump assures temperature uniformity. The bath is protected by a separate adjustable overtemperature thermostat and a low liquid cut-off. A built-in cooling coil is provided for circulating a refrigerated coolant or tap water if needed.

### Specifications

Conforms to the specifications of:

ASTM D5, D217, D937, D1321, D1403, D2884, D5329

Temperature Range: Ambient to  $70^{\circ}\text{C}$

Temperature Stability:  $0.05^{\circ}\text{C}$  ( $0.1^{\circ}\text{F}$ )

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 9A

220-240V 50/60Hz, Single Phase, 4.5A

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

18x13 $\frac{1}{2}$ x8 $\frac{1}{2}$  (45.7x33x21.6)

Net Weight: 6 lbs (2.7kg)

### Shipping Information

Shipping Weight: 10 lbs (4.5kg)

Dimensions: 1.2 Cu. ft.



**K95600 Penetrometer Bath**

### Ordering Information

#### Catalog No.

|               |                                 |
|---------------|---------------------------------|
| <b>K95600</b> | Penetrometer Bath, 115V 60Hz    |
| <b>K95690</b> | Penetrometer Bath, 230V 50/60Hz |

### Accessories

|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| <b>250-000-17F</b> | ASTM 17F Thermometer<br>Range: 66 to $80^{\circ}\text{F}$    |
| <b>250-000-17C</b> | ASTM 17C Thermometer<br>Range: 19 to $27^{\circ}\text{C}$    |
| <b>250-000-63F</b> | ASTM 63F Thermometer<br>Range: 18 to $89^{\circ}\text{F}$    |
| <b>250-000-63C</b> | ASTM 63C Thermometer<br>Range: $-8$ to $+32^{\circ}\text{C}$ |
| <b>250-000-64F</b> | ASTM 64F Thermometer<br>Range: 77 to $131^{\circ}\text{F}$   |
| <b>250-000-64C</b> | ASTM 64C Thermometer<br>Range: 25 to $55^{\circ}\text{C}$    |

**Please inquire with Koehler Customer Service about Stainless Steel Bath option.**

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

## 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.

### **Cone Penetration of Lubricating Grease .....Page 26**

ASTM D217; IP 50; ISO 2137; DIN 51804; FTM 791-311, FTM 791-313

Spatula

Paper

Light Petroleum Naphtha

### **Needle Penetration of Petroleum Waxes .....Page 26**

ASTM D1321; IP 376; DIN 51579

Glycerin

### **Cone Penetration of Petrolatum .....Page 27**

ASTM D937; IP 179; ISO 2137; DIN 51580

Laboratory Oven

### **Cone Penetration of Lubricating Grease Using One-Quarter and One-Half Scale Cone Equipment .....Page 27**

ASTM D1403; IP 310; ISO 2137; DIN 51804

Spatula

# FLASH POINT

| Test Methods                                                                                                                                 | Page |
|----------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Flash Point by Automatic Pensky-Martens Closed Tester</b><br>ASTM D93; IP 34; ISO 2719; DIN EN 22719; NF M 07-019;<br>JIS K2265 .....     | 32   |
| <b>Flash Point by Automatic Abel Tester</b><br>IP 170, 304; ISO 1523, 13736; NF M 07-011; NF T 06-009 .....                                  | 32   |
| <b>Flash Point by Automatic Tag Closed Tester</b><br>ASTM D56; IP 304 .....                                                                  | 33   |
| <b>Flash Point and Fire Points by Automatic Cleveland<br/>Open-Cup Tester</b> ASTM D92; IP 36; ISO 2592 .....                                | 33   |
| <b>Flash Point by Pensky-Martens Closed Tester</b><br>ASTM D93; AASHTO T73-811; IP 34; ISO 2719;<br>DIN 51758; FTM 791-1102 .....            | 34   |
| <b>Flash Point by Tag Closed Tester</b><br>ASTM D56; IP 304; FTM 791-1101 .....                                                              | 35   |
| <b>Flash Point and Fire Points by Cleveland Open-Cup Tester</b><br>ASTM D92; IP 36; ISO 2592; DIN 51376;<br>FTM 791-1103, FTM 141-4294 ..... | 36   |
| <b>Flash Point and Fire Points of Liquids by Tag<br/>Open-Cup Apparatus</b> ASTM D1310 .....                                                 | 37   |
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| <b>Autoignition Temperature of Liquid Chemicals</b><br>ASTM E659 .....                                                                       | 39   |



## AUTOMATED FLASH POINT TESTERS



*Automated Pensky-Martens Flash Point Tester*

### Automatic Abel Flash Point Tester

- Conforms to IP 170 and related specifications
- Simple automation routine for easy operation

The automated Abel flash point tester is used primarily to test flammable and combustible materials for shipping and safety regulations. The flash tester provides an increased temperature range of operation as compared with other testers, allowing greater flexibility in testing samples according to the Abel test method. The unit provides a test range to 110°C and can be extended to -30°C by any appropriate external chiller. The flash point tests are simply conducted by mounting the flash cup filled with sample into the test position and selecting a pre- or user-programmed test method. Automation routines provide accurate test results. A quick search method is available to determine the flash point of unknown samples. The dual detection system (thermal and ionization) allows for testing all types of products. Ignition by gas flame or electrical ignitor is included, along with safety cut-off devices. Test results are automatically corrected to standard pressure (101.3 kPa). The system is equipped with a differential Pt-100 RTD probe designed to duplicate the response time of a mercury-in-glass thermometer and with multiple sensors that continually monitor instrument function, displaying an error message if a problem is detected. Supervision software is included.

*Temperature range of Flash Tester can be extended. Please contact Koehler Customer Service for additional information.*

#### Specifications

Conforms to the specifications of:

IP 170; ISO 1523, 13736;  
NF M 07-011; NF T 66-009

Electrical Requirements: **CE**

115V 60Hz, Single Phase  
230V 50/60Hz, Single Phase

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

10.25 x 21 x 19.75 (26 x 53 x 50)

Net Weight:

44 lbs (20kg)

### Auto Pensky-Martens Closed Cup Flash Point Tester

- Conforms to ASTM D93 and related specifications
- Dual flash point detection system (thermal and ionization) for measurement of samples containing water and/or silicone
- Gas or electric ignition
- Flash point operation range between 0 and 400°C
- Simple automation routine for easy operation
- Large viewing screen for observing test status at a distance from the unit
- Automatic barometric correction

The automated Pensky-Martens flash point tester accurately determines the lowest flash point temperature of fuels, lubricating oils, and homogenous liquids (ASTM D93 A), or liquids containing suspended solids as well as liquids that tend to form a surface film during testing (ASTM D93 B). Flash point tests are simply conducted by mounting the flash cup filled with sample into the test position and selecting a pre- or user-programmed test method. A quick search method allows for determination of flash points for unknown samples and a method for asphalts is also included. The automation routines provide accurate test results, even with users inexperienced in flash point test methods. The flash point test result is automatically corrected to standard pressure (101.3 kPa). The unit is equipped with a differential Pt-100 RTD probe designed to duplicate the response time of a mercury-in-glass thermometer as per ASTM D93-02a and E1-03a. The system features multiple sensors for continually monitoring of instrument function and displaying an error message if a problem is detected. The performance of the electrical ignitor is continuously checked, and the user is notified upon the need of replacement due to either damage or the end of its useful life. The system is easily interfaced with an external PC for operation and method updates. When performing a test, the system will display the stirring speed, temperature curve (also printed out), and current test status. The system alerts the user if the first application of the ignitor results in a flash or if no flash point is detected at the end of the test program. If a flash is not detected 30°C above the expected flash point or at 400°C, then the test is automatically aborted for safety. An easy connection to the air ventilation system or external water connection provides a quick cool down between test runs for operational efficiency.

#### Specifications

Conforms to the specifications of:

ASTM D93; IP 34; ISO 2719; DIN EN 22719;  
NF M 07-019; JIS K2265

Electrical Requirements: **CE**

115V 60Hz 1000W  
230V 50/60Hz 1000W

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

10.25 x 21 x 19.75 (26 x 53 x 50)

Net Weight:

44 lbs (20kg)

## AUTOMATED FLASH POINT TESTERS

### Automatic Tag Closed Cup Flash Point Tester

- Conforms to ASTM D56 and related specifications
- Simple automation routine for easy operation

The automated Tag Closed Cup flash point tester ensures the accuracy and precision required according to the ASTM D56 and related test methods. The test sample is heated at a prescribed rate of temperature increase throughout the standard temperature test range to 100°C. The flash point tests are simply conducted by mounting the flash cup filled with sample into the test position and selecting a pre-programmed test method or the search mode to determine an approximate flash point. The automation routines provide accurate test results. Ignition by gas flame or electrical ignitor is included, along with safety cut-off devices. The measurement range can be extended to -30°C by any appropriate external chiller. Supervision software is included.

*Temperature range of Flash Tester can be extended. Please contact Koehler Customer Service for additional information.*

#### Specifications

Conforms to the specifications of:  
ASTM D56; IP 304

Electrical Requirements: **CE**  
115V 60Hz, Single Phase  
230V 50/60Hz, Single Phase

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

21 x 10.5 x 19.75 (53.5 x 26 x 50)

Net Weight:

44 lbs (20kg)



*Automated Tag closed Cup Flash Point Tester*

### Automatic Cleveland Open Cup Flash Point Tester

- Conforms to ASTM D92 and related specifications
- Simple automation routine for easy operation
- Flash point operation between ambient and 400°C
- Gas or electric ignition

The automated Cleveland Open Cup flash point tester accurately determines flash and fire point temperatures of viscous petroleum products including oils and bitumens over an extended temperature range. When examining highly viscous specimens, a preheating time and temperature are set in order to liquefy the sample for testing. The surface skin from bituminous samples can be removed with a skimmer. The flash/fire point tests are simply conducted by mounting the flash cup filled with sample into the test position and selecting a pre-programmed test method or the search mode to determine an approximate flash point. The test results are automatically corrected to standard pressure (101.3 kPa). Equipped with a differential Pt-100 RTD probe, the system is designed to duplicate the response time of a mercury-in-glass thermometer. Multiple sensors continually monitor instrument function, displaying an error message if a problem is detected. The performance of the ionization sensor which detects the flash and fire points is continuously monitored, and the user is notified upon the need of replacement. If a flash is not detected 20°C above the expected flash point or at 420°C, then the test is automatically aborted for safety. The system is easily interfaced with an external PC for operation and method updates. When performing a test, the system will display the stirring speed, temperature curve (also printed out), and current test status. The system alerts the user if the first application of the ignitor results in a flash or if no flash point is detected at the end of the test program. If a flash is not detected 30°C above the expected flash point or at 400°C, then the test is automatically aborted for safety.

#### Specifications

Conforms to the specifications of:  
ASTM D92; IP 36; ISO 2592

Electrical Requirements: **CE**  
115V 60Hz 1000W  
230V 50/60Hz 1000W

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

21 x 10.5 x 19.75 (53.5 x 26 x 50)

Net Weight:

44 lbs (20kg)

#### Ordering Information

| Catalog No.                                                                        | Order Qty |
|------------------------------------------------------------------------------------|-----------|
| <b>Automatic Abel Flash Point Tester</b>                                           | 1         |
| <b>K87300</b> Automatic Abel Flash Point Tester, 115V 60Hz                         |           |
| <b>K87390</b> Automatic Abel Flash Point Tester, 230V 50/60Hz                      |           |
| <b>Automatic Pensky-Martens Closed Cup Flash Point Tester</b>                      | 1         |
| <b>K87100</b> Automatic Pensky-Martens Closed Cup Flash Point Tester, 115V 60Hz    |           |
| <b>K87190</b> Automatic Pensky-Martens Closed Cup Flash Point Tester, 230V 50/60Hz |           |
| <b>Automatic Tag Closed Cup Flash Point Tester</b>                                 | 1         |
| <b>K87700</b> Automatic Tag Closed Cup Flash Point Tester, 115V 60Hz               |           |
| <b>K87790</b> Automatic Tag Closed Cup Flash Point Tester, 230V 50/60Hz            |           |
| <b>Automatic Cleveland Open Cup Flash Point Tester</b>                             | 1         |
| <b>K87400</b> Automatic Cleveland Open Cup Flash Point Tester, 115V 60Hz           |           |
| <b>K87490</b> Automatic Cleveland Open Cup Flash Point Tester, 230V 50/60Hz        |           |

# FLASH POINT BY PENSKY-MARTENS CLOSED CUP TESTER



*K16200 Pensky-Martens Flash Tester with  
K16220 Accessory Stirrer Motor (Sold Separately)*

## Specifications

Conforms to the specifications of:

ASTM D93; AASHTO T73-811; IP 34; ISO 2719; DIN 51758; FTM 791-1102;  
NF M 07-019

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 6.5A

220-240V 50/60Hz, Single Phase, 3.4A

## Included Accessories

Brass Test Cup with Handle

Thermometer Holder

Cover Assembly

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

9 1/2 x 8 x 22 1/2 (24 x 20 x 57) with optional stirrer motor installed

Net Weight:

K16000: 21 lbs (9.5kg)

K16200/K16270: 24 lbs (10.9kg)

## Shipping Information

Shipping Weight: 30 lbs (13.6kg)

Dimensions: 3.1 Cu. ft.

**Please refer to page 32 about our automated Pensky-Martens Closed Cup Flash Point Tester or inquire by contacting Koehler Customer Service.**

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

## Test Method

For flash point determinations of fuels, lubricating oils, liquids containing suspended solids and liquids that tend to form a surface film during testing.

## Pensky-Martens Closed Cup Flash Tester

- Conforms to ASTM D93 and related specifications
- Choice of electric or gas heating

Determines flash points of a wide range of products by a closed cup method with two option speed stirring of the sample. Extensively used in shipping and safety regulations for detection of contamination by volatile and flammable materials in fuel oils and lubricating oils, and for characterization of hazardous waste samples.

Smooth operating cover mechanism slides shutter open and applies test flame at the turn of a knob. Cover fits over brass test cup and includes pilot flame, test flame reference bead, built-in stirrer and plated brass thermometer ferrule.

Electrically heated model is equipped with a 1000W nickel-chromium heater with stepless variable control for accurate, repeatable temperature rate of rise settings per specifications. Heater unit is enclosed in a stainless steel housing with cooling vents. Includes line cord receptacle and switch for accessory slow speed stirrer.

Gas heated model has a built-in nickel plated brass natural gas burner, or can be supplied with an artificial gas burner or liquid propane burner (specify when ordering). Both models are mounted on a sturdy cast iron base.

## Ordering Information

| Catalog No.                                   |                                                                                                                                                                                                                                             | Order Qty |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Pensky-Martens Closed Cup Flash Tester</b> |                                                                                                                                                                                                                                             |           |
| <b>K16200</b>                                 | Electrically Heated Model, 115V 60Hz                                                                                                                                                                                                        | 1         |
| <b>K16270</b>                                 | Electrically Heated Model, 220-240V 50/60Hz                                                                                                                                                                                                 |           |
| <b>K16000</b>                                 | Gas Heated Model                                                                                                                                                                                                                            |           |
| <b>Accessories</b>                            |                                                                                                                                                                                                                                             |           |
| <b>K16220</b>                                 | Stirrer Motor, 115V 60Hz<br>Slow speed gear motor rotates stirrer of Pensky-Martens Tester at 115rpm for Procedure A and at 250rpm for Procedure B. Includes adjustable support bracket and mounting rod. Installs in base of flash tester. | 1         |
| <b>K16228</b>                                 | Stirrer Motor, 220-240V 60Hz                                                                                                                                                                                                                |           |
| <b>K16229</b>                                 | Stirrer Motor, 220-240V 50Hz                                                                                                                                                                                                                |           |
| <b>250-000-09F</b>                            | ASTM 9F Thermometer<br>Range: 20 to 230°F                                                                                                                                                                                                   |           |
| <b>250-000-09C</b>                            | ASTM 9C Thermometer<br>Range: -5 to +110°C                                                                                                                                                                                                  | 1         |
| <b>250-000-10F</b>                            | ASTM 10F Thermometer<br>Range: 200 to 700°F                                                                                                                                                                                                 |           |
| <b>250-000-10C</b>                            | ASTM 10C Thermometer<br>Range: 90 to 370°C                                                                                                                                                                                                  | 1         |
| <b>K16010</b>                                 | Cover Assembly<br>Complete assembly. Includes shutter, flame exposure device, stirrer and thermometer ferrule.                                                                                                                              |           |
| <b>K16020</b>                                 | Brass Test Cup<br>With heat resistant handle.                                                                                                                                                                                               |           |
| <b>K16020-NI</b>                              | Nickel Plated Test Cup<br>With heat resistant handle                                                                                                                                                                                        |           |

## FLASH POINT BY TAG CLOSED TESTER

### Test Method

For flash point determinations of liquids with a viscosity of below 5.5 centistokes (cSt) at 104°F (40°C) or below 9.5cSt at 77°F (25°C), and a flash point below 200°F (93°C) except cut-back asphalts, those liquids which tend to form a surface film under test conditions and materials which contain suspended solids.

### Tag Closed Cup Flash Tester

- Conforms to ASTM D56 and related specifications
- Gas or electrical heating

Determines flash points of liquid products by the Tag Closed Cup method. Features stepless variable heat control with reference dial for accurate repeat setting of temperature rate of rise per specifications. Also available with gas burner instead of electric heater. Precision machined cover mechanism simultaneously opens slide shutter and applies test flame to sample at the turn of a knob. Includes liquid bath with constant level overflow, brass test cup, plated brass thermometer ferrules and test flame reference bead. Bath and cover mechanism are constructed of plated brass. Heater is enclosed in a cast aluminum base assembly.

**Please refer to page 33 about our automated Tag Closed Cup Flash Point Tester or inquire by contacting Koehler Customer Service.**

#### Ordering Information

| Catalog No.                        |                                                                             | Order Qty |
|------------------------------------|-----------------------------------------------------------------------------|-----------|
| <b>Tag Closed Cup Flash Tester</b> |                                                                             |           |
| <b>K14600</b>                      | Electrically Heated Model,<br>115V 60Hz                                     | 1         |
| <b>K14670</b>                      | Electrically Heated Model,<br>220-240V 50/60Hz                              |           |
| <b>K14690</b>                      | Gas Heated Model                                                            |           |
| <b>Accessories</b>                 |                                                                             |           |
| <b>250-000-09F</b>                 | ASTM 9F Thermometer<br>Range: 20 to 230°F                                   | 2         |
| <b>250-000-09C</b>                 | ASTM 9C Thermometer<br>Range: -5 to +110°C                                  |           |
| <b>250-000-57F</b>                 | ASTM 57F Thermometer<br>Range: -4 to +122°F                                 | 2         |
| <b>250-000-57C</b>                 | ASTM 57C Thermometer<br>Range: -20 to +50°C                                 |           |
| <b>K14510</b>                      | Cover Assembly<br>Includes slide shutter burner and<br>thermometer ferrules |           |
| <b>K14520</b>                      | Brass Test Cup                                                              |           |

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



**K14600 Tag Closed Cup Flash Tester**

### Specifications

Conforms to the specifications of:

ASTM D56; IP 304; FTM 791-1101

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 1.3A

220-240V 50/60Hz, Single Phase, 0.6A

### Included Accessories

Brass Test Cup

Cover Assembly (includes Slide Shutter, Burner and Thermometer Ferrules)

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

5x5x16 (13x13x41)

\*with thermometers inserted

Net Weight: 7 lbs (3.2kg)

### Shipping Information

Shipping Weight: 8 lbs (3.6kg)

Dimensions: 0.76 Cu. ft.

## FLASH AND FIRE POINTS BY CLEVELAND OPEN CUP



K13900 Cleveland Open Cup Flash Tester

### Specifications

Conforms to the specifications of:

ASTM D92, D6074, D6158; AASHTO T48; ANS Z-11.6; IP 36; ISO 2592;

DIN 51376; FTM 791-1103, FTM 141-4294

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 6.5A

220-240V, 50/60Hz, Single Phase, 3.4A

### Included Accessories

Brass Test Cup

### Dimensions

l x w x h, in. (cm)

10 x 5½ x 14 (25 x 14 x 36)

Net Weight: 8½ lbs (3.9kg)

### Shipping Information

Shipping Weight: 12 lbs (5.4kg)

Dimensions: 1.5 Cu. ft.

### Test Method

For flash and fire points of all petroleum products, except fuel oils and those having an open cup flash below 79°C (175°F).

### Cleveland Open-Cup Flash Tester

- Conforms to ASTM D92 and related specifications
- For flash points above 79°C (175°F)

Determines flash and fire points by the Cleveland Open-Cup method. Consists of test flame applicator, brass test cup, thermometer support, heating plate and electric heater. Applicator is precisely aligned per specifications and pivots for test flame application at specified temperature intervals. Hinged thermometer support raises to facilitate placement and removal of test cup. Adjust flame size using built-in needle valve and comparison bead.

Equipped with a 1000W nickel-chromium heater with stepless variable heat control for accurate repeat setting of temperature rate of rise per specifications.

Heater unit is enclosed in a stainless steel housing with cooling vents. Test flame applicator and thermometer support are constructed of machined nickel plated brass.

**Please refer to page 33 about our automated Cleveland Open Cup Flash Point Tester or inquire by contacting Koehler Customer Service.**

### Ordering Information

| Catalog No.                            |                                                                                 | Order Qty |
|----------------------------------------|---------------------------------------------------------------------------------|-----------|
| <b>Cleveland Open-Cup Flash Tester</b> |                                                                                 | 1         |
| <b>K13900</b>                          | Electrically Heated Model,<br>115V 60Hz                                         |           |
| <b>K13990</b>                          | Electrically Heated Model,<br>220-240V 50/60Hz                                  |           |
| <b>Accessories</b>                     |                                                                                 |           |
| <b>250-000-11F</b>                     | ASTM 11F Thermometer<br>Range: 20 to 760°F                                      | 1         |
| <b>250-000-11C</b>                     | ASTM 11C Thermometer<br>Range: -6 to +400°C                                     |           |
| <b>K14000</b>                          | Cleveland Open Flash Cup<br>Precision machined brass with heat resistant handle |           |

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

## FLASH POINT BY TAG OPEN-CUP APPARATUS

### Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus

#### Flash Point of Cutback Asphalt with Tag Open-Cup Apparatus

#### Test Method

For determination of flash and fire points of liquids at temperatures of up to 325°F (163°C) and flash points of cutback asphalts at temperatures of less than 200°F (93°C).

#### Tag Open-Cup Flash Tester

- Conforms to ASTM D1310, D3143 specifications
- Choice of gas or electrically heated

Determines Tag Open-Cup flash point of liquid products and cutback asphalts. Includes sample test cup, plated brass liquid bath with constant level overflow, pivoting ignition taper with pilot light and reference bead, pivoting thermometer holder, heater and cast aluminum base.

Electrically heated model is equipped with stepless variable heat control for accurate control of temperature rate of rise per specifications. Gas heated model also available.



**K15600 Tag Open-Cup Flash Tester**

#### Ordering Information

| Catalog No.                      |                                                                                                                       | Order Qty |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Tag Open-Cup Flash Tester</b> |                                                                                                                       |           |
| <b>K15600</b>                    | Electrically Heated Model, 115V 60Hz                                                                                  | 1         |
| <b>K15670</b>                    | Electrically Heated Model, 220-240V 50/60Hz                                                                           |           |
| <b>K15690</b>                    | Gas Heated Model                                                                                                      |           |
| <b>Accessories</b>               |                                                                                                                       |           |
| <b>250-000-33F</b>               | ASTM 33F Thermometer<br>Range: -36.5 to +107.5°F                                                                      | 1         |
| <b>250-000-33C</b>               | ASTM 33C Thermometer<br>Range: -38 to +42°C                                                                           |           |
| <b>250-000-09F</b>               | ASTM 9F Thermometer<br>Range: 20 to 230°F                                                                             | 1         |
| <b>250-000-09C</b>               | ASTM 9C Thermometer<br>Range: -5 to +110°C                                                                            |           |
| <b>250-000-35F</b>               | ASTM 35F Thermometer<br>Range: 194 to 338°F                                                                           |           |
| <b>250-000-35C</b>               | ASTM 35C Thermometer<br>Range 90 to 170°C                                                                             | 1         |
| <b>K15610</b>                    | Leveling Device<br>For proper adjustment of sample level in test cup.<br>Meets ASTM specifications. Polished aluminum |           |
| <b>K15620</b>                    | Draft Shield                                                                                                          | 1         |
| <b>K15520</b>                    | Sample Cup                                                                                                            |           |

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

#### Specifications

Conforms to the specifications of:

ASTM D1310, D3143

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 13A

220-240V 50/60Hz, Single Phase, 0.6A

#### Included Accessories

Borosilicate Glass Sample Cup

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

10x7x17 (25x18x43)

\*with thermometer inserted

Net Weight: 7½ lbs (3.4kg)

#### Shipping Information

Shipping Weight: 9½ lbs (4.3kg)

Dimensions: 1.3 Cu. ft.

# FLASH POINT AND SUSTAINED BURNING OF LIQUIDS



**K16500 Rapid Flash Tester, Closed Cup**

## Flash Point of Liquids by Small Scale Closed Cup Apparatus

### Flash Point by Small Scale Closed Tester

### Sustained Burning of Liquid Mixtures by Setaflash Tester (Open-Cup)

#### Test Method

Verifies the flash point or the sustained burning qualities of small samples in the range of  $-30^{\circ}\text{C}$  to  $+300^{\circ}\text{C}$ .

#### Rapid Flash Tester

- Conforms to ASTM D3278, D3828, D4206; DOT CFR 49-173.115; IATA; ISO 9038 and related specifications
- One minute test with a 2mL sample
- Simple to operate

Rapid Tester® provides rapid determinations of flash point or sustained burning qualities by using a small sample. A flash/no flash test result is achieved in one minute for flash points below  $212^{\circ}\text{F}$  ( $100^{\circ}\text{C}$ ) with a 2mL sample. Ideally suited for quality assurance and environmental compliance testing as well as actual flash point for paints, fragrances, hydrocarbons and other liquids. Open cup models are used for determining sustained burning qualities characteristics of mixtures of flammable and nonflammable liquids or liquids with widely different flash points when assessing flammability characteristics. Features convenient semi-automatic operation for flash/no flash tests. Set the test temperature on the digital display and inject a 2mL or 4mL sample into the sample cup. The tester quickly stabilizes itself at the desired value, permitting the test flame to be applied and the result to be observed by the operator. Unit also performs conventional determinations of actual flash temperature by the small scale closed tester method.

Two models are offered: the Closed Cup Model is for routine flash point tests in the range from  $-30$  to  $+300^{\circ}\text{C}$  ( $-22$  to  $+572^{\circ}\text{F}$ ); the Open-Cup Model is for sustained burning tests in the range from ambient to  $212^{\circ}\text{F}$  ( $100^{\circ}\text{C}$ ). Both models include automatic temperature control with  $^{\circ}\text{C}/^{\circ}\text{F}$  selector switch, syringe, electronic timer, integral NIST traceable thermometer, and an external fuel cylinder valve for connection to a customer-supplied fuel cylinder or other fuel source.

#### Specifications

Conforms to the specifications of:

ASTM D3278, D3828, D4206; IP 303; ISO 3679, ISO 3680, ISO 9038; DOT CFR 49-173.115; IATA

Electrical Requirements:

115V 60Hz  
220-240V 50/60Hz

#### Included Accessories

Thermometer, range 32 to  $572^{\circ}\text{F}$  (0 to  $300^{\circ}\text{C}$ )

Syringe

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

15x23.4x6.3 (38.1x8.6x16.2)

Net Weight: 10 lbs (4.6kg)

#### Shipping Information

Shipping Weight: 16 lbs (7.26kg)

Dimensions: 2.3 Cu. ft.

#### Ordering Information

##### Catalog No.

|               |                                                                                   |
|---------------|-----------------------------------------------------------------------------------|
| <b>K16500</b> | Rapid Flash Tester, Closed Cup, 115V<br>Aluminum Test Cup/Brass Lid & Shutter     |
| <b>K16591</b> | Rapid Flash Tester, Closed Cup, 220-240V<br>Aluminum Test Cup/Brass Lid & Shutter |
| <b>K16502</b> | Rapid Flash Tester, Closed Cup, 115V<br>Stainless Steel Test Cup, Lid & Shutter   |
| <b>K16592</b> | Rapid Tester, Closed Cup, 220-240V<br>Stainless Steel Test Cup, Lid & Shutter     |
| <b>K16503</b> | Rapid Flash Tester, Open-Cup, 115V<br>Aluminum Test Cup                           |
| <b>K16593</b> | Rapid Flash Tester, Open-Cup, 220-240V<br>Aluminum Test Cup                       |
| <b>K16504</b> | Rapid Flash Tester, Open-Cup, 115V<br>Stainless Steel Test Cup                    |
| <b>K16594</b> | Rapid Flash Tester, Open-Cup, 220-240V<br>Stainless Steel Test Cup                |

#### Accessories

|               |                                                                                     |
|---------------|-------------------------------------------------------------------------------------|
| <b>K16506</b> | Fuel Cylinder Valve                                                                 |
| <b>K16507</b> | Heat Transfer Compound for thermometer                                              |
| <b>K16508</b> | Metal Cooling Block to facilitate cooling<br>of the sample cup between tests        |
| <b>K16509</b> | Refrigerant Charged Cooling Block to hold cooling<br>mixture for subambient testing |
| <b>K16510</b> | Syringe 2mL/4mL                                                                     |
| <b>K16511</b> | Thermometer, range 32 to $572^{\circ}\text{F}$ /0 to $300^{\circ}\text{C}$          |
| <b>K16512</b> | Thermometer, range 32 to $230^{\circ}\text{F}$                                      |
| <b>K16513</b> | Thermometer, range 212 to $572^{\circ}\text{F}$                                     |
| <b>K16514</b> | Thermometer, range 0 to $110^{\circ}\text{C}$                                       |
| <b>K16515</b> | Thermometer, range 100 to $300^{\circ}\text{C}$                                     |
| <b>K16516</b> | Thermometer, range $-36$ to $+105^{\circ}\text{F}$                                  |
| <b>K16517</b> | Thermometer, range $-38$ to $+40^{\circ}\text{C}$                                   |

# AUTOIGNITION TEMPERATURE OF LIQUID CHEMICALS

## Test Method

Determines the lowest temperature at which the vapors of a liquid or solid chemical sample will self-ignite under prescribed laboratory conditions. The temperatures at which 'cool flame' and 'hot flame' ignitions occur, as evidenced by sudden temperature increases in the sample flask, are measured and recorded, and the delay time between introduction of the sample and ignition is timed.

## Autoignition Apparatus

- Conforms to ASTM E659 specifications
- Digital furnace temperature control
- Digital flask temperature display

Modified crucible furnace with digital thermocouple readout of flask temperature at prescribed points per ASTM specifications. Linearized analog output permits connection to a strip chart recorder or datalogging instrument. Furnace provides rapid response and  $\pm 1^\circ\text{C}$  stability throughout the operating range from Ambient to  $750^\circ\text{C}$ . Cylindrical heating chamber provides excellent radial temperature uniformity. Furnace cover has ports for flask exterior thermocouples, and a borosilicate glass thermocouple tube is provided to assure correct positioning of the gas temperature thermocouple inside the test flask. Thermocouples plug directly into the furnace control unit for quick disconnection when removing the flask. A hinged holder in the cover facilitates handling of the test flask. Adjustable mirror permits safe viewing of the flask interior during testing. Control panel has temperature controls and digital thermocouple readout with four-position selector switch.

## Specifications

Conforms to the specifications of:  
ASTM E659

Temperature Range: Ambient to  $750^\circ\text{C}$

Temperature Control: digital setpoint solid state controller  
accurate to within  $\pm 1^\circ\text{C}$

Flask Temperature Display:  $0-750^\circ\text{C}$ , with four position selector switch

Electrical Requirements: 220-240V 50/60Hz, Single Phase, 7.7A  $\text{C}\text{E}$

## Included Accessories

Borosilicate Test Flask, 500mL

Thermocouples (4)

## Dimensions lwxh,in.(cm)

Furnace: 15x15x22 (38x38x56)

Control Cabinet: 22x10x14 (56x25x36)

Net Weight: 72 lbs (32.8kg)

## Shipping Information

Shipping Weight: 98 lbs (44.5kg)

Dimensions: 16.3 Cu. ft.



K47000 Autoignition Apparatus

**Special apparatus for performing the Autoignition Test according to the ASTM D2155 test method is available. Please contact Koehler Customer Service for additional and ordering information.**

## Ordering Information

| Catalog No.        |                                          |   |
|--------------------|------------------------------------------|---|
| K47000             | Autoignition Apparatus, 220-240V 50/60Hz | 1 |
| <b>Accessories</b> |                                          |   |
| 362-001-000        | Syringe, 1mL                             | 1 |
| K470-0-1-14        | Needle, 6", stainless steel              | 1 |
| K70015-1A          | Recorder, 115V/230V 50/60Hz              | 1 |
| 374-115-001        | Hot Air Gun, 115V 60Hz                   | 1 |
| 374-230-001        | Hot Air Gun, 220-240 50/60Hz             |   |
| 332-003-008        | Quartz Test Flask, 500mL                 | 1 |
| K470-0-1-8         | Quartz Thermocouple Guide                |   |

## 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.

### **Flash Point by Pensky-Martens Closed Tester.....Pages 32, 34**

ASTM D93, AASHTO T73-811, IP 34, ISO 2719, DIN 51758, FTM 791-1102

Propane  
Toluene  
Acetone  
Calcium Chloride  
Barometer

### **Flash Point by Tag Closed Tester .....Pages 33, 35**

ASTM D56, IP 304, FTM 791-1101

Ethylene Glycol  
Propane  
Barometer  
Water

### **Flash and Fire Points by Cleveland Open-Cup .....Pages 33, 36**

ASTM D92, AASHTO T48, ANS Z-11.6. IP 36, ISO 2592, DIN 51376,  
FTM 791-1103, FTM 141-4294

Barometer

### **Flash Point of Cutback Asphalt with Tag Open-Cup Apparatus .....Page 33**

ASTM D3143

Ethylene Glycol  
Distilled Water

### **Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus .....Page 37**

ASTM D1310

Flasks, 500mL (2)  
Distilled Water  
Solid Carbon Dioxide  
Acetone  
n-Heptane  
p-Xylenol  
Isopropanol  
Diethylene Glycol

### **Autoignition Temperature of Liquid Chemicals.....Page 39**

ASTM E659

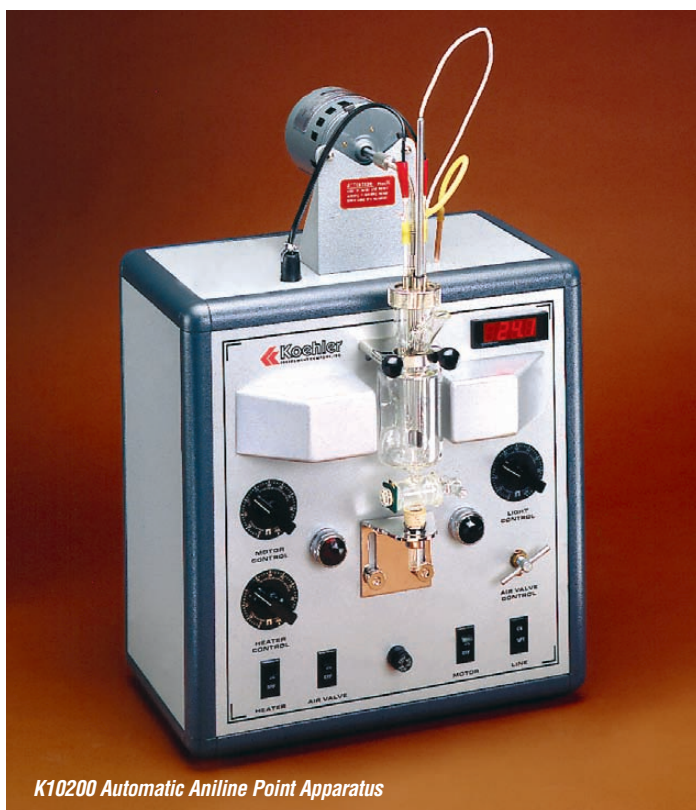
Laboratory Balance  
Powder Funnel

# GENERAL TEST EQUIPMENT

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# 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

- 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.

### 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: **CE**  
 115V 60Hz, Single Phase, 0.4A  
 220-240V 50/60Hz, Single Phase, 0.2A

### Included Accessories

Standard Borosilicate Glass Test Cell with drain

### Dimensions

14½x8½x20¼ (37x22x53)  
 Net Weight: 32½ lbs (14.7kg)

### Shipping Information

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

### Ordering Information

| Catalog No.        |                                                     | Order Qty |
|--------------------|-----------------------------------------------------|-----------|
| K10200             | Automatic Aniline Point Apparatus, 115V 60Hz        | 1         |
| K10290             | Automatic Aniline Point Apparatus, 220-240V 50/60Hz |           |
| <b>Accessories</b> |                                                     |           |
| 250-000-33F        | ASTM 33F Thermometer<br>Range: -36.5 to +107.5°F    | 1         |
| 250-000-33C        | ASTM 33C Thermometer<br>Range: -38 to +42°C         |           |
| 250-000-34F        | ASTM 34F Thermometer<br>Range: 77 to 221°F          | 1         |
| 250-000-34C        | ASTM 34C Thermometer<br>Range: 25 to 105°C          |           |
| 250-000-35F        | ASTM 35F Thermometer<br>Range: 194 to 338°F         | 1         |
| 250-000-35C        | ASTM 35C Thermometer<br>Range: 90 to 170°C          |           |
| K10210             | Borosilicate Glass Test Cell with drain             |           |
| K10220             | Heating-Cooling Tube with platinum element          |           |

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

# 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 Borosilicate Glass 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 1000W heater and has a positioning well for the Borosilicate Glass 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

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

Electrical Requirements: **CEE**

115V 60Hz, Single Phase, 6.5A

220-240V 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**

## 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 Borosilicate Glass 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 |
| K10190               | Thin Film Aniline Point Apparatus, 115V 60Hz        | 1         |
| K10191               | Thin Film Aniline Point Apparatus, 220-240V 50/60Hz | 1         |
| K10020               | Powertrol Heater, 115V 60Hz                         | 1         |
| K10029               | Powertrol Heater, 220-240V 50/60Hz                  | 1         |
| <b>Accessories</b>   |                                                     |           |
| 250-000-33F          | ASTM 33F Thermometer<br>Range: -36.5 to +107.5°F    | 2         |
| 250-000-33C          | ASTM 33C Thermometer<br>Range: -38 to +42°C         | 2         |
| 250-000-34F          | ASTM 34F Thermometer<br>Range: 77 to 221°F          | 2         |
| 250-000-34C          | ASTM 34C Thermometer<br>Range: 25 to 105°C          | 2         |
| 250-000-35F          | ASTM 35F Thermometer<br>Range: 194 to 338°F         | 2         |
| 250-000-35C          | ASTM 35C Thermometer<br>Range: 90 to 170°C          | 2         |

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

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

# 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

Electrical Requirements: **CE**

115V 60Hz

220-240V 50/60Hz

## Included Accessories

Whole Color Standards (3)

Half Color Standard (1)

Engraved Conversion Chart

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

5½ x 5½ x 26½ (14 x 14 x 67)

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.

|               |                                           |   |
|---------------|-------------------------------------------|---|
| <b>K13009</b> | Saybolt Chromometer                       | 1 |
| <b>K13100</b> | Saybolt Wax Chromometer, 115V 60Hz        | 1 |
| <b>K13190</b> | Saybolt Wax Chromometer, 220-240V 50/60Hz |   |

### Accessories

|                    |                                                                                                                                                               |   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| <b>K13010</b>      | Daylight Lamp                                                                                                                                                 | 1 |
|                    | Meets ASTM D156 and related test specifications for illumination of Saybolt Chromometers. Adjustable for correct positioning. Standard 60W bulb not included. |   |
| <b>K13020</b>      | Whole Color Standard                                                                                                                                          |   |
| <b>K13029</b>      | Half Color Standard                                                                                                                                           |   |
| <b>K13032</b>      | Matched Set of Tubes with Turret                                                                                                                              |   |
|                    | Assembly for K13009 Saybolt Chromometer                                                                                                                       |   |
| <b>K13033</b>      | Matched Set of Tubes with Turret and Draincock                                                                                                                |   |
|                    | Assembly for K13100/K13190 Saybolt Wax Chromometer                                                                                                            |   |
| <b>279-115-005</b> | Frosted Bulb, 60W, 115V                                                                                                                                       | 1 |
| <b>279-230-002</b> | Frosted Bulb, 60W, 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

Single scale, 3-field petroleum comparator designed for visual color grading by direct comparison between the sample and colored glass filters housed in test discs conforming to the chromaticity coordinates of ASTM D1500. The sample and two consecutive glasses on the color scale are viewed simultaneously, making it easier to achieve the optimum color match. For rapid color grading within predetermined color limits, the glass standards can be set to the two limiting colors so that it is easy to check that the sample is within tolerance. The tungsten halogen light source is color corrected to CIE Standard Illuminant C, giving constant lighting conditions for color grading, regardless of ambient lighting. A prism brings the three fields together to aid color grading.

### Specifications

Conforms to the specifications of:

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

Electrical Requirements: **CE**

115V 60Hz

220-240V 50/60Hz

### Included Accessories

Glass Color Discs (2) Sample Container (3) Calibration Certificate

**Dimensions** d x w x h, in. (cm)

10.5 x 9 x 5 (25 x 27 x 18)

Net Weight: 3.5 lbs (1.6kg)

### Shipping Information

Shipping Weight: 5.5 lbs (2.5kg)

Dimensions: 2.5 Cu. ft.



*K13200 Petroleum Colorimeter with  
K13210 Sample Containers (3 Included)*

### Ordering Information

| Catalog No.        |                                            | Order Qty |
|--------------------|--------------------------------------------|-----------|
| K13200             | Petroleum Colorimeter,<br>115V 60Hz        | 1         |
| K13290             | Petroleum Colorimeter,<br>220-240V 50/60Hz |           |
| <b>Accessories</b> |                                            |           |
| K13210             | Sample Container                           |           |
| K13223             | Replacement Tungsten Halogen Lamp, 12V 20W |           |

## 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<br>Provides uniform lighting for Oil Comparator | 1         |
| K13294             | Daylight Illuminator, 220-240V                                             |           |
| K13205             | Rectangular Glass Cell                                                     |           |

## PORTABLE AUTOMATED COLORIMETER



**K13260 Portable Automatic Colorimeter with K13351 Cylindrical Cuvette and K13353 Rectangular Cuvettes (Both Sold Separately)**

### Specifications

Conforms to the specifications of:  
ASTM D156, D1209,  
D1544, D6045; ISO 4630, 6271;  
DIN 6162; NF M 07-003;  
NF T 60-104; JIS K2580  
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  $\text{C}\text{E}$

### Portable Automated Colorimeter

- Conforms to ASTM D156, D1544, D1209, DIN 6162, and related international test specifications
- Measures the 4 most important color scales used for liquid chemicals, resins, oils, fuels, and fats for liquid color measurement
- 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 4 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. Please contact Koehler Customer Support for assistance on additional accessories required for your application.

### Color Ranges

- Saybolt Color (ASTM D156, NF M 07-003)
- 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.

**K13260**

Portable Automatic Colorimeter

#### Accessories

**K13551**

Starter Kit – Consists of Addista Color Standards;  
50 x 10 Rectangular Cuvettes, Pk/10; Cuvette Set,  
10 x 11mm round glass cuvettes

**K13550-1**

Thermal Printer with USB Connection

## AUTOMATED COLORIMETER FOR SAYBOLT AND ASTM COLOR



**K13150 Automated Colorimeter**

### Specifications

Conforms to the specifications of:  
ASTM D156, D1500, D6045,  
E 308; JIS K2580; ISO 2049;  
NF M 07-003  
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°

### Electrical Requirements

115-240V 50/60Hz  $\text{C}\text{E}$

### 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. Equipped with integrated heater unit for melting solid samples such as fats and waxes and preventing from solidification within the cell during 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

- Touch-screen TFT-Color Display
- Automatic cuvette recognition
- Data log for 500 color values, 50 color reference values, 500 photometric readings, 20 wavelength scans, 20 time scans
- Automatic zero calibration program
- Reference Beam Technology
- Password protection, GLP documentation
- USB-Ports: 1 x Type A and 1 x Type B

High performance, microprocessor controlled spectrophotometer with a wavelength range from 380 to 720 nm for color measurement or 320 nm up to 1100 nm for routine analysis. The K13550 can carry out an exact colorimetric evaluation in conformity with several ISO/ASTM standards with just a single measurement and display the result in terms of traditional color systems such as Iodine, Hazen/APHA or Gardner color numbers as well as in modern CIE-L\*a\*b\* color values. Besides the over 20 color indexes, transmittance and absorbance can be measured at individual wavelengths, so that the K13550 can be used universally for analytical purposes in the laboratory.

### Color measurement methods:

- Iodine, Hazen, APHA, Pt/Co, Gardner-Color
- Saybolt, Klett-color
- Hess-Ives, ADMI, Yellowness-index
- AOCS-Red/Yellow, Chlorophyll A
- CIE-Lab, Hunter-Lab, XYZ
- European and US Pharmacopoeia

### Photometer methods:

- Wavelength Scan 320-1100nm incl. Difference Mode
- Time Course Mode
- Single and Multi Wavelength Mode



**K13550 Automatic Colorimeter with K13351 Cylindrical Cuvettes and K13353 Rectangular Cuvette (Both Sold Separately)**

### Included Accessories:

- Universal power supply 100-240V, 50-60 Hz, with exchangeable plug adapters for EU, GB, US, China
- Dust Cover
- User Manual

### Specifications

Conforms to the specifications of:

ASTM D156, D1209, D1544, D1925, D5386, D6045, D6166; ISO 4630, 6271; DIN 5033, 6162, 6174; AOCS Cc 13e; USP Ch 631, 1061; Ph EUR; NF M 07-003; NF T 60-104

Spectral Bandwidth: 5 nm

Wavelength Reproducibility: 0.1nm

Wavelength Resolution: 1nm

Scanning Speed: 12 nm/s (in steps of 1 nm)

Stray Light: < 0.1% T at 340 nm with NaNO<sub>2</sub>

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

Wavelength Range: 320-1100nm in steps of 1nm

Wavelength Accuracy: +/- 1.5 nm (wavelength range 340-900 nm)

Photometric Measuring Range: +/- 3.5 Abs (wavelength range 340-900 nm)

Photometric Accuracy: 5 m Abs at 0.0 to 0.5 Abs

1% at 0.50 to 2.0 Abs

Photometric linearity: < 0.5% to 2 Abs

1% at > 2 Abs with neutral glass at 546 nm

Light Source: Gas-filled Tungsten (visible)

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

14.5 x 14.1 x 5.7 (36.8 x 35.9 x 14.4)

Net Weight: 14.11 lbs (6.4 kg)

### Shipping Information

Shipping Weight: 18 lbs (8.2 kg)

Dimensions: 20x16x16in.

### Electrical Requirements

115-240V, 50/60 Hz C €

### Ordering Information

#### Catalog No.

**K13550** Automatic Colorimeter 115-240V, 50/60 Hz

#### Accessories

**K13551** Starter Kit

Consists of Addista Color Standards; 50 x 10 Rectangular Cuvettes, Pk/10; Cuvette Set, 10 x 11mm round glass cuvettes

**K13552** USB-Barcode Scanner (hand-held scanner)

**K13553** Test filter set for stray light, absorbance and wavelength check

**K13554** USB-Keybaord (keyboard layout: US)

**K13253** Certified Testing solution set "Addista-Color"

**K13351** Round cuvettes 11mm, glass, disposable, pk/500

**K13353** Rectangular cuvette 50 x 10mm, plastic, disposable, pk/50

**K13349** Rectangular cuvette 50 x 10mm with caps, plastic, disposable, pk/10

**K13250-1** Rectangular cuvette 50 x 10, glass, pk/1

**K13500-3** Rectangular cuvette 10 x 10, glass, pk/3

**K13550-1** Printer for K13550

**K13356** Rack for 7 50x10 cuvettes

*Please use the K13250-1 Rectangular cuvette 50 x 10, glass, pk/1 or K13500-3 Rectangular cuvette 10 x 10, glass, pk/3 when testing hydrocarbons for color measurements. The disposable polycarbonate cuvettes are made for aqueous samples. Please ask you Koehler Sales Representative for details.*

# 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"<br>(64x305mm) |
| K26390      | Brass        | 2x15"<br>(51x381mm)  |
| 332-002-011 | Glass        | 2x15½"<br>(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** l x w x h, 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: **CE**  
115V 60Hz, Single Phase, 22A  
230V 50/60Hz, Single Phase, 11A

### Ordering Information

| Catalog No.        |                                                                        | Order Qty |
|--------------------|------------------------------------------------------------------------|-----------|
| <b>K26400</b>      | Constant Temperature Hydrometer Bath, 115V 60Hz                        | 1         |
| <b>K26490</b>      | Constant Temperature Hydrometer Bath, 230V 50/60Hz                     |           |
| <b>Accessories</b> |                                                                        |           |
| <b>K26410</b>      | Hydrometer Cylinder<br>Borosilicate glass, 15½" x 2" dia. with 2½" lip | 12        |
| <b>250-000-61F</b> | ASTM 61F Thermometer<br>Range: 90 to 260°F                             | 1         |
| <b>250-000-61C</b> | ASTM 61C Thermometer<br>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: **CE**  
115V 60Hz, Single Phase, 4.3A  
230V 50/60Hz, Single Phase, 2.2A

**Dimensions** dia. x h. (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.   |                                                    |
|---------------|----------------------------------------------------|
| <b>K26200</b> | Constant Temperature Hydrometer Bath, 115V 60Hz    |
| <b>K26290</b> | Constant Temperature Hydrometer Bath, 230V 50/60Hz |



# 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

- ASTM D 1533, D4928, D6304, IP 386, IP 438, API MPMS Chap. 10.9, BS 60814, ISO 10101-3, ISO 10337, ISO 12937
- Simple operation
- Multi-language display and print out
- Integral high-speed thermal printer
- Small footprint
- Automatic Compensation of Errors

The AKF5000 offers new standards in versatility and ease of operation. Providing fast, accurate and reproducible determinations of water content in liquids, gases and powders. This easy to use titrator incorporates many state-of-the-art features. Designed to be equally suitable for meeting the routine needs of the Quality Control laboratory or the more demanding and varied requirements of research applications. Hard copies of results are provided by the built in high-speed thermal printer, along with statistics, data input parameters, sample ID numbers and time/date of analysis.

### Ordering Information

#### Catalog No.

**K90365** AKF5000 Compact Coulometric Karl Fischer Titrator,  
115-240V 50/60Hz

#### Included Accessories

Glassware pack comprising twin port titration vessel, detector electrode, generator electrode, dessicant tube, molecular seive, stirrer bar, injection septa, funnel & 1ml glass syringe with luer needle.

#### Accessories

**K90365-7** Gas Analysis Kit  
(Comprised of gas inlet, gas outlet, seal ring & cap)

**K90365-8** Carry Case

**K90365-20** Formula Reagent Kit (Pack of 8 x 100ml anode reagent,  
8 x 5ml cathode reagent)

**K90365-35** Water Standard, 0.1 mg/ml, 5ml, pk/10

**K90365-36** Water Standard, 1.0 mg/ml, 5ml, pk/10

## Specifications and Features

Titration method: Coulometric Karl Fischer titration

End point detection: AC polarisation

End point indication: Visual display/print out/acoustic beep

Display: 40 character alphanumeric backlit LCD

Measuring range (possible): 1µg – 100mg water

Measuring range (typical): 1µg – 10mg water

Moisture range: 1 ppm – 100%

Max. sensitivity: 0.1 µg

Max. titration speed: 2.0 mg per minute

Max. current: 400 ma

Drift compensation: Automatically controlled

Start delay time: 0 - 30 minutes, user selectable

End delay time: 0 - 30 minutes, user selectable

Power supply: 90-264VAC, 47-63Hz Universal input **CE**

Precision: 10-100µg ±3µg, 100µg-1mg ±5µg,  
above 1mg ±0.5%

Calculation modes: Weight/weight, user programmable

Weight/dilution ratio, user programmable

Volume/density, user programmable

Volume/volume, user programmable

Display format: µg, mg/kg, ppm, %

Print format: µg, mg/kg, ppm, %

Statistics: max, mean, min values upto 99 runs

Method storage: 10 user programmable methods

Sample ID number: user programmable

Printer: 42 character high-speed thermal printer

Stirrer speed: Microprocessor controlled

Dimensions: 250 x 245 x 120 mm

Weight: 3 kg

Language: English, Francais, Espanol, Portugues,  
Deutsch and Magyar

Calendar/clock: Analysis time and date print out

# AUTOMATIC FLOCCULATION TITRIMETER

## Test Method

Samples of asphalt or heavy oil, or residuum are dissolved in toluene at various concentrations and titrated with iso-octane or n-heptane at controlled temperatures to determine the point of flocculation (asphaltene precipitation) and calculate the Heithaus compatibility parameters. These results are intended primarily as a laboratory diagnostic tool for estimating the colloidal stability or compatibility of asphalt, asphalt cross blends, aged asphalt, pyrolyzed asphalt, crudes, and heavy oil (residuum). The stability values will allow the refiner to increase yields by allowing longer retention time in process. The compatibility values will allow blending of crudes so as to prevent asphaltene formation during blending and storage. Both of these parameters are of utmost importance when we consider the price of crude in today's market.

## Automated Flocculation Titrimeter

- Complete instrument and data acquisition system
- Rapid, accurate and highly reproducible
- Determines blending insolubility and solubility numbers
- Generates the data to calculate the WRI Coking Index (patent pending) to predict the proximity to coke formation during heavy oil distillation and improve distillate yield

The Automated Flocculation Titrimeter (AFT) is a highly automated, computerized instrument that acquires oil stability and compatibility parameters directly. The AFT can be used to perform ASTM D6703 test method for Automated Heithaus Titrimetry. The instrument operates as a closed system with accurately controlled temperatures between 20-100°C, important for properly determining Heithaus compatibility parameters. The flocculation point is determined spectroscopically and the results are analyzed by the data acquisition system, virtually eliminating operator error in the interpretation of endpoints. A key benefit to the user is the fact that the asphaltene concentration can be calculated by the software much faster than traditional methods and with more accuracy. The utility of the original Heithaus method has been expanded by developing multiple titration schemes. The software uses the data from the expanded method to predict the proximity to coke formation during heavy oil distillation. Many refiners stop distillation short of coke formation to avoid fouling in distillation equipment, tanks and transfer lines. The expanded AFT methodology allows the refiner to recover additional distillate without the fear of fouling. This attribute of the instrument should allow up to a 1-2% increase in yields if applied to a process. Conversely, the added benefit of being able to predict coking tendency, would prevent fouling of the process and thus decrease the use of energy in production as well as reduce down time due to having to clean vessels after fouling.

One of the primary uses of Heithaus values is to predict the compatibility (P Index) of which oils and petroleum residua or asphalts can be mixed together for shipping, processing, or in formulations without causing phase separation. This is valuable to the refiner, researcher, or asphalt jobber who supplies petroleum asphalts for highway and roofing applications because it ensures that compatible asphalt blends are supplied. Incompatible asphalts show early failure in both applications.

**Coking Index (US Patent 6,773,921)**-Stability also influences coke formation in the refining process. Another major use for the AFT is to acquire the data needed to employ the Coking Index. The Coking Index is a quantitative measure of the proximity to coking (fouling) during visbreaking, distillation, transfer and storage of heavy oil. This allows the petroleum refiner to optimize heavy oil processing and to recover the maximum amount of distillate, and to stop the processing before fouling occurs.

**Solubility Parameter**-The solubility parameter at which asphaltenes begin to precipitate and the solubility parameter of the whole oil can be calculated from the AFT data.



*K47100 Automated Flocculation Titrimeter*

## Specifications

Conforms to the specifications of:

ASTM D6703

Temperature Range: 20 to 100°C

Electrical Requirements: **CE**

115V 60Hz

220-240V 50/60Hz

## Included Accessories

- External Desktop PC with Data Acquisition Software
- Fiber Optic Spectrometer with Multi-Bandpass Detector
- High and Low Flow Rate Metering Pumps
- Magnetic Stirring Plates
- Programmable Circulator with External Probe to Monitor Jacket Temperature of the Sample
- Reaction Vessels
- Quartz Flow Cell with Temperature Stability Feature
- Glassware
- Thermometer Probes
- Digital Variable Sample Circulator with Built in Reverse

## Shipping Information

Shipping Weight: 40 lbs (18.1kg)

Dimensions: 11 Cu. ft.

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

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

## Ordering Information

### Catalog No.

**K47100**

Automated Flocculation Titrimeter, 115V 60Hz

**K47190**

Automated Flocculation Titrimeter, 230V 50/60Hz

In collaboration with Western Research Institute

# DISTILLATION OF PETROLEUM PRODUCTS AT REDUCED PRESSURE

## Test Method

Determines the range of boiling points for petroleum products that can be partially or completely vaporized at a maximum liquid temperature of 400°C at reduced pressures. The sample is distilled at a controlled, reduced pressure under conditions that are designed to provide approximately one theoretical plate fractionation. Initial and final boiling point is measured and a distillation curve relating volume percent distilled and the atmospheric equivalent boiling point temperature can be prepared.

## VDS3000 Manual Vacuum Distillation System

- Conforms to ASTM D1160 and related specifications
- Comes standard with glassware set and accessories kit for "Turn-Key" set up and operation
- Sturdy cabinet composed of aluminum frame and cold rolled steel walls
- Control Unit can easily attach and detach from the main unit offering versatility for laboratory workspace
- Clear protective door provides added safety while allowing the operator full view of the system during testing
- Equipped with digital temperature and vacuum displays for improved measurement reading and accuracy
- Upgrade to glassware set composed entirely of quartz available upon request

The Koehler VDS3000 Manual Vacuum Distillation System is the latest design for determining, at reduced pressures, the range of boiling points for petroleum products according to ASTM D1160 and related specifications. The main body of the system or cabinet is composed of an aluminum frame and cold rolled steel walls. The base of the cabinet houses a 5 Liter Stainless Steel Surge Tank to reduce pressure fluctuations during testing. The control unit of the system features a versatile, compact, modern design. Dual temperature displays independently show both the overhead and flask temperature of the system. Built in cooling fan rapidly cools the distilling flask allowing the user to handle glassware and shorten turnaround time in between test runs. Equipped with complete glassware set and accessories kit for "Turn-Key" installation and operation of the Vacuum Distillation System.

The Standard Glassware Set consists of 500mL quartz distilling flask with thermowell, vacuum jacketed distilling column and condenser assembly, water jacketed receiving cylinder, 90° elbow adapter tube, Dewar-Type Cold Trap with 10mL graduated receiver and stopcock drain, PT100 probe adapter, PT100 vapor temperature probe and PT100 flask temperature probe. The system also includes an adjustable scissor jack, heating mantle, retaining springs, ball joint clamps, connection tubing, hose clamps, quick connect adapters and fittings for easy connection of jacketed glassware and tubing and vacuum grease.

## Specifications

Conforms to the specifications of:

ASTM D1160; ISO 6616; JIS K2254

Temperature Range: Ambient to 425°C (797°F)

Temperature Display: 0.1°C resolution

Temperature Accuracy:  $\pm 0.5^\circ\text{C}$

Vacuum Range: 0.1 Torr to Atmospheric Pressure (760 Torr)

Vacuum Display: 0.1 Torr resolution

Vacuum Accuracy:  $\pm 0.2$  Torr

External Circulator Temperature Range: Ambient +5°C to 150°C

Electrical Requirements: **CE**

115V 60Hz

220-240V 50/60Hz



**K80300 VDS3000 Vacuum Distillation System**

Vacuum Pump and Refrigerated Constant Temperature Circulation Bath are not included with the VDS3000 System but are available from Koehler Instrument Company, Inc. Please refer to Recommended Accessories in the Ordering Information Section for details. Side shelf for housing the Vacuum Pump and Circulation bath is also available upon request.

## Shipping Information

Shipping Weight: 120 lbs

Dimensions: 15 Cu.ft.

## Dimensions wxdxh,in.(cm)

Cabinet: 29½ x 9¼ x 32½ (75 x 23.5 x 82.6)

Control Box: 7¼ x 9¼ x 9¼ (19.7 x 23.5 24.7)

Net Weight:

Cabinet: 62 lbs (28.2 kg)

Control Box: 21 lbs (9.6 kg)

## Ordering Information

| Catalog No.        |                                                                                                                                                                                                              | Order Qty |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| K80300             | VDS3000 Manual Vacuum Distillation System<br>115V 60Hz                                                                                                                                                       | 1         |
| K80390             | VDS3000 Manual Vacuum Distillation System<br>220-240V 50/60Hz                                                                                                                                                |           |
| <b>Accessories</b> |                                                                                                                                                                                                              |           |
| K80320             | VDS Vacuum Pump with Kit<br>Consists of Vacuum Pump, Hose Nozzle,<br>Centering O-Ring, Hinged Clamp, Outlet Filter,<br>Filter O-Ring, Filter Clamp, 1 Liter Vacuum Oil,<br>Connection Tubing, Hose Clamp (2) | 1         |
| K33062             | Standard Constant Temperature Circulation Bath, 115V 60Hz                                                                                                                                                    |           |
| K33063             | Standard Constant Temperature Circulation Bath,<br>220-240V 50/60Hz                                                                                                                                          |           |

# AUTOMATIC AND SEMI-AUTOMATIC VACUUM DISTILLATION OF PETROLEUM PRODUCTS

## Test Method

Determines the range of boiling points for petroleum products that can be partially or completely vaporized at a maximum liquid temperature of 400°C at reduced pressures. The sample is distilled at a controlled, reduced pressure under conditions that are designed to provide approximately one theoretical plate fractionation. Initial and final boiling point is measured and a distillation curve relating volume percent distilled and the atmospheric equivalent boiling point temperature can be prepared.

## Automatic Vacuum Distillation System

- Fully Automatic Operation
- Simple to Operate and Maintain
- Vacuum Step Down Inhibits Foaming
- Easy Access to all Components
- Safety Shields & Doors Protect Operator
- Turn Key System
- High Precision and Accuracy
- Automatic Cleaning Cycle
- Receiver is Easy to Remove
- PC Control

The Automatic Vacuum Distillation System is designed to make vacuum distillation easy, safe and affordable. The self contained unit is controlled by a standard PC. Fully automatic function minimizes the amount of operator time needed for the test.

The latest Windows® operating system is included along with a state of the art PC. The Windows®-based software is intuitive and guides you through the distillation step by step. All data is saved to the hard drive in standard format that can be easily opened by spread sheets or exported to LIMS. Files can be accessed through portable USB drives, Ethernet connection or written to a CD/DVD. A color printer is provided to print hard copies of the reports. Process diagrams clearly show the current equipment status. Results can be viewed as the distillation proceeds in both tables and graphs. Distillation parameters can be modified at any time during the distillation.

## Semi-Automatic Vacuum Distillation System

- Automatic Vacuum Control
- Automatic Heat Control
- Vapor Temperature Display
- Pot Temperature Display
- Automatic shutdown for high pot or vapor temperature

The Semi-Automatic Vacuum Distillation System features standard ASTM D1160 glassware enhanced with microprocessor control. The vacuum level, bath temperature and heating rates are programmable with up to 50 stored programs. Vapor temperature, distilling flask temperature and vacuum level are digitally displayed. Optional PC interface allows the distillation to be controlled from a PC and for data to be stored on the PC.

## Specifications

Conforms to the Specifications of:

ASTM D1160; ISO 6616

Distillation Temperature Range:

Ambient to 400°C (752°F)

Condenser Temperature Range:

Ambient +5°C to 150°C

Vacuum Range:

1.00 mmHg to 50 mmHg (0.13 to 6.7 kPa)

Electrical Requirements:

220-240V 50/60Hz

## Ordering Information

### Catalog No.

**K87170** Automatic Vacuum Distillation System, 220-240V 50/60Hz

**K87180** Semi-Automatic Vacuum Distillation System, 220-240V 50/60Hz

# AUTOMATIC AND SEMI-AUTOMATIC VACUUM DISTILLATION OF CRUDE OIL

## Test Method

ASTM D2892 covers the procedure for the distillation of stabilized crude petroleum (see Note 1) to a final cut temperature of 400°C Atmospheric Equivalent Temperature (AET). This test method employs a fractionating column having an efficiency of 14 to 18 theoretical plates operated at a reflux ratio of 5:1.

ASTM D5236 covers the procedure for the distillation of heavy hydrocarbon mixtures having initial boiling points greater than 150°C (300°F), such as heavy crude oils, petroleum distillates, residues, and synthetic mixtures. It employs a potstill with a low pressure drop entrainment separator operated under total takeoff conditions. Distillation conditions and equipment performance criteria are specified and typical apparatus is illustrated.

## Automatic Crude Oil Vacuum Distillation System

- Ergonomic Design makes the distillation system easy to use with easy access to all components
- The Windows®-based software is intuitive and guides you through the distillation process in a logical step-by-step fashion

The Automatic Crude Oil Vacuum Distillation System is a fully automatic crude oil distillation system that complies with ASTM D2892 and D5236. The distillation process is automated from beginning to end, minimizing the time needed to operate the equipment. Its fully customizable modular design allows for multiple configurations and easy switching from ASTM D2892 and D5236. Please contact your Koehler representative for required method and corresponding flask size and type.

## Semi-Automatic Crude Oil Vacuum Distillation System

- Highly Automated - Minimizes operator time and makes test easier to perform
- Complete System - Includes all equipment needed to perform a distillation

Fully Automatic Functions include Vacuum Control, Fraction Collector, Condenser Bath Temperature, Heat Control of Column Heated Jacket, Shut Down at End of Distillation, Reflux Ratio and AET Vapor Temperature Calculation. Semi-Automatic Functions include Heat Control for Boiling Flask. Manually Controlled Functions include Measurement of Receiver Volume and Creation of Volume vs. Temperature Distillation Curve.

The Semi-Automatic Crude Oil Vacuum Distillation system can come in a wide variety of configurations with single or multiple distillation columns. Please contact your Koehler representative for required test method and configuration.

# DISTILLATION OF PETROLEUM PRODUCTS

## 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 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, 1250W 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 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

Electrical Requirements: **CE**

115V 60Hz

220-240V 50/60Hz

## Included Accessories

Flask Support Boards A and C  
Graduate Cylinder Support Block

## Shipping Information

Shipping Weight: 65 lbs (29.5kg)

Dimensions: 13.3 Cu. ft.

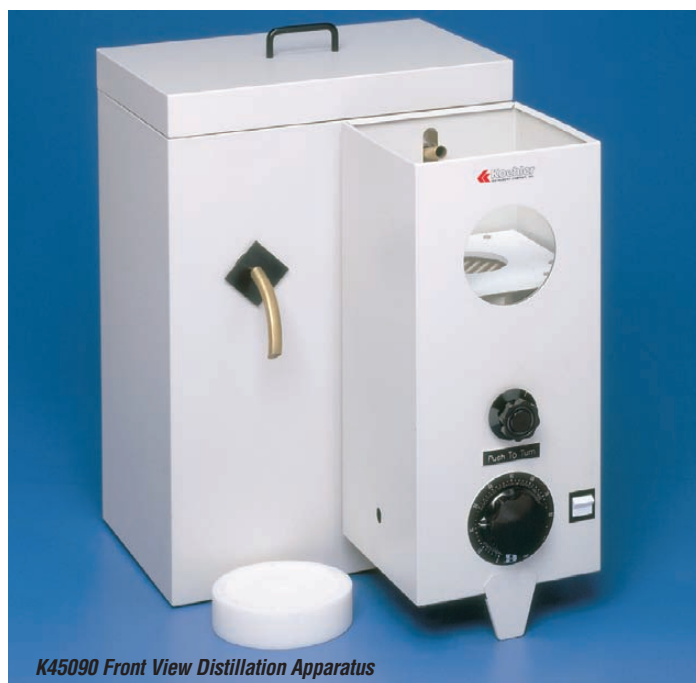
## Dimensions l x w x h, in. (cm)

15½ x 18¾ x 19½ (39 x 46 x 50)

## 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.



K45090 Front View Distillation Apparatus

## Ordering Information

### Catalog No.

#### Front View Distillation Apparatus

|        |                                    |
|--------|------------------------------------|
| K45000 | Right-Hand Model, 115V 60Hz        |
| K45100 | Left-Hand Model, 115V 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 60Hz        |
| K45300 | Left-Hand Model, 115V 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)   |
| <b>Miscellaneous</b>        |                                              |              |
| K45540                      | Receiver Cooling Bath Jar                    |              |
| 334-002-001                 | Top Silicone Plug, For Type A, B, & D Flasks | pk/10        |
| 334-002-002                 | Side Silicone Plug                           | pk/10        |
| 334-002-003                 | Top Silicone Plug, For Type C Flask          | pk/10        |

# AUTOMATIC DISTILLATION OF PETROLEUM PRODUCTS



**K45603 Automatic Distillation Analyzer with Optional External PC**

## Specifications

Conforms to the specifications of:

ASTM D86, D285, D850, D1078, D4737; D189 Section 10; DIN 51751; ISO 3405; IP 123; IP 195; JIS K2254I; NF M 07-002

Electrical Requirements: **CE**

120V 60Hz 20A

230V 50/60Hz 10A

Temperature

Distillation Range: 0 to 450°C ( $\pm 0.1^\circ\text{C}$  accuracy)

Condenser:  $-5$  to  $60^\circ\text{C}$  ( $\pm 0.1^\circ\text{C}$  accuracy); closed loop system

Receiver Chamber: 0 to  $60^\circ\text{C}$  ( $\pm 0.1^\circ\text{C}$  accuracy)

Distillation Parameters:

Distillation Rate: 2 to 15mL/min in 0.1mL increments, user selectable

Receiver Volume: 0 to 100mL ( $\pm 0.01\text{mL}$  accuracy) by photoelectric infrared detection of meniscus by level following system utilizing a precision stepper motor and a special calibrated glass receiver; automatic calibration of evaporated loss volume and automatic volume calibration system ensures highest accuracy

Barometric Pressure: Automatic barometric correction utility with automatic sensor, range 550 to 900 mm Hg ( $\pm 1$  mm Hg accuracy)

Dry Point Detection: Automatic dry point detection board is included with standard equipment and only requires a dry point sensor, 200mL flask and PTFE plug for ASTM D850 and D1078 tests.

Environment: Operates at 0 to  $25^\circ\text{C}$  ( $113^\circ\text{F}$ )

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

21x21.5x27.75 (53.3x54.6x70.5)

Net Weight: 230 lbs (91kg)

**Shipping Information**

Shipping Weight: 260 lbs (95 kg)

Dimensions: 28 Cu. ft.

## 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 specific temperatures.

## Automatic Distillation Analyzer 5000 Series

- Conforms to ASTM D86, D285, D4737 and related international specifications
- Pt-100 RTD probe with **automatic temperature calibration system** ( $^\circ\text{C}$  or  $^\circ\text{F}$ )
- Windows®-based software package for PC control with LIMS export capabilities
- Automatic determination of initial boiling point (IBP), final boiling point (FPB), dry point and barometric and residue corrections
- Diagnostic system continuously ensures proper unit performance and user safety
- Automatic temperature and volume calibration
- Programmable distillation rate (2-15mL/min)
- Ready for distillation groups 1 - 4
- Networking for up to 32 units
- Powerful CFC-free cooling and heating system
- Receiver chamber heating system up to  $60^\circ\text{C}$
- Precision level follower system with optical meniscus detector
- Integrated automatic fire extinguishing system with manual operation override

The Koehler Automatic Distillation Analyzer is 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. The analyzer automatically performs tests, processes results, and produces standard reports according to ASTM, ISO, and related specifications.

**Two Models are Available**-The Automatic Distillation Analyzer 5000 Series may be ordered for operation with an external PC (purchased separately) or may be ordered with a built-in PC, internal touch screen monitor, virtual keyboard and mouse. An easy-to-use Windows®-based PC communication software expands user capabilities for data analysis and unit control. Distillation methods and parameters can be easily created or modified. Software calculates repeatability and reproducibility as per ASTM D86 as well as standard and deviation against reference materials. Test results are 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. The heater compartment is rapidly cooled at the completion of a distillation run to reduce operator downtime. The analyzers are of rugged construction for instrument longevity with a modular design for easy routine maintenance.

**Receiver Chamber Heating System**-The receiver chamber heating system is ideal for samples that form waxes or other solids during distillation.

## AUTOMATIC DISTILLATION OF PETROLEUM PRODUCTS

**Dry Point Detection as Standard Feature-** Dry point can be detected visually or by automatic detection for ASTM D850 and D1078 test methods. The unit is delivered ready with the PC board components already included as standard to perform the dry point analysis. Simply order the Automatic Dry Point Detection Kit for Solvents (see Ordering Information at right) which includes dry point thermocouple, 200mL flask and PTFE plug to perform dry point detection analysis automatically.

**Ready for Groups 1 - 4 and more-**Each Koehler Automatic Distillation Analyzer 5000 Series comes ready with the equipment, accessories and features as standard to properly run distillation groups 1 to 4 per ASTM D86 and related test specifications. No additional accessories are required. The Windows®-based software package allows simple operator selection of the programmed settings for each distillation protocol. No complicated routines are needed to set up the unit. User defined programs are easily created for customization of the analyzer.

**Calculated Cetane Index-**Calculated cetane index is a useful tool for estimating ASTM D4737 cetane number where a test engine is not available for determining this properly. It may be conveniently employed for approximating cetane number where the quantity of sample is too small for an engine rating. In cases where the cetane number of a fuel has been initially established, the index is useful as a cetane number check on subsequent samples of that fuel, provided its source and mode of manufacture remain unchanged. The Cetane index is automatically calculated at the end of the test if all the necessary variables are entered and is a component of the Windows®-based software which comes standard with the unit.

**Carbon Residue on 10% Distillation Residue-**As per section 10, ASTM D189 the procedure for carbon residue of light distillate oils can be performed.

### Included Accessories

Distillation Flask, 125mL with Markings  
Ceran Plate, 25mm dia. hole  
Ceran Plate, 38mm dia. hole  
Ceran Plate, 50mm dia. hole  
3 Point Calibrated PT100 Thermometer with Cable and Plug  
Special Graduated Receiver Cylinder with Base  
Wiper for Condenser Tube  
Dropping Plate  
Teflon Plug for 125mL Flask  
Silicone Plug for Flask Side Arm  
Dry Point Detection Board  
Windows®-based Automatic Distillation Software



**K45703-TS Automatic Distillation Analyzer with Touch Screen Display and Integrated PC**

### Ordering Information

#### Automatic Distillation Analyzer 5000 Series

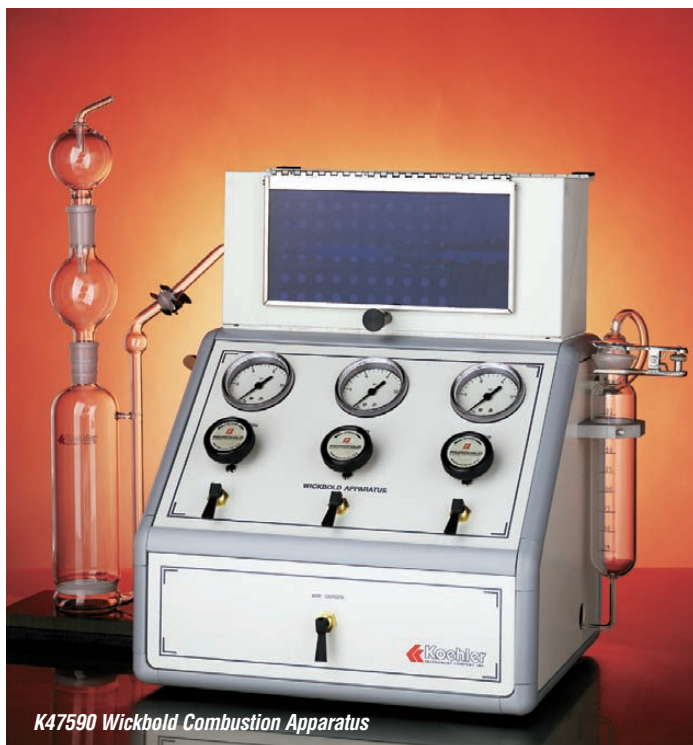
##### Catalog No.

|                  |                                                                                           |
|------------------|-------------------------------------------------------------------------------------------|
| <b>K45603</b>    | Automatic Distillation Analyzer, 120V 60Hz                                                |
| <b>K45604</b>    | Automatic Distillation Analyzer, 230V 50/60Hz                                             |
| <b>K45703-TS</b> | Automatic Distillation Analyzer with Touch Screen Display and Integrated PC, 120V 60Hz    |
| <b>K45704-TS</b> | Automatic Distillation Analyzer with Touch Screen Display and Integrated PC, 230V 50/60Hz |

#### Accessories

|                     |                                                      |
|---------------------|------------------------------------------------------|
| <b>K45634</b>       | Distillation Flask, 125mL with Markings              |
| <b>K45635</b>       | PTFE Centering Stopper for 125mL Flask               |
| <b>K45655</b>       | Ceran Plate, 32mm dia. hole                          |
| <b>K45656</b>       | Ceran Plate, 38mm dia. hole                          |
| <b>K45657</b>       | Ceran Plate, 50mm dia. hole                          |
| <b>K45656-A</b>     | Ceran Plate, 25mm dia. hole                          |
| <b>K45650</b>       | PT100 Thermometer with Cable and Plug                |
| <b>K45651-E</b>     | Special Graduated Receiver Cylinder (with base)      |
| <b>K45651-B</b>     | Special Graduated Receiver Cylinder (without base)   |
| <b>K45601-03014</b> | Condenser Tube Cleaning Assembly                     |
| <b>K45668</b>       | Dropping Plate                                       |
| <b>K45654-A</b>     | Flask 200mL with Silicon Plug                        |
| <b>K45652-C</b>     | Silicone Plug                                        |
| <b>K45654</b>       | Automatic Dry Point Detection Kit for D850 and D1078 |

## SULFUR, TRACE SULFUR, VOLATILE CHLORIDES



K47590 Wickbold Combustion Apparatus

### Specifications

Conforms to the specifications of:

ASTM D2384, D2747 (Withdrawn 1985), D2784,  
D2785 (Withdrawn 1987); GPA 2140; IP 243;  
ISO 4260; DIN EN 41; NF T 60-142

Electrical Requirements: **CE**

115V 60Hz

220-240V 50/60Hz

### 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 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 Borosilicate Glass 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 60Hz        | 1         |
| K47590      | Wickbold Apparatus, 220-240V 50/60Hz |           |

### Accessories

|        |                                                                                                                                                                                                                                               |   |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| K47580 | Gas Sample Adapter<br>For burning liquefied petroleum, natural and refinery gases in the Wickbold Apparatus.<br>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.

### Ordering Information

| Catalog No.        |                                                                                                                                                                                 | Order Qty |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| K27100             | Ramsbottom Carbon Residue Apparatus, 115V 60Hz                                                                                                                                  | 1         |
| K27190             | Ramsbottom Carbon Residue Apparatus, 220-240V 50/60Hz                                                                                                                           |           |
| <b>Accessories</b> |                                                                                                                                                                                 |           |
| 332-007-001        | Coking Bulb<br>Borosilicate Glass, with capillary<br>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<br>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<br>Stainless steel, with IC thermocouple.<br>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<br><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: **C** **E**

115V 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.



Software compatible, inquire with Koehler Customer Service.

## 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 with heating tube, Hopkins reflux condenser with aspirator, thistle tube, 250W heating coil and 400mL Borosilicate Glass beaker.

#### Specifications

Conforms to the specifications of:  
ASTM D2547 (Withdrawn 1989);  
IP 77, 182, 248; ISO 2083;  
NF M 07-014, 07-023

Electrical Requirements: **CE**

115V 60Hz  
220-240V 50/60Hz

#### Dimensions

l x w x h, in. (cm)  
17 x 11 x 36 1/2 (43 x 28 x 93)  
Net Weight: 46 lbs (21kg)

#### Shipping Information

Shipping Weight: 66 lbs (30kg)

#### Ordering Information

| Catalog No. |                                             | Order Qty |
|-------------|---------------------------------------------|-----------|
| K46600      | Dual Extraction Apparatus, 115V 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         |

#### Accessories

|           |                                     |
|-----------|-------------------------------------|
| K80031    | Porcelain Crucible                  |
| K80032    | Skidmore Crucible, with Iron Cover  |
| K80033    | Iron Crucible, with cover           |
| K80034    | Iron Hood, with bridge              |
| K80034-WT | Nickel-Chrome Triangle Wire Support |
| K80035    | Refractory Block                    |
| K80036    | Tripod                              |
| K80039    | Burner                              |



#### 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

#### Shipping Information

Shipping Weight: 7 lbs (3.2kg)

#### Included Accessories

Porcelain Crucible  
Skidmore Crucible, with Iron Cover  
Iron Crucible, with Cover  
Iron Hood, with Bridge  
Refractory Block  
Nickel-Chrome Triangle Wire Support  
Tripod  
Burner

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

## 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.

#### Ordering Information

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



K48300 Sediment Extraction Apparatus

### 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 and IP 265 test specifications
- GOST certified
- Measures salt content, conductance, and temperature of crude oil samples, and pH measurements of aqueous samples
- Measures Salts Concentration in the range of 0 to 150 PTB (lb/1000 bbl)
- Portable for field or laboratory testing with up to 8 hours of continuous operation from internal Ni-Cd rechargeable batteries
- 18-bit analog-to-digital converter for high precision
- 24Kb RAM dedicated for data storage (about 500 test results)
- Data can be uploaded in a comma delimited format to a PC with easy to use Windows® 2000/XP/Vista – based software via an RS232 serial data port

Determines the salt content, conductance, and temperature of crude oil samples according to ASTM D3230 and IP 265 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 mS 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.



K23050  
Salt in Crude Analyzer

### Electrical Requirements ☐

115V 60Hz  
220-240V 50/60Hz

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

9x4.25x2.5 (23x10.8x6.5)  
Net Weight: 2 lbs (1kg)

### Shipping Information

Shipping Weight: 6 lbs (2.75kg)  
Dimensions: 1.5 Cu. ft.

#### Ordering Information

| Catalog No.        |                                          |
|--------------------|------------------------------------------|
| K23050             | Salt in Crude Analyzer, 115/230V 50/60Hz |
| <b>Accessories</b> |                                          |
| K23050-9           | Mixed Salts Solution, 100ml              |
| K23050-10          | Mixed Salts Solution, 500ml              |

# WATER AND SEDIMENT DETERMINATION BY AUTOMATIC CENTRIFUGE

## Test Method

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

## Automatic Heated Oil Test Centrifuge

- Choice of long, short, pear, or finger rotor assembly to accommodate corresponding centrifuge tubes
- Accommodates four (4) centrifuge tubes of 6 or 8" conical ASTM types, long, short, pear or finger tubes
- Automatic control of acceleration ramp, centrifugation speed, and timing functions.
- 4½" LCD Touch Screen Control Panel
- Substantial Insulation for Reduced Heat Loss
- Precise balancing, Quiet Operation
- Large, clear, top opening lid
- Class 1, Division 2 explosion resistant rating

Fully automatic bench top centrifuge designed expressly for petroleum testing applications. Features a 4½" LCD touch screen control panel. This integrated touch screen can be used to turn the heat on and off, set the duration of the test, set the RCF/RPM values and choose the type of rotor assembly and corresponding glassware to be used during the test. The motor speed mechanism allows the user to simply set the desired speed and the instrument will attain that speed. This mechanism calculates RPM based on the given RCF and type of Rotor selected. The large, clear, top opening lid provides for easy access to the rotor and tube holders and for cleaning of the unit. The lid has a 18½" diameter viewing window allowing the operator to view inside the chamber for checking the status of the rotor and checking for possible spillage of the centrifuge tubes. Molded PTFE cushions provide for maximum protection and easy positioning of the tubes.

## Safety Features

The Centrifuge comes equipped with a Safety Lockout Mechanism. Upon emergency shutdown the door is locked and cannot be unlocked until the unit comes to a complete stop, the unit is turned back on, and the stop/unlock key is pressed on the touch screen display. Furthermore, the centrifuge cannot start while the door of the chamber is open and the latch is not engaged. The "Nitrogen Purge" feature allows for a slow release of Nitrogen into the bowl of the centrifuge. This feature requires an external Nitrogen Gas source and can easily connect to an Inlet port located at the back of the unit

## Specifications

Conforms to the specifications of:

ASTM D91, D96, D893, D1796, D1966, D2273, D2709, D2711, D4007, D5546; IP 75, 145, 359; API MPMS Chapter 10.4, API 2542, 2548; ISO 3734; DIN 51793; NF M 07-020

Capacity: Four (4) oil test centrifuge tubes: long (100mL), short (100mL), pear (100mL), or finger tubes (12.5mL)

Maximum Speed: 2200 RPM

Maximum RCF: 1327 (long); 1170 (short); 865 (pear-shaped)

Timer: 0 to 999 min

Set Speed: 200 - 2200 RPM

Speed Readout: 0 - 2200 RPM

Temperature Control: ambient to 93°C (200°F)

Temperature Readout: Digital

Brake: Automatic Dynamic

## Electrical Requirements

115V 60Hz, 10A

230V 50/60Hz, 5A

## Dimensions

23x30x13½ (51x76x34)

Net Weight: 93 lbs (42 kg)

## Shipping Information

Shipping Weight: 110 lbs (50 kg)

Dimensions: 11.2 Cu. ft.



**K60002 Automatic Heated Oil Test Centrifuge**

## Ordering Information

### Catalog No.

|                  |                                                                               |
|------------------|-------------------------------------------------------------------------------|
| <b>K60002</b>    | Automatic Heated Oil Test Centrifuge, 115V 60Hz with Long Tube Rotor Assembly |
| <b>K60092</b>    | Automatic Heated Oil Test Centrifuge, 230V 50/60Hz with Long Tube (RA*)       |
| <b>K60002-ST</b> | Automatic Heated Oil Test Centrifuge, 115V 60Hz, Short Tube (RA*)             |
| <b>K60092-ST</b> | Automatic Heated Oil Test Centrifuge, 230V 50/60Hz with Short Tube (RA*)      |
| <b>K60002-PT</b> | Automatic Heated Oil Test Centrifuge, 115V 60Hz, Pear Tube (RA*)              |
| <b>K60092-PT</b> | Automatic Heated Oil Test Centrifuge, 230V 50/60Hz with Pear Tube (RA*)       |
| <b>K60002-FT</b> | Automatic Heated Oil Test Centrifuge, 115V 60Hz, Finger Tube (RA*)            |
| <b>K60092-FT</b> | Automatic Heated Oil Test Centrifuge, 230V 50/60Hz with Finger Tube (RA*)     |

\*Rotor Assembly

## Accessories

|                    |                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>K60002-LT-1</b> | Rotor Assembly for Long Tubes                                                                                                                                                        |
| <b>K61101</b>      | Centrifuge Tube, Long, 100mL, 8", marked in mL (ASTM D91, D96, D893, D1796, D4007)                                                                                                   |
| <b>K61106</b>      | Centrifuge Tube, Long, 100mL, 8", marked in 200 parts (ASTM D96)                                                                                                                     |
| <b>K61110</b>      | Centrifuge Tube, Long, 100mL, 8", marked in mL every 1mL above 10mL (ASTM D96, D4007)                                                                                                |
| <b>K61112</b>      | Centrifuge Tube, Long, 100mL, 8", marked in 200 parts every 2 parts above 20 parts (ASTM D96)                                                                                        |
| <b>K61109</b>      | Centrifuge Tube, Cone-Shaped, 100mL with capillary tip capable of measuring 0.01 mL and readable by estimation to 0.005% (ASTM D2273, D2709) (K61153 cushion required for each tube) |
| <b>K61153</b>      | PTFE cushion for Long Tubes w/capillary tip (Req. for K61109 tubes)                                                                                                                  |
| <b>K60002-ST-1</b> | Rotor Assembly for Short Tubes                                                                                                                                                       |
| <b>K61102</b>      | Centrifuge Tube, Short, 100mL, 6", marked in 200 parts every 4 parts above 20mL (ASTM D96)                                                                                           |
| <b>K61105</b>      | Centrifuge Tube, Short, 100mL, 6", marked in mL (ASTM D96)                                                                                                                           |
| <b>K61107</b>      | Centrifuge Tube, Short, 100mL, 6", marked in mL every 2mL above 10mL (ASTM D96)                                                                                                      |
| <b>K61108</b>      | Centrifuge Tube, Short, 100mL, 6", marked in 200 parts (ASTM D96)                                                                                                                    |
| <b>K60002-PT-1</b> | Rotor Assembly for Pear Tubes                                                                                                                                                        |
| <b>K61104</b>      | Centrifuge Tube, Pear, 100mL, marked in mL (ASTM D1966)                                                                                                                              |
| <b>K61152</b>      | Centrifuge Tube, Pear, 100mL, with tube tip having graduations of 0.01mL over the range 0 to 0.2mL (ASTM D2709)                                                                      |
| <b>K61111</b>      | Cork Stopper for Centrifuge Tubes                                                                                                                                                    |
| <b>K60002-FT-1</b> | Rotor Assembly for Finger Tubes                                                                                                                                                      |
| <b>K61141</b>      | Centrifuge Tube, Finger Tube (API 2542)                                                                                                                                              |

# WATER AND SEDIMENT DETERMINATION IN CRUDE OIL BY CENTRIFUGE

## Test Method

For the determination of water and sediment of crude oil by centrifuge method during field custody transfers. This test method is considered the most practical method for field determination of sediment and water.

## Portable Oil Test Centrifuge

- Two Models Available: Two (2) place 12VDC & Four (4) place 115/230VAC
- Accommodates either two 6" conical centrifuge short tubes or four short cone / finger centrifuge tubes, model dependent
- Integrated Tube Holder / Pre-heater / Timer. Model Dependent
- Switchable Temperature Display between °C and °F
- Opening in Top Lid for Speed Calibration by Portable Laser Tachometer

## Specifications

Conforms to the specifications of: ASTM D96; API MPMS Chapter 10.4, API 2542  
 Test Capacity: K60094: Two (2) short cone centrifuge tubes  
 K600X5/K600X6: Four (4) short cone or finger centrifuge tubes  
 Speed Range: 300 – 1800 RPM RCF Range: 20 - 700  
 Temperature Control: Ambient to 160°F (71.1°C)  
 Electrical Requirements: 12V DC 40, 115VAC 60HZ, 220-240VAC 50/60Hz **CE**



**K60094**  
 Portable Heated Oil Test Centrifuge

## Ordering Information

| Catalog No.       |                                                                             |
|-------------------|-----------------------------------------------------------------------------|
| <b>K60094</b>     | Portable Heated Oil Test Centrifuge, 12V DC 40A                             |
| <b>K60005</b>     | Heated Oil Test Centrifuge, 4-Place, 115V 60Hz                              |
| <b>K60095</b>     | Heated Oil Test Centrifuge, 4-Place, 220-240V 50/60Hz                       |
| <b>K60005-FT</b>  | Heated Oil Test Centrifuge, 4-Place, Finger Tube RA, 115V 60Hz              |
| <b>K60095-FT</b>  | Heated Oil Test Centrifuge, 4-Place, Finger Tube RA, 220-240V 50/60Hz       |
| <b>K60005-FT8</b> | Heated Oil Test Centrifuge, 8-Place, Finger Tube RA, 115V 60Hz              |
| <b>K60095-FT8</b> | Heated Oil Test Centrifuge, 8-Place, Finger Tube RA, 220-240V 50/60Hz       |
| <b>K60006</b>     | Heated Oil Test Centrifuge, 4-Place, w/Timer, 115V 60Hz                     |
| <b>K60096</b>     | Heated Oil Test Centrifuge, 4-Place, w/Timer, 220-240V 50/60Hz              |
| <b>K60006-FT</b>  | Heated Oil Test Centrifuge, 4-Place, Finger Tube, w/Timer, 115V 60Hz        |
| <b>K60096-FT</b>  | Heated Oil Test Centrifuge, 4-Place, Finger Tube, w/Timer, 220-240V 50/60Hz |

## Ordering Information

| Catalog No.   | Accessories                                                                     |
|---------------|---------------------------------------------------------------------------------|
| <b>K61102</b> | Centrifuge Tube, Short, 100mL, 6", marked in 200 parts every 4 parts above 20mL |
| <b>K61105</b> | Centrifuge Tube, Short, 100mL, 6", marked in mL                                 |
| <b>K61107</b> | Centrifuge Tube, Short, 100mL, 6", marked in mL every 2mL above 10mL            |
| <b>K61108</b> | Centrifuge Tube, Short, 100mL, 6", marked in 200 parts                          |
| <b>K61141</b> | Centrifuge Tube, Finger Tube, 12.5mL                                            |
| <b>K61111</b> | Cork Stopper                                                                    |

# ASH FROM PETROLEUM PRODUCTS

## Test Method

Determines the amount of ash in distillate and residual fuels, gas turbine fuels, crude oils, lubricating oils, waxes, and other petroleum products.

## Programmable Ashing Furnace

- Six Complete Air Exchanges per Minute
- Incoming air preheated for enhanced temperature uniformity
- Digital PID Temperature Control
- Integrated Timer
- Store up to 9 different programs
- Maximum Temperature of 1100°C

## Specifications

Conforms to the Specifications of: ASTM D482, D874, D3174, D4422, D5184; IP4, IP163, ISO 3987, ISO 6245; NF M 07-045; DIN 51352, DIN 51575  
 Temperature Range: Ambient - 1100°C Temperature Accuracy: ± 3°C

| Oven Volume:             | Power:                     |
|--------------------------|----------------------------|
| 0.07 cu. ft. model: 3 L  | 0.07 cu. ft. model: 1.2 kW |
| 0.16 cu. ft. model: 5 L  | 0.16 cu. ft. model: 2.4 kW |
| 0.33 cu. ft. model: 9 L  | 0.33 cu. ft. model: 3.0 kW |
| 0.47 cu. ft. model: 15 L | 0.47 cu. ft. model: 3.6 kW |

## Ordering Information

| Catalog No.   |                                                       |
|---------------|-------------------------------------------------------|
| <b>K24305</b> | Programmable Ashing Furnace, 0.07 cu.ft. 208V 50/60Hz |
| <b>K24306</b> | Programmable Ashing Furnace, 0.16 cu.ft. 208V 50/60Hz |
| <b>K24307</b> | Programmable Ashing Furnace, 0.33 cu.ft. 208V 50/60Hz |
| <b>K24308</b> | Programmable Ashing Furnace, 0.47 cu.ft. 208V 50/60Hz |
| <b>K24395</b> | Programmable Ashing Furnace, 0.07 cu.ft. 240V 50/60Hz |
| <b>K24396</b> | Programmable Ashing Furnace, 0.16 cu.ft. 240V 50/60Hz |
| <b>K24397</b> | Programmable Ashing Furnace, 0.33 cu.ft. 240V 50/60Hz |
| <b>K24398</b> | Programmable Ashing Furnace, 0.47 cu.ft. 240V 50/60Hz |



**K24308**  
 Programmable Ashing Furnace

Electrical Requirements: **CE**  
 208V, 50/60Hz, Single Phase 240V, 50/60Hz, Single Phase

**Dimensions** wxdxh,in.(cm) Net Weight: lbs (kg)  
 0.07 cu. ft. model: 14.96x14.57x29.53 (38x37x75) Net Weight: 44.1 (20)  
 0.16 cu. ft. model: 17.33x18.50x33.46 (44x47x85) Net Weight: 77.2 (35)  
 0.33 cu. ft. model: 18.90x21.66x35.44 (48x55x90) Net Weight: 99.3 (45)  
 0.47 cu. ft. model: 18.90x25.59x35.44 (48x65x90) Net Weight: 121.3 (55)

# AUTOMATIC DENSITY METER

## Test Method

Density is a fundamental physical property that can be used in conjunction with other properties to characterize the quality of crude oils, light and heavy fractions of petroleum and petroleum products. The test method covers the determination of the density or relative density of crude oils, petroleum distillates and viscous oils that can be handled in a normal fashion as liquids at test temperatures between 15 and 35°C.

## Specifications

Conforms to the specifications of:

ASTM D1250, D4052, D5002, D5931; DIN 51757

Measurement Ranges:

Density: 0 to 3 g/cm<sup>3</sup>

Temperature: 0°C to 90°C

Pressure: 0 to 10 bars

Measurement Modes: Continuous, Single, Multiple

Accuracy:

K86200: Density: 0.00005 g/cm<sup>3</sup>

Temperature: 0.03°C

K86201: Density: 0.0001 g/cm<sup>3</sup>

Temperature: 0.05°C

Repeatability:

K86200: Density: 0.00001 g/cm<sup>3</sup>

Temperature: 0.01°C

K86201: Density: 0.00005 g/cm<sup>3</sup>

Temperature: 0.02°C

Resolution: Density: 0.00001 g/cm<sup>3</sup>

Temperature: 0.01°C

Minimum Sample Volume: 1 ml, approximately

Wetted Materials: Borosilicate glass, Teflon (PTFE, ECTFE)

Display: 10.4 inch diagonal, 800-600 pixels, color, Flat Panel Monitor with Resistant Touch Screen Interface, 200 bit brightness, gasketed for spill protection.

Communication Interface:

K86200: Touch Screen User Interface

3 – USB Ports

2 – RS232 Ports

Ethernet Port for Network Connection

Keyboard, Bar Code Scanner,

Mouse, Network Capabilities

K86201: Touch Screen User Interface

3 – USB Ports

1 – Cat. 5 Port

2 – RS232 Ports

Keyboard, Bar Code Scanner,

Mouse, Network Capabilities

Video and Magnification: Video assisted view of cell, capable of approximately 10X magnification

Internal Memory: 2 GB Non-removable Compact Flash

Electrical Requirements: **CE**

85 to 260 VAC; 48 to 62 Hz

150- 200 Watts

## Included Accessories

Quick Start Guide

Desiccant

Filling Nozzles

NIST Standards

IQ/OQ/PQ Documentation

Luer Syringes

Connecting Fittings & Tubing

Manual



**K86200 Automatic Density Meter**

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

91.44cm (L) x 48.26 cm (W) x 45.72 cm (H)

## Shipping Information

Shipping Weight: 70 lbs. (31.75 kg)

## Ordering Information

| Catalog No.   |                                  | Order Qty |
|---------------|----------------------------------|-----------|
| <b>K86200</b> | Automatic Density Meter, Model A | 1         |
| <b>K86201</b> | Automatic Density Meter, Model B | 1         |

## Accessories

|               |                                                                                                                           |
|---------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>K86202</b> | 21 CFR Part 11 Option                                                                                                     |
| <b>K86203</b> | Refractometer Control Module                                                                                              |
| <b>K86204</b> | Heated Interface Attachment                                                                                               |
| <b>K86206</b> | Bar Code Scanner - USB                                                                                                    |
| <b>K86207</b> | Fluke Hart Thermometer Kit<br>Consists of Handheld Digital Thermometer,<br>Temperature Probe, and Calibration Certificate |
| <b>K86208</b> | Inkjet USB Printer Kit<br>Includes Inkjet Printer and USB communication cable                                             |
| <b>K86209</b> | Laser USB Printer Kit<br>Includes Laser printer and USB communication cable                                               |
| <b>K86210</b> | 40 Column Serial Printer Kit<br>Includes 40 Column Serial (RS232) Printer,<br>Null Modern Cable, and Adapter              |

# 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.

### Ordering Information

| Catalog No.             |                                                                                                                                                            | Order Qty |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Humidity Cabinet</b> |                                                                                                                                                            |           |
| <b>K35200</b>           | Humidity Cabinet,<br>115V 60Hz                                                                                                                             | 1         |
| <b>K35295</b>           | Humidity Cabinet,<br>220-240V 50Hz                                                                                                                         |           |
| <b>K35296</b>           | Humidity Cabinet,<br>220-240V 60Hz                                                                                                                         |           |
| <b>Accessories</b>      |                                                                                                                                                            |           |
| <b>K35210</b>           | Steel Test Panels<br>Soft temper low carbon cold rolled steel,<br>surface ground on both faces<br>to a 10-20 micro-inch finish.<br>2x4x1/4" (51x102x3.2mm) | 33        |
| <b>380-240-002</b>      | Aluminum Oxide Cloth, 240-grit<br>For test panel preparation.<br>Pack of 50                                                                                | 1         |
| <b>250-000-09F</b>      | ASTM 9F Thermometer<br>Range: 20 to 230°F                                                                                                                  | 1         |
| <b>250-000-09C</b>      | ASTM 9C Thermometer<br>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.



K35200 Humidity Cabinet

## 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: **CE**  
115V 60Hz, Single Phase, 13.0A  
220-240V 50Hz or 60Hz, Single Phase, 6.8A

## Included Accessories

Monel Test Specimen Hooks (33 sets)

## Dimensions l x w x h, 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 1½" 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  | 3¾ (8.6)                         | 15½ (38.5)             | 13 (5.9)                |
| K27701      | 32 (946)        | stainless steel | Viton O-ring  | 3¾ (8.6)                         | 15½ (38.5)             | 13 (5.9)                |
| K27790      | 16 (473)        | plated brass    | Viton O-ring  | 2¾ (7)                           | 12½ (30.6)             | 9 (4.1)                 |
| K27795      | 16 (473)        | plated brass    | Metal Seat    | 2¾ (7)                           | 12½ (30.6)             | 9 (4.1)                 |
| K27791      | 16 (473)        | stainless steel | Viton O-ring  | 2¾ (7)                           | 12½ (30.6)             | 8 (3.6)                 |
| K27792      | 16 (473)        | acrylic         | Viton O-ring  | 2¾ (7)                           | 12½ (30.6)             | 8 (3.6)                 |
| K27780      | 8 (237)         | plated brass    | Viton O-ring  | 2½ (5.9)                         | 10½ (25.8)             | 5 (2.3)                 |
| K27785      | 8 (237)         | plated brass    | Metal Seat    | 2½ (5.9)                         | 10½ (25.8)             | 5 (2.3)                 |
| K27781      | 8 (237)         | stainless steel | Viton O-ring  | 2½ (5.9)                         | 10½ (25.8)             | 5 (2.3)                 |
| K27782      | 8 (237)         | acrylic         | Viton O-ring  | 2½ (5.9)                         | 10½ (25.8)             | 5 (2.3)                 |
| K27770      | 4 (118)         | plated brass    | Viton O-ring  | 1¾ (4.7)                         | 9½ (24.6)              | 4 (1.8)                 |
| K27771      | 4 (118)         | stainless steel | Viton O-ring  | 1¾ (4.7)                         | 9½ (24.6)              | 4 (1.8)                 |
| K27772      | 4 (118)         | plexiglass      | Buna N O-ring | 1¾ (4.01)                        | 9½ (24.6)              | 3 (1.4)                 |
| K27760      | 4 (118)         | plated brass    | Viton O-ring  | 1¾ (2.8)                         | 13¼ (33.7)             | 3 (1.4)                 |
| K27761      | 4 (118)         | stainless steel | Viton O-ring  | 1¾ (2.8)                         | 13¼ (33.7)             | 3 (1.4)                 |
| K27762      | 4 (118)         | acrylic         | Viton O-ring  | 1¾ (2.8)                         | 13¼ (33.7)             | 3 (1.4)                 |

#### 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 |

#### 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)       |             |

## 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.   |                             |
|---------------|-----------------------------|
| <b>K27400</b> | Drum Thief, plated brass    |
| <b>K27401</b> | 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 or stainless steel 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.   |                                                    |
|---------------|----------------------------------------------------|
| <b>K27600</b> | Weighted Copper Beaker, with 3/4" opening          |
| <b>K27610</b> | Weighted Copper Beaker, with 1 1/2" opening        |
| <b>K27601</b> | Weighted Stainless Steel Beaker, with 3/4" opening |

### 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.   |                             |
|---------------|-----------------------------|
| <b>K27851</b> | LPG Sample Cylinder, 150mL  |
| <b>K27852</b> | LPG Sample Cylinder, 300mL  |
| <b>K27853</b> | LPG Sample Cylinder, 500mL  |
| <b>K27854</b> | LPG Sample Cylinder, 1000mL |
| <b>K27856</b> | LPG Sample Cylinder, 3000mL |

### Core-Type Sampling Thief

- Obtains bottom samples or samples from any level
- Butterfly valve on bottom for easy sampling
- Stainless steel and brass construction
- Three Petcocks for draining at different levels

The K28100, Core-Type Sampling Thief is used to manually obtain samples of a liquid, semi liquid or solid state whose vapor pressure at ambient conditions is below 101kPa (crude oil, etc.)

#### Ordering Information

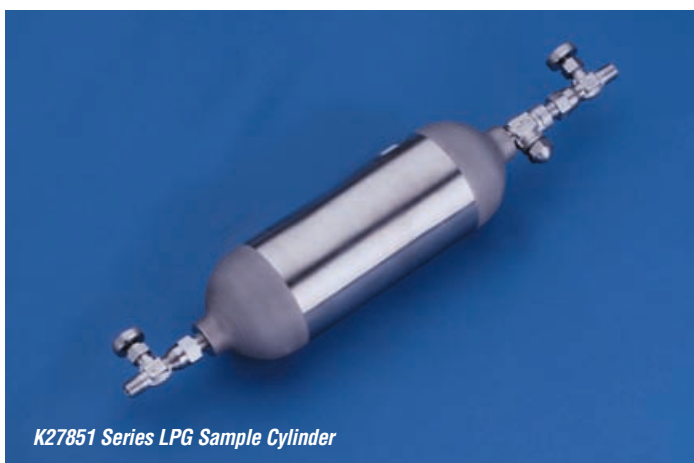
| Catalog No.   |                          |
|---------------|--------------------------|
| <b>K28100</b> | Core-Type Sampling Thief |



**K27400**  
*Drum Thief*



**K27600**  
*Weighted Beaker*



**K27851 Series** *LPG Sample Cylinder*

### Specifications

Conforms to the specifications of: ASTM D4057  
Capacity: 33oz.  
Empty Weight: 6.187 lbs.  
Sample Container Material: Polycarbonate  
Markings: Every inch from 3" to 14"  
Distance from tank bottom to inlet valve: 1.729"  
Max height: 21"  
Max length: 4.7"  
Max width: 4.2"

## 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.

Electrical Requirements: **CE**

115V 60Hz  
220-240V 50Hz  
220-240V 60Hz

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



K56300 Anhydride Purity Bath

### 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.)

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

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

12x12x21 (31x31x54)  
Net Weight: 65 lbs (30 kg)

Electrical Requirements: **CE**

115V 60Hz  
220-240V 50/60Hz

### Shipping Information

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

# 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.

The Automatic Melting Point 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 approximately 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.



*K90190 Automatic Melting Point Range 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 (approximately)

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

### Ordering Information

| Catalog No.        |                                                       | Order Qty |
|--------------------|-------------------------------------------------------|-----------|
| K90100             | Automatic Melting Point Range Apparatus,<br>115V 60Hz | 1         |
| K90190             | Automatic Melting Point Range Apparatus,<br>220V 50Hz |           |
| <b>Accessories</b> |                                                       |           |
| K90100-1           | Glass slides (pack of 500)                            |           |
| K90100-2           | Cover slips (pack of 1000)                            |           |
| K90100-3           | Sampling jig                                          |           |

## GENERAL PURPOSE BATHS

### Constant Temperature Water Baths

- Accurate Microprocessor Control
- Three User-defined Temperature Preset Buttons
- Redundant Safety Backup
- Front Panel Lockout
- Electronic Calibration

Economical constant temperature water baths offer superior temperature control, range, and uniformity. Bath fluids can be controlled at temperatures as high as 100°C (60°C without cover) with 0.1°C precision and +/- 0.2°C uniformity. Bath temperature is displayed continuously on a bright, easy-to-read LED panel in your choice of °C or °F. Set point temperature is recalled with just the touch of a button. Three user-defined temperature preset buttons allow for quick selection of often used temperature set points.

Dual thermostats provide optimum protection for your work and water bath. The high limit alarm alerts you if bath temperature exceeds your pre-set limit. A secondary Safety Set thermostat guards against thermal runaway, automatically disconnecting heater power should bath temperature get too high or the liquid level drop too low.

The Constant Temperature Water Baths are also designed for operating convenience. The steeply gabled, polycarbonate cover accommodates glassware of varying heights and tilts out of your way when loading or removing samples, allowing condensate to drain neatly back into the bath.



**K33056 General Purpose Water Bath, 10L**

### Specifications

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

Temperature Stability: +/- 0.2°C

Temperature Range: Ambient to 100°C with cover,

Ambient to 60°C without cover

### Ordering Information

| Catalog No.                    | Capacity                | Electrical Requirements<br>C €              | Overall Dimensions<br>LxWxH                  | Opening Dimensions<br>LxWxH                 | Shipping Weight    |
|--------------------------------|-------------------------|---------------------------------------------|----------------------------------------------|---------------------------------------------|--------------------|
| <b>K33050</b><br><b>K33051</b> | 2L (0.5 gal)            | 120V, 50/60Hz, 2.5A<br>240V, 50/60Hz, 1.25A | 8.94x7.90x8.13 in<br>22.71x20.07x20.65 cm    | 5.31x5.88x5.81 in<br>13.49x14.94x14.76 cm   | 11 lbs<br>4.99 kg  |
| <b>K33052</b><br><b>K33053</b> | 2L shallow<br>(0.5 gal) | 120V, 50/60Hz, 2.5A<br>240V, 50/60Hz, 1.25A | 9.44x13.65x8.13 in<br>23.98x34.67x20.65 cm   | 5.81x11.69x2.50 in<br>14.76x29.69x6.35 cm   | 12 lbs<br>5.44 kg  |
| <b>K33054</b><br><b>K33055</b> | 5L (1.3 gal)            | 120V, 50/60Hz, 4.2A<br>240V, 50/60Hz, 2.1A  | 9.44x13.65x8.13 in<br>23.98x34.67x20.65 cm   | 5.94x11.75x5.94 in<br>15.09x29.85x15.09 cm  | 15 lbs<br>6.80 kg  |
| <b>K33056</b><br><b>K33057</b> | 10L (2.6 gal)           | 120V, 50/60Hz, 4.2A<br>240V, 50/60Hz, 2.1A  | 15.43x14.90x8.13 in<br>39.19x37.85x20.65 cm  | 11.69x12.75x5.94 in<br>29.69x32.39x15.09 cm | 23 lbs<br>10.43 kg |
| <b>K33058</b><br><b>K33059</b> | 20L (5.2 gal)           | 120V, 50/60Hz, 8.3A<br>240V, 50/60Hz, 4.15A | 15.19x21.65x8.13 in<br>38.58x54.99x20.65 cm  | 11.50x19.50x5.88 in<br>29.21x49.53x14.94 cm | 30 lbs<br>13.61 kg |
| <b>K33060</b><br><b>K33061</b> | 28L (7.3 gal)           | 120V, 50/60Hz, 8.3A<br>240V, 50/60Hz, 4.15A | 15.19x21.65x10.13 in<br>38.58x54.99x25.73 cm | 11.63x19.56x7.94 in<br>29.54x49.68x20.17 cm | 33 lbs<br>14.97 kg |

## GENERAL PURPOSE BATHS



**K33064 Constant Temperature Circulating Bath**

### Constant Temperature Circulating Baths

- Above Ambient Temperature Control
- Available in Three Different Capacities: 6, 13, and 28 Liter
- Large Reservoir Opening
- Microprocessor temperature control with °C/°F digital temperature set and display
- Adjustable Over-Temperature protection and Low-Liquid Cutoff

**Programmable Model** - Constant temperature circulating bath provides precise temperature control stability of  $\pm 0.01^{\circ}\text{C}$  and features time/temperature programming, remote probe capability, and a variable speed pressure/suction (duplex) pump. An RS232 interface and PC programming software are standard while LabView™ drivers and Excel® macros provide even greater programming and data logging convenience. A full graphic LCD display and multi-language help menus simplify operation and set-up.

**Standard Model** - Economical constant temperature circulating bath model. Microprocessor temperature control ranges from  $5^{\circ}\text{C}$  to  $150^{\circ}\text{C}$  with  $\pm 0.05^{\circ}\text{C}$  stability. This model features a bright set-and-read LED display with a readout accuracy of  $\pm 0.5^{\circ}\text{C}$ , three user-defined set point buttons, and a 2-speed pressure (simplex) pump suitable for closed loop applications.

### Specifications

Temperature Range:

K33064, K33065:  $+5^{\circ}\text{C}$  to  $200^{\circ}\text{C}$

All Other Models:  $+5^{\circ}\text{C}$  to  $150^{\circ}\text{C}$

Temperature Stability:

Programmable Model:  $\pm 0.01^{\circ}\text{C}$

Standard Model:  $\pm 0.05^{\circ}\text{C}$

Readout Accuracy:

Programmable Model:  $\pm 0.25^{\circ}\text{C}$

Standard Model:  $\pm 0.5^{\circ}\text{C}$

Temperature Readout:  $^{\circ}\text{C}$  or  $^{\circ}\text{F}$

Pressure Flow Rate:

Programmable Model: 30 lpm max. (60 Hz)

22 lpm max. (50 Hz)

Standard Model: 2-speed, 9 or 15 lpm

Suction Flow Rate:

Programmable Model: 22 lpm max. (60 Hz)

15 lpm max. (50 Hz)

Standard Model: N/A

Heater:

Programmable Model: 1100 Watts (60 Hz)

2200 Watts (50 Hz)

Standard Model: 1100 Watts (60 Hz)

1600 Watts (50 Hz)

### Ordering Information

| Catalog No.                    | Model        | Capacity      | Electrical Requirements<br>C € | Overall Dimensions<br>LxWxH               | Working Access<br>LxWxD               | Shipping Weight |
|--------------------------------|--------------|---------------|--------------------------------|-------------------------------------------|---------------------------------------|-----------------|
| <b>K33062</b><br><b>K33063</b> | Standard     | 6L (1.6 gal)  | 120V, 50/60Hz<br>240V, 50/60Hz | 14.25x8.25x8.14 in<br>37.5x21x35.6 cm     | 5.25x5.25x5.5 in<br>13.3x13.3x14 cm   | 24 lbs<br>11 kg |
| <b>K33064</b><br><b>K33065</b> | Programmable | 6L (1.6 gal)  | 120V, 50/60Hz<br>240V, 50/60Hz | 14.25x8.25x8.14 in<br>37.5x21x35.6 cm     | 5.25x5.25x5.5 in<br>13.3x13.3x14 cm   | 30 lbs<br>14 kg |
| <b>K33066</b><br><b>K33067</b> | Standard     | 13L (3.4 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 15.5x10.88x14.75 in<br>39.4x27.6x37.5 cm  | 5.25x8.5x7.75 in<br>13.3x21.6x19.7 cm | 31 lbs<br>14 kg |
| <b>K33068</b><br><b>K33069</b> | Programmable | 13L (3.4 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 15.5x10.88x14.75 in<br>39.4x27.6x37.5 cm  | 5.25x8.5x7.75 in<br>13.3x21.6x19.7 cm | 40 lbs<br>18 kg |
| <b>K33070</b><br><b>K33071</b> | Standard     | 28L (7.3 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 22.75x13.19x14.75 in<br>55.8x33.5x37.5 cm | 12.13x10.38x8 in<br>30.8x26.4x20.3 cm | 42 lbs<br>19 kg |
| <b>K33072</b><br><b>K33073</b> | Programmable | 28L (7.3 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 22.75x13.19x14.75 in<br>55.8x33.5x37.5 cm | 12.13x10.38x8 in<br>30.8x26.4x20.3 cm | 50 lbs<br>23 kg |

# WATER IN PETROLEUM PRODUCTS & 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                |                        |
|-------------------------------------|------------------------|
| <b>Catalog No.</b><br><b>K31830</b> | Dean & Stark Apparatus |

## 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 |
| <b>K31800</b>        | Metal Still<br>Plated brass and copper, with lid and clamp assembly, gasket and O-ring seal. | 1         |
| <b>K31910</b>        | Ring Burner, 5" (12.7cm) dia.                                                                | 1         |
| <b>K31810</b>        | Glassware Set<br>Includes 400mL condenser, 10mL and 25mL receiving traps                     | 1         |
| <b>K31820</b>        | Mounting Equipment<br>Consists of stand and connecting hardware                              |           |

# GENERAL PURPOSE HEATER

## Utility Heater

- For general laboratory applications
- Precise, reproducible settings
- 1000W 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 (1000W 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.

Electrical Requirements: **CE**

115V 60Hz

220-240V 50/60Hz

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

5x5x10 (12.7x12.7x25.4)

Net Weight: 4½ lbs (2.0kg)

## Shipping Information

Shipping Weight: 8 lbs (3.6 kg)

Dimensions: 1.5 Cu. ft.

| Ordering Information |                                     |
|----------------------|-------------------------------------|
| <b>Catalog No.</b>   |                                     |
| <b>K42000</b>        | Utility Heater, 115V 60Hz, 1000W    |
| <b>K42001</b>        | Utility Heater, 115V 60Hz, 1250W    |
| <b>K42090</b>        | Utility Heater, 230V 50/60Hz, 1000W |
| <b>K42091</b>        | 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, D1747 and D5006 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
- Clear graphical LCD display with on-screen instructions and full menu operation
- Multipoint calibration routines maximize accuracy
- RS232C and centronics 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 dual temperature control system and flat, easy clean sample area make the instrument ideal for viscous or sticky samples.

Two models are available. Models K27550 and K27560 conform to ASTM D1218 and D1747 (maximum temperature 100°C) and measures to the fifth decimal place refractive index or one hundredth place in percent solids. The K27550 also has a built in data storage system with secure electronic signature recording.

The refractometer incorporates numerous innovations designed to improve the accuracy of petroleum product testing. 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.

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.

### Ordering Information

#### Catalog No.

- K27550** Automatic Petroleum Refractometer for D1218 and D1747  
110-240V 50/60Hz  
Includes data storage
- K27560** Automatic Petroleum Refractometer for D1218 and D1747  
110-240V 50/60Hz

#### Accessories

- K27504** Calibration Fluid,  
Certificate of NIST traceability included.
- K27505** Refractometer Communication Software Package,  
with real-time data export into Microsoft® Excel.



**K27550 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: 1.29000 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:  $\pm 0.02\%$  Solids  $\pm 0.00002nD$
- 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

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

Electrical Requirements: **CE**  
110-240V 50/60Hz

### 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.

## 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  $\pm 0.02^\circ\text{C}$
- 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  $\pm 0.02^\circ\text{C}$  in the range  $-30^\circ\text{C}$  to  $+200^\circ\text{C}$ . 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 ( $^\circ\text{C}/^\circ\text{F}$  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:  $-30^\circ\text{C}$  to  $+200^\circ\text{C}$

*For sub-ambient temperatures, refrigerated recirculating coolant is required from an external source.*

Temperature Uniformity:  $\pm 0.02^\circ\text{C}$

Temperature Limit Control:  $-16.7^\circ\text{C}$  ( $30^\circ\text{F}$ ) above setpoint and  $204^\circ\text{C}$  ( $400^\circ\text{F}$ ) maximum

Heater Range: 0-750W

Circulator: ½ hp impeller

Working Depth: Oil Bath: 12" (30.5cm)

Ice Bath: 10½" (26.7cm)

Electrical Requirements: **CE**

115V 60Hz

220-240V 50/60Hz

### Ordering Information

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

### Accessories

|               |                                                                                                                                            |   |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------|---|
| <b>K26501</b> | Standard Thermometer,<br>certified traceable to NIST Standards<br>at 0, 20, 37, 56, 80, 100, 121, 140,<br>160, 180 and $200^\circ\text{C}$ | 1 |
| <b>K26503</b> | Thermometer Magnifier(10X)                                                                                                                 | 1 |
| <b>K26502</b> | Thermometer Carrying Case,<br>holds K26501 Standard Thermometer                                                                            | 1 |

## PH / CONDUCTIVITY METERS

### pH Meter

This bench-top pH meter is an ideal help in every laboratory for routine or R&D level measurement. This instrument measures pH, mV and has 40- point data memory storage. Instrument has two operating modes -

- Standard mode
- GLP mode: 40 data readings can be stored, printed and scanned on display. For GLP mode, additional entries of sample name and ID number can be stored.

The optional Data logging function enables the user to store 24 data points consisting of pH, temperature and time readings. For example, as required in kinetic study or in any chemical reaction. Time intervals from 1min. to 1Hr. in steps of 1min. are available. User entries of pH limit values make the data more defined and informative.

### Conductivity Meter

Koehler offers the perfect choice of a bench top conductivity meter for measurements in the laboratory - whether routine or at the R & D level. The conductivity meter offers better operating comfort and measuring confidence in all areas of application. Due to a user selective temperature function, the instrument calculates the conductivity at the reference temperature  $25 \pm 0.1^\circ\text{C}$  with a linear function.

Conductivity is an important factor in water analysis for quality of drinking water, direct ionic concentration measurement in pharmaceutical preparations, waste water treatment plants, pollution control in lakes & rivers, boiler feed water and oceanography to determine salinity and TDS.

### Specifications

Temperature Range: 0 to  $150^\circ\text{C}$

Temperature Resolution:  $0.1^\circ\text{C}$

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

Display: 20 x 2 line back-lit LCD

Keyboard: Aphanumeric splash water-proof polyester soft keys

Output: 1 – Parallel Port for Printer, 1 – RS232C for PC

Environmental Operating Temperature: Ambient to  $45^\circ\text{C}$

Relative Humidity: 5 to 90% non-condensing

Electrical Requirements: **CE**

115V 60Hz

230V 50Hz

**Dimensions** w x d x h, in. (cm)

12x8.7x27.6 (30.5x22x70)

Net Weight: 4.85 lbs (2.2kg)

### Ordering Information

| Catalog No.   |                                    |
|---------------|------------------------------------|
| <b>K90601</b> | pH Meter, 115V 60Hz                |
| <b>K90691</b> | pH Meter, 230V 50Hz                |
| <b>K90602</b> | Conductivity Meter, 115V 60Hz      |
| <b>K90692</b> | Conductivity Meter, 230V 50Hz      |
| <b>K90603</b> | pH / Conductivity Meter, 115V 60Hz |
| <b>K90693</b> | pH / Conductivity Meter, 230V 50Hz |

# AUTOMATIC TITRATION

## Test Method

For determination of Total Acid Number (TAN), Total Base Number (TBN), Mercaptan Sulfur and Karl Fischer Water Content of petroleum products, lubricants and transformer insulating oils. Titration is the fundamental chemical analysis procedure whereby the concentration of a chemical substance in solution is determined by reacting it with a measured amount of another chemical. The Auto titrator performs this analysis using a motor driven dispenser, stirred reaction vessel and electrodes which sense the completion of reaction by measuring the potential difference between two electrodes. Automatic Titration increases accuracy, repeatability and reproducibility as well as minimizing errors in calculation and documentation.

## Automatic Titrator

The Automatic Titrator is capable of performing a wide range of Titrations:

- Acid-base or aqueous titration
- Redox titration
- Complexometric titration or EDTA titration
- Blank titration
- Silver Assay titrations
- Non-aqueous titration
- Argentometric or Precipitation titration
- Voltametric / KF Titration
- Back titration

The Automatic Titrator is provided with two-point auto calibration and standardization (zero offset). The instrument is capable of displaying pH and mV of the sample, with temperature compensation. The Automatic Titrator can accept a variety of electrodes to cater to various applications in different fields. The liquid path is comprised of Teflon tubing, a Teflon lined valve and gas tight burette with a Teflon plunger head. It creates a chemically inert system for any sensitive analysis. The instrument is supplied with high speed vortex stirrer with digital speed indication. This specially designed stirrer provides excellent homogenous mixing of samples. An optional magnetic stirrer is also available.

### Ordering Information

#### Catalog No.

|               |                                               |
|---------------|-----------------------------------------------|
| <b>K90500</b> | Automatic Potentiometric Titrator, 115V, 60Hz |
| <b>K90590</b> | Automatic Potentiometric Titrator, 230V, 50Hz |

#### Accessories

|                 |                                        |
|-----------------|----------------------------------------|
| <b>K90500-1</b> | Karl Fischer Titrator Burette Assembly |
| <b>K90500-2</b> | Filter Desiccant Dryer Tube            |
| <b>K90500-3</b> | Magnetic Stirrer with Holding Ring     |
| <b>K90500-4</b> | Magnetic Stirrer with Electrode Arm    |
| <b>K90500-5</b> | Vessel Heating / Cooling Accessory     |
| <b>K90500-6</b> | pH Checker                             |



K90500 Automatic Potentiometric Titrator

## Specifications

Conforms to the Specifications of:

ASTM D664, D2896, D3227, D4739

Principle: Volume determination by equivalence point, end point or pH STAT.

Control: Microcontroller based

mV range:  $\pm 3200$  mV.

Accuracy:  $\pm 0.1$  mV ( $\pm 0.0016$  pH).

Amplifier input impedance:  $> 10$  ohms

Burette Resolution: 1/5000 for 5 ml, 1/10000 for 10 ml, 1/5000 for 25 ml.

Filling time: Less than 20 seconds

Keyboard: Alphanumeric splash waterproof polyester soft keys.

Display: 40 x 2 line back lighted liquid crystal display (LCD).

Titration Head: Manual stand with swiveling arm.

Stirrer System: Microcontroller based variable speed, high torque vortex stirrer with digital indication. (Magnetic Stirrer optional)

### Sensors:

Electrodes for Potentiometric titration - (pH, Ion, Redox, Argentometric).

a) Any combination electrode. b) Differential Electrode System comprising sensing (Indicator) Electrode with BNC Connector and Reference Electrode with 4mm Banana Connector.

Electrode for KF/Voltametric titration with BNC/TNC Connectors.

Temperature sensor (PRT/PT100)

Calibration: 3-point Calibration with user entered buffer values and standardization with 7 pH buffer.

End Point detection: a) Potentiometric b) Voltametric c) Thermometric and Photometric.

Cut-off criteria: a) Volume b) End point c) mV/pH.

### Methods:

Titration:

a) Acid base b) Nonaqueous c) Redox d) Precipitation

e) Complexometric f) back titration

KF titration (Optional)

Results: a) Molarity b) % Assay(wt), c) % volume (ml) d) ppm e) mg/l f) mg/g g) g/l h) meq/l i) mol/kg j) TAN and TBN for oil samples.

Method Storage: 50 methods with parameters.

Titrant Molarity storage: 20 values

Input/Output Peripheral Interface:

(a) Parallel Port: 1 - for printer

(b) Serial Port: 2 - for Balance & PC

Electrical Requirements:  $\text{C} \text{ } \text{E}$

115V, 60Hz

230V, 50Hz

# HEAT OF COMBUSTION OF LIQUID HYDROCARBON FUELS BY BOMB CALORIMETER

## Test Method

Heat of combustion is determined in this test method by burning a weighed sample in an oxygen bomb calorimeter under controlled conditions. The heat of combustion is computed from temperature observations before, during and after combustion with proper allowances for thermochemical and heat transfer corrections. Either isothermal or adiabatic calorimeter jackets can be used.

## Automatic Calorimeter

The automatic calorimeter is the latest system for determining gross calorific values of liquids and solid fuels. A higher level of automation with extremely simple handling characterizes this device.

In addition to the Isoperibolic measurement procedure, a Dynamic (reduced-time) mode is also available for the user. Different working temperatures can be selected for both procedures based on the temperature of the connected water.

To provide a supply of cooling water, the calorimeter can be connected to a standard thermostat or an appropriate permanently installed water connection, with a connection valve. The unit is equipped with a very convenient operating panel through which operation of the device takes place. The graphical display with active back lighting displays the appropriate status messages. The temporal course of a measurement that has been started and all current parameters of the weighed in sample can be constantly monitored and are arranged to be clearly visible.

Connections for analysis scale, printer, sample rack for identifying and managing samples are already integrated into the basic device. The network connection and the special configuration for data exchange can be implemented at any time with LIMS.

In combination with special halogen-resistant decomposition vessels quantitative decompositions can be performed to determine halogen and sulfur content.

## Dimensions

17"x17"x19" (440x450x500) Net Weight: 66 lbs (30 kg)

## Specifications

Conforms to the specifications of:

ASTM D240; D4809; D5865; D1989; D5468; E711; ISO 1928; DIN 51900; BS1016

Measurement range: 40,000 J

Measuring mode: Isoperibolic 25°C; Isoperibolic 30°C;

Dynamic 25°C; Dynamic 30°C

Isoperibolic Measuring Time: Approximately 22 min

Dynamic Measuring Time: Approximately 7 min

Oxygen Operating Pressure: 30 bar

Cooling Medium: Water via line, flow through quantity 60 + 10 liters / hour

Water Operating Pressure: 1 – 1.5 bar max.

Water Test Pressure: 10 bar

Interfaces: Serial (RS232); Parallel; Keyboard; Sample rack; External monitor

## Ordering Information

### Catalog No.

**K88800** Automatic Calorimeter, 115V 60Hz

**K88890** Automatic Calorimeter, 220V 50Hz

### Accessories

**K88800-1** Cooling water supply unit, 115V 60Hz

**K88890-1** Cooling water supply unit, 220V 50Hz

**K88800-2** Pressure Gauge, Oxygen

To reduce the pressure of the oxygen cylinder to 30 bar

**K88800-3** Standard Decomposition Vessel

**K88800-4** Decomposition Vessel, Halogen Resistant

For quantitative decomposition determine halogen and sulfur content

**K88800-5** Connection valve

Required for permanently installed water connection

# AUTOMATIC FILTER PLUGGING TENDENCY ANALYZER (FPT)

## Test Method

Determines the Filter Plugging Tendency (FPT) of distillate fuel oils where the end use demands an exceptional degree of cleanliness. This test is applicable to fuels within the viscosity range of 1.50 to 6.00 mm<sup>2</sup>/s (cSt) at 40°C. The test is not applicable to fuels that are not clear and bright because water interferes with the measurement of filter plugging. Causes of poor filterability might include fuel degradation products, contaminants picked up during storage or transfer, or interaction of the fuel with the filter media. Any of these could correlate with orifice or filter system plugging, or both.

## Automatic Filter Plugging Tendency Analyzer

- Integrated Cooling System equipped with a single stage gas motor compressor CFC free
- Measuring device complete with support for filter, Beakers, PT100 sensor Class A, level sensor, pressure gauge, tubes and joints.
- Pump 20 mL/min
- 6.4" TFT/LCD built-in touch screen panel PC for the managing of the analyzer by means of Lab-Link Software
- USB connection to an external printer or external PC
- Storage capacity for more than 60,000 analysis

## Specifications

Conforms to the specifications of:

ASTM D2068; IP 387

Electrical Requirements: C €

115V 60Hz

220-240V 50/60Hz



*KLA-6 Automatic Filter Plugging Tendency Analyzer (FPT)*

## Ordering Information

### Catalog No.

**KLA-6** Automatic Filter Plugging Tendency Analyzer (FPT), 115V 60Hz

**KLA-6 (220)** Automatic Filter Plugging Tendency Analyzer (FPT), 220-240V 50/60Hz

### Accessories

**KLA-1820-8013** Glass Fibre Filters, pk of 100

**KLA-PT100-CAL** Calibration Box and Cables

**KLA-DB-KIT** Kit of Connectors and Cables for Cold range

# OXIDATION STABILITY OF FOODS, OILS, FATS AND BIODIESEL FUELS

## Test Method

For the determination of the oxidation stability of samples (solid, semi-solid, or liquid), in order to determine product quality and obtain value added information related to the fat oxidation processed in samples of foods, oils, fats and Biodiesel Fuels.

## Oxidation Test Reactor

The Oxidation Test Reactor is a versatile instrument suitable for a wide range of oxidation stability and shelf-life applications including:

- Prediction of the oxidation stability during shelf-life studies, by analyzing the product at defined time intervals and building an experimental curve
- Evaluation of the adequacy of storage conditions
- Evaluation of an optimal packaging solution
- Comparison of the oxidation stability of different formulas for food preparations
- Evaluation of the oxidative stability of vegetable oils of different botanical origin
- Evaluation of the effectiveness of antioxidants
- Information on product oxidation when the oxidation flex is not visible, especially for products with a low fat content (4-5%). In this case, product oxidation can be achieved by combining the Oxidation Test Reactor with the gas chromatographic technique.

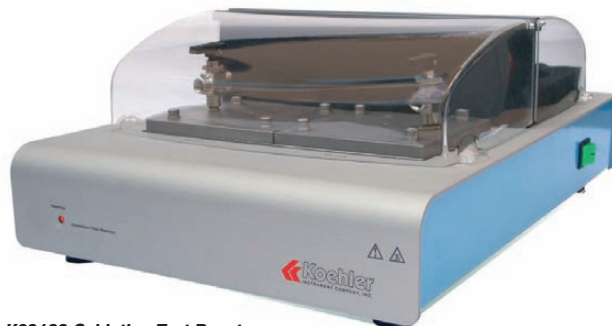
The Oxidation Test Reactor is a complete solution, controlled entirely by the Windows®-based oxidation software capable of providing high added value information concerning fat oxidation processes in foods, oils, fats and biodiesel fuels.

The Oxidation Test Reactor works directly on the whole sample without the need for preliminary fat separation, and is suitable for the determination of the quality and the state of preservation of the sample.

An extremely simple and intuitive instrument equipped with two separate titanium chambers in order to analyze the same sample in duplicate or different samples at the same time, under the same conditions.

The stability of the sample is determined by accelerating the oxidation process using high temperatures (from Ambient to 110°C) and a pre-determined oxygen pressure. Oxygen is consumed during fat oxidation and it is this decrease in oxygen pressure that enables us to obtain useful information concerning the sample.

The intuitive software controls the entire process in a user friendly way and the operator can record data in a database, compare tests, export the data to an Excel file, filter and order the data quickly and easily.



*K83100 Oxidation Test Reactor*

## Specifications

Based on the Specifications of:

ASTM D942; IP 142

Temperature Range: Ambient to 110°C

Number of Oxidation Chambers: 2

Chamber Capacity: 100mL

Pressure Range: 0 – 8 bar

Interface: USB

Overpressure: Safety Valve

Out of Range Temperature: Visual Alarm

Damaged Probe: Visual Alarm

Electrical Requirements: **CE**

220-240VAC, 50/60Hz

## Included Accessories

Oxidation Software

USB Cable

Sample Holder (6)

Spacer (4)

## Dimensions wxdxh,in.(cm)

14.6 x 19.4 x 7.6 (36.5x48.5x19)

Net Weight: 36.3 lb (16.5 kg)

## Ordering Information

### Catalog No.

**K83100**

Oxidation Test Reactor, 220-240V 50/60Hz

## 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 45-46

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

Solvent Kerosene (for dark samples)  
Distilled Water

### **Distillation of Petroleum Products at Reduced Pressures** .....Pages 53-54

ASTM D1160

|               |                  |
|---------------|------------------|
| Toluene       | Nitrogen         |
| Cyclohexane   | Balance          |
| n-Tetradecane | n-Hexadecane     |
| 1L Beaker     | Calcium Chloride |
| Boiling Chips | Silicone Fluids  |

### **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

### **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

# FUELS

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| <b>Vapor Pressure of Petroleum Products (Reid Method)</b><br>ASTM D323; GPA 2140; IP 69; ISO 3007; DIN 51616;<br>FTM 791-1201 .....                                         | 92-94 | <b>Residues in Liquefied Petroleum (LP) Gases</b><br>ASTM D2158; GPA 2140 .....                                                                                                                                                                                                                                                                                                                                                    | 105  |
| <b>Vapor Pressure of Liquefied Petroleum (LP) Gases (LP-Gas Method)</b><br>ASTM D1267; GPA 2140; IP 161; ISO 4256;<br>DIN 51754; FTM 791-1201 .....                         | 92-94 | <b>Filterability of Diesel Fuels by Low Temperature Flow Test (LTFT)</b><br>ASTM D4539 .....                                                                                                                                                                                                                                                                                                                                       | 105  |
| <b>Wax Appearance Point of Distillate Fuels</b> ASTM D3117 .....                                                                                                            | 94    | <i>For information on additional testing methods for fuels:</i><br>–Cloud Point and Pour Point of Petroleum Oils<br>–please refer to pages 132-133<br>–Oxidation Stability of Distillate Fuel Oil (Accelerated Method)<br>–please refer to pages 120-122<br>–Please refer to the Viscosity, Flash Point and General Tests Sections<br>–Additional test methods are available upon request<br>–please call or write for information |      |
| <b>Smoke Point of Aviation Turbine Fuels</b><br>ASTM D1322; ISO 3014; IP 57; DIN 51406; FTM 791-2107 .....                                                                  | 95    |                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |
| <b>Freezing Point of Aviation Fuels</b> ASTM D2386; IP 16; ISO 3013;<br>DIN 51421; FTM 791-1411 .....                                                                       | 96    |                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |
| <b>Automated Freezing Point of Aviation Fuels</b> ASTM D2386; IP 16;<br>ISO 3013 .....                                                                                      | 97    |                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |



# OXIDATION STABILITY OF GASOLINE AND AVIATION FUELS

## Oxidation Stability of Gasoline (Induction Period Method)

## Oxidation Stability of Aviation Fuels (Potential Residue Method)

### Test Method

Provides an indication of the tendency of gasoline and aviation fuels to form gum in storage. The sample is oxidized inside a stainless steel pressure vessel initially charged with oxygen at 100psi (689kPa) and heated in a boiling water bath. The amount of time required for a specified drop in pressure (gasoline) or the amount of gum and precipitate formed after a specific aging period (aviation fuels) is determined.

### Oxidation Stability Test Apparatus

- Conforms to ASTM D525, D873, ISO 7536 and related specifications
- Oxidata® Pressure Measurement System
- Available in two, four or six-unit configurations
- Choice of water/liquid or solid block heating baths
- Oxidation pressure vessel incorporates burst disk assembly

Consists of Oxidation Pressure Vessel, Pressure Measurement Equipment, Oxidation Bath and Accessories.

### Ordering Information

Oxidation Pressure Vessel

Oxidation Baths

Pressure Measurement Equipment

Accessories

page 80

pages 81-82

pages 83-84

pages 81-82



### Oxidata® Pressure Measurement System

For Oxidata® specifications and ordering information refer to pages 83-84.



K10500 Oxidation Pressure Vessel

### Oxidation Pressure Vessel

Precision machined stainless steel pressure vessel includes threaded body; lid; stem with filler rod and mounting flange; needle valve for purging, pressurizing and exhausting pressure vessel with oxygen; and burst disk assembly. Pressure vessel interior and inside of stem have a high polish to facilitate cleaning and prevent corrosion. Stainless steel burst disk ruptures at 223psi (1537kPa) to prevent unsafe pressure build-up inside pressure vessel. Octagonal sections on the pressure vessel and lid permit tight closure with wrench. Includes buna-N gaskets. See Accessories on pages 81-82 for available rupture disk assembly retrofit for existing pressure vessels. Can also be used as a pressure vessel in ASTM D5304 "Standard Test Method for Assessing Distillate Fuel Storage Stability by Oxygen Overpressure".

### Ordering Information

Catalog No.

K10500

Oxidation Pressure Vessel

# OXIDATION STABILITY OF GASOLINE AND AVIATION FUELS

## Solid Block Oxidation Baths

- Solid block baths conforming to ASTM and related specifications. Constant temperature baths for heating K10500 Oxidation Pressure Vessels in accordance with ASTM specifications.

**Solid Block Baths**—Insulated aluminum block baths available in two or four-unit capacity. Baths feature microprocessor temperature control with built-in overtemperature protection and dual LED displays for setpoint and actual temperature values in °C/°F format. The solid block design offers operating advantages over the boiling water bath, and meets temperature control and other requirements of ASTM and related methods. It should be noted, however, that many applicable specifications for this test method call for a liquid bath medium. Housed in an insulated steel cabinet with chemical-resistant polyurethane enamel finish. Includes lids for pressure vessel ports. Order thermometer separately.

*Communications software (RS232, etc.) ramp-to-set and other enhanced features are available on the solid block and 4-6 place liquid baths as extra cost options. Contact your Koehler representative for information.*

## Specifications

Conforms to the specifications of: ASTM D525, D873; IP 40, IP 138; ISO 7536; DIN 51780, 51799; FTM 791-3352, 791-3354; NF M 07-012, 07-013

Maximum Temperature:

Solid Block Baths: 250°F (121°C)

*Solid block baths meet temperature control and other requirements of ASTM and related methods. While the aluminum block design offers operating advantages over the standard boiling water bath, it should be noted that many applicable specifications for this test call for a liquid bath medium. Please refer to the test method for the specific requirements.*



K10491 Solid Block Oxidation Bath

## Ordering Information

| Type        | Catalog No. | Electrical Requirements C € | Heater Range | Dimensions l x w x h, in. (cm) |
|-------------|-------------|-----------------------------|--------------|--------------------------------|
| Solid Block | K10401      | 115V 60Hz<br>12A            | 0-1300W      | 15x10x17<br>(38x25x43)         |
|             | K10491      | 220-240V 50/60Hz<br>6A      |              |                                |
|             | K10403      | 115V 60Hz<br>22A            | 0-2500W      | 24x10x17<br>(61x25x43)         |
|             | K10493      | 220-240V 50/60Hz<br>11A     |              |                                |

 Software compatible, inquire with Koehler Customer Service.

## Ordering Information

### Catalog No.

### Accessories

|             |                                                                                                                                                                                                                                                                                        |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| K10540      | Glass Sample Container and Cover with pour out spout                                                                                                                                                                                                                                   |
| K10540/C    | Glass Sample Container Cover Only                                                                                                                                                                                                                                                      |
| K10510      | Gasket. Replacement composition gasket for K10500 Oxidation Pressure Vessel                                                                                                                                                                                                            |
| K10551      | Pressure Line. For pressurizing Oxidation Pressure Vessel. 6 ft. (1.83m) long, with quick release coupling for needle valve on pressure vessel and threaded fitting for oxygen tank                                                                                                    |
| K10556      | Oxygen Manifold Pressure Relief System<br>Connects to oxygen source to prevent overcharging of vessel. Equipped with relief valve to vent at 125psi and 300 series stainless steel 150psi burst disk assembly. Constructed from 300 series stainless steel. Cleaned for oxygen service |
| K10520      | Wrench. For tightening seal on Oxidation Pressure Vessel                                                                                                                                                                                                                               |
| K10530      | Table Socket. Installs in benchtop to aid in tightening seal on Oxidation Pressure Vessel                                                                                                                                                                                              |
| K10560      | Bronze Tubing<br>For connecting pressure recorder to vessel.<br>Flexible seamless helical tubing with protective armor braid and connections. 5 ft (1.52m) long                                                                                                                        |
| K10525      | Burst Disk Assembly<br>Retrofit kit for Oxidation Pressure Vessel without burst disk assembly                                                                                                                                                                                          |
| 250-000-22F | ASTM 22F Thermometer<br>Range: 204 to 218°F                                                                                                                                                                                                                                            |
| 250-000-22C | ASTM 22C Thermometer<br>Range: 95 to 103°C                                                                                                                                                                                                                                             |

# OXIDATION STABILITY OF GASOLINE AND AVIATION FUELS



**K10404 Liquid Oxidation Bath with K10500 Pressure Vessels**

## Specifications

Conforms to the specifications of: ASTM D525, D873; IP 40, IP 138; ISO 7536; DIN 51780, 51799; FTM 791-3352, 791-3354; NF M 07-012, 07-013

Maximum Temperature:

- 2 Unit Water/Liquid Bath: boiling water
- 6 Unit Water/Liquid Bath: 250°F (121°C)

*Solid block baths meet temperature control and other requirements of ASTM and related methods. While the aluminum block design offers operating advantages over the standard boiling water bath, it should be noted that many applicable specifications for this test call for a liquid bath medium. Please refer to the test method for the specific requirements.*

| Ordering Information |                          |              |                            |              |                         |
|----------------------|--------------------------|--------------|----------------------------|--------------|-------------------------|
| Type                 | Catalog No.              |              | Electrical Requirements C€ | Heater Range | Dimensions lwxh,in.(cm) |
| Water/<br>Liquid     | <b>K10400</b><br>Analog  | 2            | 115V 60Hz<br>17.3A         | 0-2000W      | 24x14x24<br>(61x36x61)  |
|                      | <b>K10402</b><br>Analog  | vessels      | 220-240V 50/60Hz<br>9.0A   |              |                         |
|                      | <b>K10404</b><br>Digital | 6<br>vessels | 220-240V 50/60Hz<br>18.1A  | 0-3000W      | 24x14x29½<br>(61x36x75) |

## Water/Liquid Oxidation Baths

- Water/liquid baths conforming to ASTM and related specifications. Constant temperature baths for heating K10500 Oxidation Pressure Vessels in accordance with ASTM specifications.

**Water/Liquid Baths**—Two different models, both equipped with low liquid-level controllers in accordance with the latest ASTM specifications. Two-unit analog controlled water bath can be flush mounted in a table top if desired, and is equipped with an overflow standpipe/drain to maintain the proper depth when the pressure vessels are inserted, and a plated brass reflux condenser to minimize evaporation loss.

The six unit model can be used with water or oil as a bath medium, and has microprocessor temperature control that provides quick temperature stabilization without overshoot. Dual LED displays provide setpoint and actual temperature values in °C/°F format. A built-in overtemperature control circuit interrupts power should the bath temperature exceed a programmed cut-off point. Both models feature double-wall insulated construction with stainless steel tanks, support racks and port covers. Order thermometer separately. *The 6 unit model can be ordered with interchangeable racks for performing the ASTM D942, ASTM D323 and D1298 test methods—please contact your Koehler representative for additional information.*

*Communications software (RS232, etc.) ramp-to-set and other enhanced features are available on the solid block and 4-6 place liquid baths as extra cost options. Contact your Koehler representative for information.*

## Ordering Information

### Catalog No.

### Accessories

|                    |                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>K10540</b>      | Glass Sample Container and Cover with pour out spout                                                                                                                                                                                                                                   |
| <b>K10540/C</b>    | Glass Sample Container Cover Only                                                                                                                                                                                                                                                      |
| <b>K10510</b>      | Gasket. Replacement composition gasket for K10500 Oxidation Pressure Vessel                                                                                                                                                                                                            |
| <b>K10551</b>      | Pressure Line. For pressurizing Oxidation Pressure Vessel. 6 ft. (1.83m) long, with quick release coupling for needle valve on pressure vessel and threaded fitting for oxygen tank                                                                                                    |
| <b>K10556</b>      | Oxygen Manifold Pressure Relief System<br>Connects to oxygen source to prevent overcharging of vessel. Equipped with relief valve to vent at 125psi and 300 series stainless steel 150psi burst disk assembly. Constructed from 300 series stainless steel. Cleaned for oxygen service |
| <b>K10520</b>      | Wrench. For tightening seal on Oxidation Pressure Vessel                                                                                                                                                                                                                               |
| <b>K10530</b>      | Table Socket. Installs in benchtop to aid in tightening seal on Oxidation Pressure Vessel                                                                                                                                                                                              |
| <b>K10560</b>      | Bronze Tubing<br>For connecting pressure recorder to vessel. Flexible seamless helical tubing with protective armor braid and connections. 5 ft (1.52m) long                                                                                                                           |
| <b>K10525</b>      | Burst Disk Assembly<br>Retrofit kit for Oxidation Pressure Vessel without burst disk assembly                                                                                                                                                                                          |
| <b>250-000-22F</b> | ASTM 22F Thermometer<br>Range: 204 to 218°F                                                                                                                                                                                                                                            |
| <b>250-000-22C</b> | ASTM 22C Thermometer<br>Range: 95 to 103°C                                                                                                                                                                                                                                             |

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

# OXIDATION STABILITY OF GASOLINE AND AVIATION FUELS

## Oxidata® Pressure Measurement Systems

- Electronic pressure measurement systems exclusively designed for ASTM oxidation test methods
- Powerful Oxidata® software for Windows® environments
- Monitors up to twelve pressure and four temperature channels
- Automatic end-point detection
- Real-time average bath temperature display
- Can be installed to most manufacturer's fuels oxidation test apparatus

Complete electronic measurement systems for plotting pressure versus time and temperature in oxidation testing of fuels. Each system includes transducers, multiplexer, data acquisition card, software, and mounting and connecting hardware. Systems are available in two, three and four pressure vessel configurations, and additional channels can be added for up to a total of twelve pressure and four temperature channels.

Koehler's pressure measurement systems for fuels oxidation testing features Oxidata®, a high accuracy pressure measurement software package designed exclusively for ASTM oxidation test methods. Designed to run in a Windows® 2000 or Windows XP environment, Oxidata® monitors up to twelve samples simultaneously, with graphical or tabular display of results. Each channel can be independently configured for any of the applicable ASTM standard test methods without compromising the independence or accuracy of the other channels. Independent start and stop times and user programmable end points add even greater flexibility.

The software plots your data on screen on line, real time, and automatically saves your data on disk or to the hard drive during the test to prevent loss of valuable data. Multiple display options include the ability to view the status of all twelve pressure channels on screen simultaneously and then click on any one channel for a graph display; or to view four channels in graphical format simultaneously. Powerful program features allow you to change axes, have colored plot lines and zoom in on a specific plot sector to view data in greater detail.



*Oxidata® software automatically detects the break point and induction period.*



## Oxidata® Features and Specifications

- On line, real time monitoring of up to twelve samples simultaneously – results plot directly to the screen for instant monitoring or printout of results
- Automatic detection and reporting of break point and induction period
- Invalid test indication when a pressure leak is detected
- Menu options for fuels oxidation testing and other ASTM oxidation tests
- Programmable automatic end point detection with graphical and tabular representation
- Each channel can be configured and operated independently with different start/stop times and different ASTM test methods
- Zoom in feature allows for magnification of any plot sector on any channel for a more detailed study
- Monitors and reports temperatures of as many as twelve pressure vessels simultaneously using accessory RTD's, and calculates and displays average temperature for each bath
- Exports data to spreadsheet programs such as Microsoft Excel®, Lotus 1-2-3® etc.
- Temperature and pressure calibration capability
- Data is saved directly to the disk or hard drive during testing to prevent loss of valuable data
- Operates in Windows® 2000 and Windows XP environments

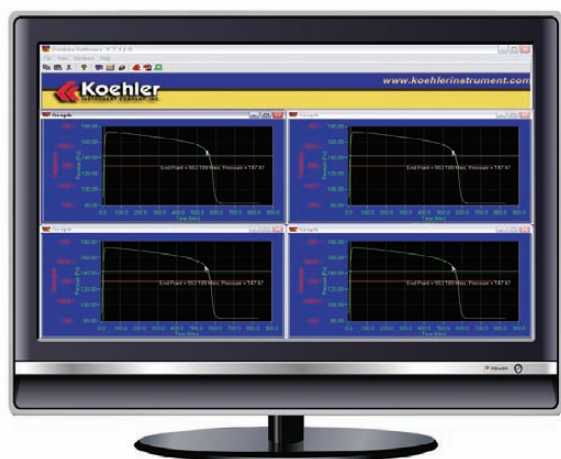
## Included Accessories (for the pressure measurement systems)

Transducers (connects directly to pressure vessel)  
USB interface  
Multiplexer  
Oxidata® software  
RTD probe assembly (1)  
Connecting cables and hardware

## Computer Requirements

Processor: Intel® Pentium II or similar (minimum)  
Memory (RAM): 256MB or higher  
Speed: 500 MHz or higher  
Windows® 2000 or higher  
Disk Space: 15 MB free space (minimum)  
Communications Port: One USB port  
Other Software: Microsoft® Excel (97 or above)  
One RS232 port for temperature controller (optional)

# OXIDATION STABILITY OF GASOLINE AND AVIATION FUELS



Real-time plot screens display pressure versus time for up to twelve samples simultaneously (four different test methods shown).

## Ordering Information

### Catalog No.

The ordering information below is for installation to existing Koehler equipment. For other makes of equipment, a few basic hardware items may also be required – please contact your Koehler representative for assistance.

### Oxidata® Pressure Measurement System for Fuels Oxidation C €

|                  |                                 |
|------------------|---------------------------------|
| <b>K10504-XP</b> | 2-Unit System, 115V 60Hz        |
| <b>K10594-XP</b> | 2-Unit System, 220-240V 50/60Hz |
| <b>K10505-XP</b> | 4-Unit System, 115V 60Hz        |
| <b>K10595-XP</b> | 4-Unit System, 220-240V 50/60Hz |
| <b>K10506-XP</b> | 6-Unit System, 115V 60Hz        |
| <b>K10596-XP</b> | 6-Unit System, 220-240V 50/60Hz |

### Accessories

|                   |                                                               |
|-------------------|---------------------------------------------------------------|
| <b>K10504-0-1</b> | Transducer                                                    |
| <b>K70519</b>     | RTD Kit, for monitoring the temperature of an additional bath |

## Mechanical Pressure Measuring and Recording Equipment

- One-pen or two-pen mechanical recorders
- Pressure gauge for aviation fuel tests

**Mechanical Recorders**—Spring-wound circular chart recorder measures pressure inside oxidation pressure vessel for break point and induction period determinations on gasoline. Housed in a steel case suitable for wall mounting. Order accessory bronze tubing for connection to oxidation pressure vessel. Suitable for oxygen service. Includes 100 24-hour charts.

**Pressure Gauge for Aviation Fuel Tests**—Suitable for testing of aviation fuels according to ASTM D873. Range 0-200psi. Suitable for oxygen service.

## Ordering Information

### Catalog No.

#### Mechanical Recorders

|               |                  |
|---------------|------------------|
| <b>K10570</b> | One-Pen Recorder |
| <b>K10580</b> | Two-Pen Recorder |

#### Pressure Gauge for Aviation Fuel Tests

|               |                |
|---------------|----------------|
| <b>K10590</b> | Pressure Gauge |
|---------------|----------------|

#### Accessories

|                    |                                                                            |
|--------------------|----------------------------------------------------------------------------|
| <b>308-000-005</b> | Recorder Charts<br>Pack of 100                                             |
| <b>308-001-02R</b> | Recorder Cartridge Pen, Red<br>(for use with K10570 Recorder)              |
| <b>308-001-02B</b> | Recorder Cartridge Pen, Blue<br>(for use with K10570 and K10580 Recorders) |
| <b>308-001-L2R</b> | Recorder Cartridge Pen, Long Red<br>(for use with K10580 Recorder)         |

# ASSESSING DISTILLATE FUEL STORAGE STABILITY BY OXYGEN OVERPRESSURE

## Test Method

Used for assessing potential storage stability of middle distillate fuels, including fuels with or without stabilizer additives, and freshly refined or previously stored fuels. The sample is aged in a pressurized vessel at constant temperature for 16 hours and, after cooling, the total amount of insoluble products is determined gravimetrically.

## Pressure Vessel

- Conforms to the specification of ASTM D5304
- Four, Six and Ten unit models

Stainless steel pressure vessels accommodate multiple sample containers for determining storage stability of fuels by the oxygen overpressure method. Vessels meet all applicable ASME and ASTM safety requirements for construction and working pressure and maximum operating temperature and are equipped with pressure safety valves factory present at 200psi (1,332kpa). Included with each model are a collapsible glassware rack that installs and removes easily for cleaning, oxygen inlet and outlet valves with quick disconnect fittings and charging hose, pressure gauge and wide-mouth closure with viton O-ring seal.

## Specifications

Conforms to the specifications of:

ASTM D5304

Capacity: Four, six or ten sample containers

Construction: 316 stainless steel, in accordance with ASME specifications

Working Pressure at 90°C: Exceeds ASTM requirements

Safety Relief Valve Setting: 200psi (1,332kPa)

Pressure Gauge: 0-200psi

## Included Accessories

Glassware rack, hinged, for four, six or ten sample containers

Charging hose with pressure tight crimp and quick disconnect

## Dimensions:

K10600: 8½" high by 9½" round

Net Weight: 14 lbs (6.4kg)

K10601/K10602: 15½" high by 9½" round

Net Weight: 17 lbs (8kg)

## Shipping Information:

K10600:

Shipping Weight: 17 lbs (8kg)

Dimensions: 2.6 Cu. Ft.

K10601/K10602:

Shipping Weight: 22 lbs (10kg)

Dimensions: 3.5 Cu. Ft.



K10600 Pressure Vessel, 4 Unit

## Ordering Information

| Catalog No. |                          | Order Qty |
|-------------|--------------------------|-----------|
| K10600      | Pressure Vessel, 4 Unit  | 1         |
| K10601      | Pressure Vessel, 6 Unit  |           |
| K10602      | Pressure Vessel, 10 Unit |           |

## Accessories

|        |                           |
|--------|---------------------------|
| K10540 | Sample Container with lid |
|--------|---------------------------|

# EXISTENT GUM IN FUELS BY JET EVAPORATION

## Test Method

Gum formed during fuel storage can deposit on induction system surfaces, intake valves, stems and guides. To test for gum content, a 50mL sample is evaporated in an aluminum block bath for a specified period under controlled conditions of temperature and flow of air (aviation and motor gasolines) or steam (aircraft turbine fuel).

## Existent Gum Test Apparatus

Evaporates aircraft turbine fuel and motor and aviation gasoline samples under controlled conditions in accordance with ASTM specifications. Consists of a high temperature evaporation bath with 100mL test beakers and, for aircraft turbine fuels, a steam generator and steam superheater.

## Evaporation Baths

- Conforming to ASTM D381 and related specifications
- Choice of three-unit and six-unit models
- Available with built-in steam superheater
- Microprocessor programmable high accuracy temperature control
- Built-in pressure regulators and air flowmeters

Electrically heated baths for determining existent gum in aircraft turbine fuels by steam-jet evaporation and in motor and aviation gasolines by air-jet evaporation. Fully insulated, aluminum block design assures safe, efficient high temperature operation. Equipped with air/steam pressure regulator with gauge and a flowmeter for adjusting air flow per ASTM specifications. Stainless steel jets deliver air or steam flow to the test wells through removable brass conical adapters. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath 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 format. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.*

**Model K33800 with Built-in Superheater**—Six-unit bath with a built-in thermostatically controlled superheater which delivers dried steam to the bath inlet for steam-jet method testing of aircraft turbine fuels. Has digital-indicating solid state bath temperature control with digital setpoint and display.

**Model K33700**—Six-unit bath without built-in superheater.

**Model K33780**—Three-unit bath without built-in superheater. All controls are housed in the bath cabinet.



K33700 Existent Gum Evaporation Bath

## Specifications

Conforms to the specifications of: ASTM D381; IP 131; ISO 6246; DIN 51784; FTM 791-3302; NF M 07-004

Testing Capacity:

K33800 and K33700: 6 sample beakers

K33780 and K33781: 3 sample beakers

Maximum Temperature: 475°F (246°C)

Temperature Control Stability: ±1°F (±0.5°C)

Bath Configuration: machined aluminum block with multiple cartridge heaters

Heater Range:

K33800 and K33700: 0-3000W

K33780 and K33781: 0-1500W

Superheater: (Model K33800 only)

Superheating chamber and condensate trap constructed of stainless steel

Solid state thermoregulator (0-550°F) Heater Range: 0-1500W

Electrical Requirements: **C** **E**

K33700: 220-240V 50/60Hz, Single Phase, 13.6A

K33800: 220-240V 50/60Hz, Single Phase, 20.4A

K33780: 115V 60Hz, Single Phase, 13.0A

K33781: 220-240V 50/60Hz, Single Phase, 6.8A

## Included Accessories

Conical Brass Adapters for air/steam jets

## Dimensions lwxwxh,in.(cm)

K33800: 32½x20x20 (83x51x51)

K33780: 32½x11x19 (83x28x48)

K33700: 28x20x16 (71x51x41)

Net Weight:

K33800: 230 lbs (104.3kg)

K33780: 85 lbs (38.6kg)

K33700: 203 lbs (92.1kg)

## Shipping Information

K33800

Shipping Weight: 313 lbs (142kg)

Dimensions: 17.2 Cu. ft.

K33780

Shipping Weight: 140 lbs (63.5kg)

Dimensions: 8.3 Cu. ft.

K33700

Shipping Weight: 271 lbs (123kg)

Dimensions: 13.7 Cu. ft.



## EXISTENT GUM IN FUELS BY JET EVAPORATION

### Steam Generator

- For steam-jet method testing of aircraft turbine fuels
- Meets output requirements of three-unit and six-unit evaporation baths
- Electrically heated for clean, efficient operation and ease of installation
- Meets applicable ASME, NEC standards; UL listed, CSA approved

Electrically heated boiler provides instantaneous and reserve steam capacity for steam-jet evaporation tests. Easy to install and operate; electrical heating eliminates the need for on-site fuel combustion. Requires only a water feed source and electrical hook-up. Ruggedly constructed, with long life industrial grade incoloy heating element. Includes a full range of safety features: automatic water level control and low water cut-off; steam safety valve; high-limit pressure cut-out with manual reset; steam pressure gauge.

### Specifications

Output: 54.1 lbs steam/hr at 212°F

Bhp Rating: 1.83

kW Rating: 18

### Dimensions lwxh,in.(cm)

20x28x36 (51x71x91)

Net Weight: 185 lbs (83.9kg)

### Shipping Information

Shipping Weight: 200 lbs (91kg)

Dimensions: 18 Cu. ft.

### Ordering Information

| Catalog No.          |                                                 |
|----------------------|-------------------------------------------------|
| <b>K33850</b>        | Steam Boiler, 120/240V 60Hz, Three Phase        |
| <b>K33850/208601</b> | Steam Boiler,<br>208V 60Hz, Single Phase, 87A   |
| <b>K33850/208603</b> | Steam Boiler,<br>208V 60Hz, Three Phase, 50A    |
| <b>K33850/240601</b> | Steam Boiler,<br>240V 60Hz, Single Phase, 75A   |
| <b>K33850/240603</b> | Steam Boiler,<br>240V 60Hz, Three Phase, 43A    |
| <b>K33850/380603</b> | Steam Boiler,<br>380V 50/60Hz, Three Phase, 27A |
| <b>K33850/415503</b> | Steam Boiler,<br>415V 50Hz, Three Phase, 25A    |
| <b>K33850/480603</b> | Steam Boiler,<br>480V 60Hz, Three Phase, 22A    |

*Other electrical configurations for the Steam Boiler are available.  
Please inquire with Koehler Customer Service for additional information.*



**K33810 Steam Superheater**

### Accessories

| Catalog No.        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Order Qty |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>K33710</b>      | Sample Beaker,<br>100mL spun copper, 50x78mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6         |
| <b>332-002-017</b> | Sample Beaker,<br>Borosilicate Glass, 100mL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |
| <b>250-000-03F</b> | ASTM 3F Thermometer<br>Range: 20 to 760°F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2         |
| <b>250-000-03C</b> | ASTM 3C Thermometer<br>Range: -5 to +400°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |           |
| <b>K33810</b>      | Steam Superheater<br>Provides dry superheated steam for evaporation<br>baths not equipped with a built-in superheater. Use<br>together with an outside steam source for steam-jet<br>method testing of aircraft turbine fuels. Superheating<br>chamber and condensate trap are constructed<br>entirely of stainless steel. Solid state temperature<br>controller adjusts between 0-550°F. Equipped with<br>steam inlet and outlet connections and condensate<br>drain valve. Steel exterior has a chemical resistant<br>polyurethane enamel finish.<br>Dimensions 5x27x9½" (13x70x24cm).<br>Shipping Weight: 23 lbs (10.4kg)<br>220-240V 50/60Hz, Single Phase, 6.8A <b>CE</b> |           |

### Test Apparatus for Steam Jet Method

### Ordering Information

| Catalog No.          |                                           | Order Qty |
|----------------------|-------------------------------------------|-----------|
| <b>K33800</b>        | Existent Gum Evaporation Bath             | 1         |
| <b>K33850 Series</b> | Steam Boiler                              | 1         |
| <b>K33710</b>        | Sample Beaker (or 332-002-017)            | 6         |
| <b>250-000-03F</b>   | ASTM 3F Thermometer. Range: +20 to +215°F | 2         |
| <b>250-000-03C</b>   | ASTM 3C Thermometer. Range: -5 to +400°C  |           |

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

# DETERMINATION OF ACCELERATED IRON CORROSION IN PETROLEUM PRODUCTS

## Test Method

Accelerated Laboratory and Field Procedure for the determination of corrosion of iron, in the presence of water, on samples such as gasoline and gasoline blended with 10% ethanol, E10 (Specification D4814); gasoline-blend components (except butane); diesel fuel and biodiesel B5, except Grade No. 4-D (Specification D975); biodiesel B6 to B20 (Specification D7467); diesel-blend component such as light cycle-oil; No.1 fuel oil, No.2 fuel oil (Specification D396); aviation turbine fuel (Specification D1655).

## Accelerated Iron Corrosion Tester

- Preset Temperature and RPM value in direct accordance with ASTM D7548
- 5" Touch Screen Control Display with Soft keys
- 4-position liquid bath
- Integrated Timer
- Small Footprint

### Specifications

Conforms to the specifications of:  
ASTM D7548

Temperature Setting: 37.8°C (100°F)

Bath Tank Volume: 1.3 Gallons

Heating/Cooling: Peltier Regulating System

Stirring Speed: 100 RPM; 900 RPM

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

15x23x14 (38.1x58.5x35.5)

Net Weight: 35 lbs (15.9kg)

### Electrical Requirements C E

115V 60Hz

220-240V 50/60Hz

### Included Accessories

5ml Syringe with 63.5mm (2.5 in) needle

Test Jar, 90 ml capacity, flat-bottom (4)

Corrosion Test Specimen Assembly (4)

Ethernet Crossover Cable (1)

Magnetic Stirrer Bar according to ASTM (5)

Temperature Probe (4)

Test Jar Cap (4)

Port Cover (4)

O-Ring (4)

2x Lighted Magnifying Lens (1)



**K30260 Accelerated  
Iron Corrosion Tester**

### Ordering Information

#### Catalog No.

**K30260**

Accelerated Iron Corrosion Tester, 115V 60Hz

**K30269**

Accelerated Iron Corrosion Tester, 220-240V 50/60Hz

#### Accessories

**250-000-28F**

ASTM 28F Thermometer, Range: 97.5 to 102.5°F

**250-000-28C**

ASTM 28C Thermometer, Range: 36.6 to 39.4°C

**K30130**

Polishing Chuck

**K30150**

Drive Motor, 115V

**K30180**

Drive Motor, 230V

**380-100-002**

Silicone Carbide Abrasive Cloth Roll, C-100 grit Open Mesh, 38mm width x 22.5m length  
For Preliminary grinding and final polishing of test specimens.

# WATER VAPOR CONTENT BY MEASUREMENT OF DEW POINT TEMPERATURE

## Test Method

Determines the water vapor content of gaseous fuels by measurement of the dew point temperature, followed by calculation of the water vapor content.

## Dew Point Apparatus

- Rugged construction
- Stainless steel sample chamber with incorporated "target mirror"

The Dew Point Apparatus consists of a closed stainless steel dew point chamber containing a highly polished stainless steel "target mirror" and sample inlet and outlet control valves. The chamber is chilled by refrigerant flowing through the outer cooling jacket, preventing any refrigerant contact with the test sample. The thermometer is inserted into the mirror support structure, providing the temperature of the "target mirror." As the sample flows in the chamber and is deflected across the surface of the mirror, the temperature at which condensation collects on the mirror is recorded as the dew point of the sample.

### Specifications

Conforms to the specifications of: ASTM D1142; GPA

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

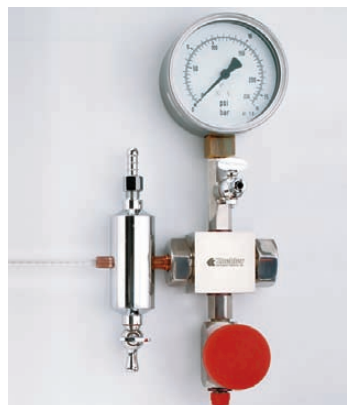
3½x6x12¼ (9x15x32.5)

Net Weight: 6½ lbs (3kg)

### Shipping Information

Shipping Weight: 11 lbs (5kg)

Dimensions: 2.5 Cu. ft.



**K32230 Dew Point Apparatus  
with Pressure Gauge and ASTM  
33C Thermometer**

### Ordering Information

#### Catalog No.

**K32230**

Dew Point Apparatus

#### Order Qty

1

#### Accessories

**K32230-1**

Pressure Gauge, 0 to 4 bar

1

**K32230-2**

Pressure Gauge, 0 to 40 bar

**K32230-3**

Pressure Gauge 0 to 70 bar

**K32230-4**

Pressure Gauge 0 to 140 bar

**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

**250-000-114F**

ASTM 114F Thermometer, range: -112 to +70°F

1

**250-000-114C**

ASTM 114C Thermometer, range: -80 to +20°C

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

# COPPER STRIP CORROSION BY LIQUEFIED PETROLEUM (LP) GASES

## Test Method

Tests the corrosiveness of LPG to copper by immersion of a polished test strip in the sample inside a test cylinder at elevated temperature. After one hour the test strip is removed and compared against the ASTM Copper Strip Corrosion Standards.

## LPG Copper Strip Corrosion Test Apparatus

- Conforms to ASTM D1838 and related specifications
- Four-sample testing capability

Consists of LPG Corrosion Test Cylinders, Water Bath, Copper Strips, Polishing Materials and the ASTM Copper Strip Corrosion Test Standards.

**LPG Corrosion Test Cylinders**—Stainless steel cylinder with ¼" needle valves for purging and admitting LPG samples. Dip tube with hook suspends copper strip in sample. Knurled, threaded cap with O-ring gasket hand tightens to a positive seal. Withstands hydrostatic test pressure of 1000 psig (6895kPa).

**LPG Corrosion Test Water Bath**—Thermostatically controlled water bath submerges four LPG Corrosion Test Cylinders in an upright position. Controls temperature at 100 ±1°F (37.8 ±0.5°C) per ASTM specifications. Soxhlet reflux condenser and constant water level device maintain proper working depth. Polished stainless steel inner wall and powder coated steel outer wall construction. Fully insulated.

### Ordering Information

| Catalog No.        |                                                                                                                                                                               | Order Qty |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| K40000             | LPG Corrosion Test Cylinder                                                                                                                                                   | 4         |
| K39900             | LPG Corrosion Test Water Bath,<br>115V 60Hz                                                                                                                                   | 1         |
| K39990             | LPG Corrosion Test Water Bath,<br>220-240V 50/60Hz                                                                                                                            |           |
| <b>Accessories</b> |                                                                                                                                                                               |           |
| K40200             | Copper Strip for LPG<br>12.5x1.5-3.0x75mm with<br>3.2mm hole per ASTM specifications                                                                                          | 4         |
| K40100             | Connecting Tubing<br>Sulfur-free plastic-lined tubing for connection of test<br>cylinder valve to sample source. With ¼" stainless<br>steel and aluminum connectors. 24" long | 1         |
| K25100             | ASTM Copper Strip Corrosion Test Standards<br>Colored reproductions of tarnished strips<br>encased in a plastic plaque.                                                       | 1         |
| 380-240-001        | Silicone Carbide Paper, 240-grit<br>For polishing copper strips prior to testing.<br>Pack of 50 sheets                                                                        | 1         |
| 380-150-000        | Silicone Carbide Grain, 150-grit<br>For final polishing of copper strips prior to testing.<br>1 lb package                                                                    | 1         |
| 380-150-001        | Silicone Carbide Paper, 150-grit<br>For polishing copper strips prior to testing.<br>Pack of 50 sheets                                                                        | 1         |
| K25000             | Polishing Vise<br>Holds copper strip firmly in place without marring<br>the edges. Stainless steel, mounted on<br>a composition base                                          | 1         |
| K25090             | Multi-Strip Polishing Vise<br>Similar to K25000 but capable of holding four<br>strips at a time                                                                               |           |
| 250-000-12F        | ASTM 12F Thermometer. Range: -5 to +215°F                                                                                                                                     | 1         |
| 250-000-12C        | ASTM 12C Thermometer. Range: -20 to +102°C                                                                                                                                    |           |



K39900 LPG Corrosion Test Bath



K40000 LPG Corrosion Test Cylinder

## Specifications

Conforms to the specifications of:

ASTM D1838; GPA 2140; ISO 6251

Water Bath Specifications:

Capacity: four (4) LPG Corrosion Test Cylinders

Maximum Temperature: 221°F (105°C)

Temperature Control Stability: ±1°F (±0.5°C)

Heater Range: 0-750W

Bath Medium: 3.8 gal (14.4L) Water

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 6.5A

220-240V 50/60Hz, Single Phase, 3.4A

## Shipping Information

Shipping Weight: 27 lbs (12.2kg)

Dimensions: 5.3 Cu. ft.

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

12x10x24 (30x25x61)

Net Weight: 19 lbs (8.6kg)

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

# COPPER CORROSION FROM PETROLEUM PRODUCTS

## Test Method

The Copper Strip Tarnish Test assesses the relative degree of corrosivity of petroleum products, including aviation fuels, automotive gasoline, natural gasoline, solvents, kerosene, diesel fuel, distillate fuel oil, lubricating oil and other products. A polished copper strip is immersed in 30mL of sample at elevated temperature. After the test period, the strip is examined for evidence of corrosion and a classification number from 1-4 is assigned based on a comparison with the ASTM Copper Strip Corrosion Standards. For aviation fuels and natural gasoline the sample tube is placed inside a stainless steel bomb during testing.

## Test Bomb Baths

Thermostatically controlled water bath immerses Copper Strip Corrosion Test Bombs at the required depth per ASTM specifications. Use for testing aviation gasoline, aviation turbine fuel and natural gasoline. Fully insulated, double-wall stainless steel construction. Soxhlet reflux condenser and constant water level device maintain proper working depth. Choice of four-bomb and eight-bomb models. Optional removable test tube rack converts four-bomb model for testing of products not requiring corrosion bomb.

**Specifications:** Conforms to the specifications of: ASTM D130; IP 154

FSPT DT-28-65; ISO 2160; DIN 51759; FTM 791-5325; NF M 07-015

Testing Capacity:

K25310/K25319: four (4) copper strip corrosion test bombs

K25320/K25329\*: eight (8) copper strip corrosion test bombs

\*or sixteen (16) test tubes with optional test rack

(Catalog No. K25309) installed

Maximum Temperature: 221°F (105°C)

Temperature Control Stability: ±1°F (±0.5°C)

Heater Range: 0-750W

Bath Medium: 5 gal (18.9L) water

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 7.5A

220-240V 50/60Hz, Single Phase, 4A

Temperature Control: Analog

## Included Accessories

Rubber Stoppers for bomb openings (4)

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

4-bomb model: 12x10x21 (30x25x53)

8-bomb model: 16x11½x21 (41x29x54)

Net Weight:

4-bomb model: 18½ lbs (8.4kg)

8-bomb model: 24 lbs (10.9kg)

## Shipping Information

Shipping Weight:

4-bomb model: 41 lbs (18.6kg)

8-bomb model: 45 lbs (20.4kg)

Dimensions:

4-bomb model: 5.3 Cu. ft.

8-bomb model: 5.5 Cu. ft.



**K25330 Copper Strip Test Tube Bath**

## Test Tube Bath

Constant temperature bath immerses 17 test tubes for copper strip tarnish tests of products not requiring a test bomb, including: diesel fuel, fuel oil, automotive gasoline, Stoddard solvent, kerosene and lubricating oil. Microprocessor temperature controller has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an overtemperature control circuit which automatically interrupts power to the unit should bath temperature exceed a 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.* Welded stainless steel inner wall and powder coated steel outer wall construction with built-in support rack. Fully insulated.

## Specifications

Conforms to the specifications of: ASTM D130, D6074, D6158; FSPT DT-28-65; IP 154; ISO 2160; DIN 51759; FTM 791-5325; NF M 07-015

Capacity: 17 test tubes

Maximum Temperature: 190°C (374°F)

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

Heater Range: 0-750W

Bath Medium: 5 gal (18.9L) water or high temperature heater transfer fluid

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 7.5A

220-240V 50/60Hz, Single Phase, 4A

Temperature Control: Digital

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

15½x12½x14 (39x32x36)

Net Weight: 27 lbs (12.2kg)

## Shipping Information

Shipping Weight: 45 lbs (20.4kg)

Dimensions: 12.8 Cu. ft.

## Ordering Information

### Catalog No.

|               |                                                                      |
|---------------|----------------------------------------------------------------------|
| <b>K25310</b> | Bath for Copper Strip Corrosion Test Bombs, 4-Unit, 115V 60Hz        |
| <b>K25319</b> | Bath for Copper Strip Corrosion Test Bombs, 4-Unit, 220-240V 50/60Hz |
| <b>K25320</b> | Bath for Copper Strip Corrosion Test Bombs, 8-Unit, 115V 60Hz        |
| <b>K25329</b> | Bath for Copper Strip Corrosion Test Bombs, 8-unit, 220-240V 50/60Hz |
| <b>K25309</b> | Optional Test Tube Rack for 8-Bomb Bath                              |

Please refer to page 99 for photograph of K25310 Series Corrosion Baths.

## Ordering Information

### Catalog No.

|                     |                                               |
|---------------------|-----------------------------------------------|
| <b>K25330</b>       | Copper Strip Test Tube Bath, 115V 60Hz        |
| <b>K25339</b>       | Copper Strip Test Tube Bath, 220-240V 50/60Hz |
| <b>K25330-8B</b>    | Optional test Bomb Rack                       |
| <b>K25330-4B-8T</b> | Optional Rack, 4-Bomb, 8- Tube                |
| <b>K25330-6B-6T</b> | Optional Rack, 6-Bomb, 6-Tube                 |

# COPPER CORROSION FROM PETROLEUM PRODUCTS

## Copper Strip Corrosion Test Bomb

- For aviation fuels and natural gasoline

Precision machined stainless steel bomb inserts in copper corrosion bath for testing aviation fuels and natural gasoline. Withstands test pressure of 100psi (689kPa) per specifications. Threaded cap with O-ring gasket and knurled circumference tightens by hand to a positive seal. A 1/8" groove in the bomb threads permits safe, gradual release of pressure when opening the bomb.

### Specifications

Conforms to the specifications of:

ASTM D130, D6074, D6158; IP 154; ISO 2160; DIN 51759; FTM 791-5325; NF M 07-015

Net Weight: 1 lb (.45kg)

### Shipping Information:

Shipping Weight: 2 lbs (.91kg)

### Ordering Information

| Catalog No.        |                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>K25200</b>      | Copper Strip Corrosion Test Bomb                                                                                               |
| <b>Accessories</b> |                                                                                                                                |
| <b>K25080</b>      | Copper Test Strip<br>12.5x1.5-3.0mm x 75mm to ASTM specifications                                                              |
| <b>332-004-004</b> | Test Tube<br>25 x 150mm                                                                                                        |
| <b>332-004-002</b> | Viewing Test Tube<br>Protects copper strip during inspection or storage                                                        |
| <b>K25100</b>      | ASTM Copper Strip Corrosion Standards<br>Colored reproductions of tarnished strips encased in a plastic plaque                 |
| <b>380-220-001</b> | Silicone Carbide Paper, FEPA Grade, 220 grit<br>For polishing of copper strips prior to testing - Pack of 50 sheets            |
| <b>380-150-003</b> | Silicone Carbide Grain, FEPA grade, 150 grit<br>For final polishing of copper strips prior to testing - 1 lb package           |
| <b>K25000</b>      | Polishing Vise<br>Holds copper strip firmly in place without marring the edges. Stainless steel, mounted on a composition base |
| <b>K25090</b>      | Multi-Strip Polishing Vise<br>Similar to K25000 but capable of holding four strips at a time                                   |
| <b>250-000-12F</b> | ASTM 12F Thermometer. Range: -5 to +215°F                                                                                      |
| <b>250-000-12C</b> | ASTM 12C Thermometer. Range: -20 to +102°C                                                                                     |

## Silver Corrosion Test

Please refer to page 99 for information.

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

### Test Apparatus for Aviation Fuels and Natural Gasoline

| Catalog No.        |                                                      | Order Qty |
|--------------------|------------------------------------------------------|-----------|
| <b>K25310</b>      | Bath for Copper Strip Corrosion Test Bombs, 115V     | 1         |
| <b>K25319</b>      | Bath for Copper Strip Corrosion Test Bombs, 220-240V |           |
| <b>K25200</b>      | Copper Strip Corrosion Test Bomb                     | 4         |
| <b>K25080</b>      | Copper Strips                                        | 4         |
| <b>332-004-004</b> | Test Tube                                            | 4         |
| <b>332-004-002</b> | Viewing Test Tube                                    | 4         |
| <b>K25100</b>      | ASTM Copper Strip Corrosion Standard                 | 1         |
| <b>380-220-001</b> | Silicone Carbide Paper, FEPA Grade, 220 grit         | 1         |
| <b>380-150-003</b> | Silicone Carbide Grain, FEPA grade, 150 grit         | 1         |
| <b>K25000</b>      | Polishing Vise                                       | 1         |
| <b>250-000-12F</b> | ASTM 12F Thermometer                                 | 1         |
| <b>250-000-12C</b> | ASTM 12C Thermometer                                 |           |

### Test Apparatus for Diesel Fuel, Fuel Oil, Automotive Gasoline, Stoddard Solvent, Kerosene, Lubricating Oil and Biodiesel

| Catalog No.        |                                                                 | Order Qty |
|--------------------|-----------------------------------------------------------------|-----------|
| <b>K25330</b>      | Copper Strip Test Tube Bath, 115V<br>(or K25339 Bath, 220-240V) | 1         |
| <b>K25080</b>      | Copper Strips                                                   | 17        |
| <b>332-004-004</b> | Test Tube                                                       | 17        |
| <b>332-004-002</b> | Viewing Test Tube                                               | 17        |
| <b>K25100</b>      | ASTM Copper Strip Corrosion Standard                            | 1         |
| <b>380-220-001</b> | Silicone Carbide Paper, FEPA Grade, 220 grit                    | 1         |
| <b>380-150-003</b> | Silicone Carbide Grain, FEPA grade, 150 grit                    | 1         |
| <b>K25090</b>      | Multi-Strip Polishing Vise                                      | 1         |
| <b>250-000-12F</b> | ASTM 12F Thermometer                                            | 1         |
| <b>250-000-12C</b> | ASTM 12C Thermometer                                            |           |



K25200 Copper Strip Corrosion Bomb with K25100 and K25080

# VAPOR PRESSURE OF PETROLEUM PRODUCTS AND LP GASES

## Vapor Pressure of Petroleum Products (Reid Method) and Liquefied Petroleum Gases (LPG Method)

### Test Method

Vapor pressure is a critical factor in the handling and performance of liquid petroleum and liquefied petroleum gas (LPG) products. The vapor pressure of automotive gasolines is subject to governmental regulation for pollution control purposes.

### Reid Vapor Pressure Cylinders

- Conform to ASTM D323, D1267 and related specifications
- One-opening and two-opening types

Polished stainless steel test cylinders for vapor pressure tests of liquid petroleum products, volatile crude oil and liquefied petroleum gas (LPG). Consists of upper chamber and lower chamber in required 4:1 volume ratio. O-ring gaskets provide tight seal between chambers and at gauge coupling. One-opening type is for gasoline and other products having a Reid Vapor Pressure below 26psi (180kPa). Two-opening type is for liquid products having a Reid Vapor Pressure above 26psi (ASTM D323) and for LPG (ASTM D1267). Lower chamber of two-opening apparatus includes straight-through ball valve and 1/4" needle valve. For LPG testing, order two-opening type apparatus and accessory bleeder valve assembly.

### Specifications:

Conforms to the specifications of: ASTM D323, D1267; GPA 2140; IP 69, 161; ISO 3007, 4256; DIN 51616, 51754; FTM 791-1201

Hydrostatic Test (two-opening type): Withstands 1000psi (6894kPa) gauge hydrostatic pressure per ASTM D1267 specifications

### Included Accessories

Threaded 1/4" Gauge Coupling  
O-ring Seals (2)

### Shipping Information

Shipping Weight: 7 lbs (3.2kg)

### Ordering Information

#### Catalog No.

|               |                                                               |
|---------------|---------------------------------------------------------------|
| <b>K11500</b> | Reid Vapor Pressure Cylinder, One-Opening Type                |
| <b>K11201</b> | Reid Vapor Pressure Cylinder Two-Opening Type                 |
| <b>K11202</b> | Bleeder Valve Assembly for LPG tests for K11201 test cylinder |



### Reid Vapor Pressure Gauges

- Conforming to ASTM D323, D1267 and related specifications
- Dual psi/kPa scale on a 4 1/2" diameter dial
- Accurate to within 0.5% of scale range
- Micrometer adjustable pointer

Ruggedly constructed Bourdon type gauge designed especially for the Reid Vapor Pressure test. Heavy duty rotary brushed stainless steel movement. Lightweight aluminum case with corrosion-resistant finish and heavy duty brass non-sparking handle. Includes blow-out disc and 1/4" NPT male thread connection.

### Ordering Information

| Catalog No.        | Range psi/kPa | Figure Intervals psi/kPa | Interval Graduations psi/kPa |
|--------------------|---------------|--------------------------|------------------------------|
| <b>311-005-004</b> | 0-5/35        | 0.5/5                    | 0.05/0.2                     |
| <b>311-015-002</b> | 0-15/100      | 1.0/10                   | 0.1/1.0                      |
| <b>311-030-002</b> | 0-30/200      | 5.0/20                   | 0.5/2.0                      |
| <b>311-060-002</b> | 0-60/400      | 5.0/50                   | 0.2/2.5                      |
| <b>311-100-002</b> | 0-100/700     | 10/50                    | 0.5/2.5                      |
| <b>311-250-001</b> | 0-250/1750    | 25/100                   | 1.0/20                       |
| <b>311-600-003</b> | 0-600/4200    | 50/250                   | 2.0/25                       |



311-060-002 RVP Gauge

# VAPOR PRESSURE OF PETROLEUM PRODUCTS AND LP GASES

## Wireless Reid Vapor Pressure Data Acquisition System

Windows®-based electronic pressure measurement software designed for ASTM Reid Vapor Pressure test methods. Monitors up to eight pressure vessel channels, graphing pressure and RVP data in real-time for each channel. Each channel can be run independently and configured for the pressure ranges of 0-50, 0-200, and 0-1000 psi. Pressure values can be reported in psi or kPa. Software automatically exports results into Microsoft® Excel for data analysis and storage.

### Ordering Information

| Catalog No.        |                                                                                                                                                                                                            | Order Qty |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>K11401</b>      | RVP Data Acquisition System, 115V 60 Hz                                                                                                                                                                    | 1         |
| <b>K11491</b>      | RVP Data Acquisition System, 230V 50/60 Hz<br><i>Includes software, multiplexer box, USB converter box and RTD temperature probe.</i><br><i>Requires one pressure transducer for each pressure vessel.</i> |           |
| <b>K11404-50</b>   | RVP Pressure Transducer, 0-50 psi                                                                                                                                                                          | 1-8       |
| <b>K11404-200</b>  | RVP Pressure Transducer, 0-200 psi                                                                                                                                                                         | 1-8       |
| <b>K11404-1000</b> | RVP Pressure Transducer, 0-1000 psi                                                                                                                                                                        | 1-8       |

## 4 Unit Reid Vapor Pressure Bath

- Conforms to ASTM D323, D1267 and related specifications
- Free standing or flush-mount benchtop installation
- Microprocessor programmable high accuracy temperature control

Constant temperature water baths designed for Reid Vapor Pressure determinations of liquid petroleum products and liquefied petroleum gases (LPG). Immerses vapor pressure apparatus at the proper depth per ASTM specifications. Controls bath temperature with  $\pm 0.2^{\circ}\text{F}$  ( $\pm 0.1^{\circ}\text{C}$ ) precision. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath 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  $^{\circ}\text{C}/^{\circ}\text{F}$  format. Double-wall construction with fiberglass insulated stainless steel tank. A sturdy 1" (25mm) flange permits flush-mount benchtop installation for easy access to the bath interior. Built-in holders suspend test cylinders at the required depth. Equipped with overflow stand pipe/drain.

### Specifications

Conforms to the specifications of:

ASTM D323, D1267; GPA 2140; IP 69, 161; ISO 3007, 4256;

DIN 51616, 51754; FTM 791-1201; NF M 07-007, 41-010

Capacity: 1 to 4 vapor pressure apparatus, one- or two-opening type

Temperature Control Stability:  $\pm 0.2^{\circ}\text{F}$  ( $\pm 0.1^{\circ}\text{C}$ )

Maximum Temperature: 212°F (100°C)

Bath Medium: 13.7 gal (51.9L) water

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 18.8A

220-240V 50/60Hz, Single Phase, 9.4A

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

15x15x36 (38.1x38.1x91.5)

Net Weight: 67 lbs (30.4kg)

### Shipping Information

Shipping Weight: 105 lbs (47.7kg)

Dimensions: 14 Cu. ft.

### Ordering Information

| Catalog No.   |                                                                                                                                                                      |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>K11450</b> | Reid Vapor Pressure Bath, 4-Unit, 115V 60Hz                                                                                                                          |
| <b>K11459</b> | Reid Vapor Pressure Bath, 4-Unit, 220-240V 50/60Hz<br><i>Photograph, thermometers, and additional accessories for Reid Vapor Pressure testing appear on page 94.</i> |



Reid Vapor Pressure Data Acquisition System

## 21-Unit Reid Vapor Pressure Bath

- Conforms to ASTM D323, 1267 and related specifications
- Digital electronic temperature control
- Automatic water level control maintains proper immersion depth

Constant temperature water bath immerses twenty-one test cylinders for vapor pressure tests on liquid products and liquefied petroleum gas (LPG). Electronic level control automatically maintains the proper immersion depth per ASTM specifications. Heating system employs a 6kW stainless steel heat exchanger with a heavy duty circulating pump to provide rapid heat-up, even heat distribution and ease of servicing. Convenient digital setpoint and display permits rapid selection of any bath liquid temperature within the operating range. A built-in overtemperature limit control protects against accidental overheating. Bath interior and internal components are constructed of heavy gauge stainless steel. Control panel is shielded by a hinged acrylic cover. Includes sturdy angle-iron base with corrosion resistant polyurethane finish. Order pressure gauges and cylinders separately.

### Specifications

Conforms to the specifications of: ASTM D323, D1267; GPA 2140;

IP 69, 161; ISO 3007, 4256; DIN 51616, 51754; FTM 791-1201

Testing Capacity: 21 vapor pressure test cylinders

Temperature Range: 212°F (100°C)

Temperature Control Stability:  $\pm 0.2^{\circ}\text{F}$  ( $\pm 0.1^{\circ}\text{C}$ )

Heater Range: 0-6000W

Bath Medium: 58 gal (219.5L) water

Electrical Requirements: **CE**

220-240V 50Hz, Single Phase, 28A

220-240V 60Hz, Single Phase, 28A

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

Overall: 48x22x36 (122x56x91)

### Ordering Information

| Catalog No.   |                                                  |
|---------------|--------------------------------------------------|
| <b>K11415</b> | Reid Vapor Pressure Bath, 21-Unit, 220-240V 50Hz |
| <b>K11416</b> | Reid Vapor Pressure Bath, 21-Unit, 220-240V 60Hz |

## VAPOR PRESSURE OF PETROLEUM PRODUCTS AND LP GASES



**K11459 Reid Vapor Pressure Bath**

Test apparatus for liquid products (ASTM D323) requires:  
 Test Cylinders, one or two-opening type  
 Pressure Gauges  
 Constant Temperature Bath  
 Bath Thermometer  
 Sample Container with Cover Assembly  
 Transfer Connection  
 Manometer  
 Manometer Adapter Kit

On-line version of this product is available. Please contact Koehler Customer Service for additional information.

| Ordering Information |                                                                                                                                                                                  |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Catalog No.</b>   |                                                                                                                                                                                  |
| <b>250-000-18F</b>   | ASTM 18F Thermometer<br>Range: 94 to 108°F                                                                                                                                       |
| <b>250-000-18C</b>   | ASTM 18C Thermometer<br>Range: 34 to 42°C                                                                                                                                        |
| <b>250-000-65F</b>   | ASTM 65F Thermometer<br>Range: 122 to 176°F                                                                                                                                      |
| <b>250-000-65C</b>   | ASTM 65C Thermometer<br>Range: 50 to 80°C                                                                                                                                        |
| <b>K11800</b>        | Sample Container with Cover Assembly                                                                                                                                             |
| <b>K11810</b>        | Transfer Connection<br>Consists of threaded brass cap, delivery tube and sampling tube. Use for removing liquid from the sample container in accordance with ASTM specifications |
| <b>371-000-002</b>   | Liquid Manometer<br>Graduated in inches (0.1" div.).<br>For checking pressure gauge reading of up to 15psi                                                                       |
| <b>K112B-1-0-12</b>  | Manometer Adapter Kit<br>Kit for attaching pressure gauge to liquid manometer for pressure verification                                                                          |
| <b>AS568-210</b>     | O-ring Seal<br>For coupling between air and gas chambers on K11500 and K11201 vapor pressure bombs                                                                               |
| <b>AS568-113</b>     | O-ring Seal<br>For gauge and bleeder valve assembly connections on K11500 and K11201 vapor pressure bombs                                                                        |
| <b>K40100</b>        | Flexible Tubing<br>Sulfur-free plastic lined tubing with ¼" stainless steel and aluminum connectors.<br>For charging LPG test cylinder.                                          |

Test apparatus for liquefied petroleum gases (ASTM D1267) requires:  
 Test Cylinders, two-opening type  
 Bleeder Valve Assemblies  
 Pressure Gauges  
 Constant Temperature Bath  
 Bath Thermometer  
 Flexible Tubing  
 Manometer  
 Manometer Adapter Kit

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

## WAX APPEARANCE POINT OF DISTILLATE FUELS

### Test Method

Detects the formation of wax crystals in burner fuels, diesel fuels and turbine engine fuels at low temperatures. The sample is cooled at a specified rate while being agitated. The temperature at which wax first appears is the wax appearance point.

### Wax Appearance Point Apparatus

- Conforms to ASTM D3117 specifications

For detection of separated solids in burner fuels, diesel fuels and turbine engine fuels. Similar to K29700 Freezing Point Apparatus. Includes jacketed sample tube, motorized stirrer assembly, outer vacuum flask, clamps and stand.

Electrical Requirements: **CE**

115V 60Hz  
 220-240V 50Hz  
 220-240V 60Hz

| Ordering Information |                                               |           |
|----------------------|-----------------------------------------------|-----------|
| Catalog No.          |                                               | Order Qty |
| <b>K29760</b>        | Wax Appearance Point Apparatus, 115V 60Hz     | 1         |
| <b>K29768</b>        | Wax Appearance Point Apparatus, 220-240V 50Hz |           |
| <b>K29769</b>        | Wax Appearance Point Apparatus, 220-240V 60Hz |           |
| <b>250-000-06F</b>   | ASTM 6F Thermometer. Range: -112 to +70°F     | 1         |
| <b>250-000-06C</b>   | ASTM 6C Thermometer. Range: -80 to +20°C      |           |

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

# SMOKE POINT OF KEROSENE AND AVIATION TURBINE FUEL

## Test Method

Smoke point is an indicator of the combustion qualities of aviation turbine fuels and kerosene. The fuel sample is burned in the Smoke Point Lamp, and the maximum flame height obtainable without smoking is measured.

## Smoke Point Lamp

- Conforms to ASTM D1322 and related specifications

Burns fuel samples under controlled conditions for smoke point determinations of aviation turbine fuels and similar products. Consists of brass lamp body with chimney; gallery; 0-50mm black glass scale with white markings; brass plated door with curved glass window; candle socket; and plated brass candle with wick tube and air vent. Mounted on a cast iron base with aluminum support rod.

| Ordering Information |                                                                                                                                                     |           |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Catalog No.          |                                                                                                                                                     | Order Qty |
| K27000               | Smoke Point Lamp                                                                                                                                    | 1         |
| <b>Accessories</b>   |                                                                                                                                                     |           |
| K27021               | Extracted Cotton Wicks<br>Prepared in accordance with<br>ASTM D1322 (9.2) requirements.<br>Packed in a sealed tube with desiccant.<br>Case of 12    |           |
| K27020               | Cotton Wicks, pack of 12                                                                                                                            |           |
| K27050               | Sighting Device<br>Installs on chimney of Smoke Point Lamp.<br>Eliminates parallax                                                                  | 1         |
| K27060               | Wick Insertion Tool<br>Facilitates insertion of cotton wick into wick tube                                                                          | 1         |
| K27065               | Wick Trimmer<br>Use together with K27060 Insertion Tool<br>to place wick at the correct height in<br>the wick tube, free of twists and frayed ends. | 1         |
| K27010               | Interchangeable Candle                                                                                                                              |           |

**Automatic Smoke Point Apparatus available. Inquire with Koehler Customer Service.**



*K27000 Smoke Point Apparatus with K27050 Sighting Device and K27060 Wick Insertion Tool*

## Specifications

Conforms to the specifications of:  
ASTM D1322; ISO 3014; IP 57;  
DIN 51406; FTM 791-2107; NF M 07-028

## Included Accessories

Cotton Wicks, non-extracted (6)  
Interchangeable Candle

## Dimensions

dia.xh,in.(cm)  
7x18½ (18x47)  
Net Weight: 10 lbs (4.5kg)

## Shipping Information

Shipping Weight: 16 lbs (7.3kg)  
Dimensions: 5 Cu. ft.

## FREEZING POINT OF AVIATION FUELS



*K29790 Freezing Point Bath with Freezing Point Apparatus and Stirrer*

### Test Method

The freezing point of an aviation fuel is the lowest temperature at which the fuel remains free of solid hydrocarbon crystals that can restrict the flow of fuel. The temperature of the fuel in the aircraft tank normally falls during flight depending upon aircraft speed, altitude, and flight duration. The freezing point of the fuel must be lower than the minimum operational tank temperature. The test determines the temperature below which solid hydrocarbon crystals form in aviation fuels. The sample is cooled with continuous stirring in a Dewar-type sample tube until crystals appear.

### Refrigerated Freezing Point Bath

- Improved design with enhanced performance and safety features
- Operating range to  $-100^{\circ}\text{F}$  ( $-73^{\circ}\text{C}$ )
- Microprocessor PID digital temperature control
- Dual digital displays show setpoint and actual bath temperature
- Selectable temperature scale – Fahrenheit or Celsius
- Conforms to ASTM D2386 and related specifications

Redesigned constant temperature bath for freezing point determinations on fuel samples at temperatures as low as  $-100^{\circ}\text{F}$  ( $-73^{\circ}\text{C}$ ). Accommodates K29700 Freezing Point Apparatus and accessory stirrer. Microprocessor PID circuitry provides precise, reliable temperature control within ASTM specified tolerances. Simple push button controls and dual digital displays permit easy setting and monitoring of bath temperature. Bath medium is contained in a clear, evacuated Dewar flask, and glare-free fluorescent backlighting provides excellent visibility when working with the freezing point samples. Air-cooled hermetic compressors provide efficient operation with the use of CFC-free refrigerants. Temperature control uniformity is assured by means of a motorized stirrer which provides complete circulation without turbulence. Cabinet construction is polyester-epoxy finished steel with a chemical-resistant composite top surface. Working (top) surface includes port and mounting plate for K29700 Freezing Point Apparatus and accessory stirrer. Bath rests on adjustable leveling feet.

### Specifications

Conforms to the specifications of:

ASTM D2386; IP 16; ISO 3013; DIN 51421; FTM 791-1411; NF M 07-048

Temperature Range: Ambient to  $-100^{\circ}\text{F}$  ( $-73^{\circ}\text{C}$ )

Temperature Control Accuracy and Uniformity: Exceeds ASTM requirements throughout the operating range

Display:  $0.1^{\circ}\text{C}/^{\circ}\text{F}$  resolution

### Electrical Requirements: ☐ ☐

115V, 60Hz, Single Phase, 18.3A

220-240V, 50Hz, Single Phase, 10.0A

220-240V, 60Hz, Single Phase, 10.0A

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

35x26x31 (89x66x78.75)

Net Weight: 259 lbs (117.75kg)

### Shipping Information

Shipping Weight: 373 lbs (169.5kg)

Dimensions:  $23\frac{3}{4}$  Cu. ft.

### Ordering Information

| Catalog No. |                                                                        | Order Qty |
|-------------|------------------------------------------------------------------------|-----------|
| K29790      | Refrigerated Freezing Point Bath<br>115V 60Hz, Single Phase, 18.3A     | 1         |
| K29795      | Refrigerated Freezing Point Bath<br>220-240V 50Hz, Single Phase, 10.0A |           |
| K29796      | Refrigerated Freezing Point Bath<br>220-240V 60Hz, Single Phase, 10.0A |           |
| K29700      | Freezing Point Apparatus, ASTM D2386                                   | 1         |
| K29750-1-7  | Stirrer Motor, 115V 60Hz                                               | 1         |
| K29758-0-7  | Stirrer Motor, 220-240V 50Hz                                           |           |
| K29759-1-7  | Stirrer Motor, 220-240V 60Hz                                           |           |

### Accessories

|              |                                                                                                          |   |
|--------------|----------------------------------------------------------------------------------------------------------|---|
| 250-000-114C | ASTM 114C Thermometer. Range: $-80$ to $+20^{\circ}\text{C}$                                             | 1 |
| K29720       | Moistureproof Collar, Type A<br>Use in place of brass packing gland to prevent condensation of moisture. |   |
| K29721       | Moistureproof Collar, Type B<br>Use to prevent condensation.                                             |   |

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

 Software compatible, inquire with Koehler Customer Service.

# AUTOMATED FREEZING POINT OF AVIATION FUELS

## Test Method

Determines the temperature below which solid hydrocarbon crystals may form in aviation turbine fuels and aviation gasoline. The freezing point of an aviation fuel is the lowest temperature at which the fuel remains free of solid hydrocarbon crystals that can restrict the flow of fuel through filters if present in the fuel system of the aircraft. The temperature of the fuel in the aircraft tank normally decreases during flight depending on aircraft speed, altitude, and flight duration. The freezing point of the fuel must always be lower than the minimum operational fuel temperature.

## Automatic Freezing Point Analyzer with Integrated Panel PC

- Conforms to ASTM D1177, D1655, D2386, D5901, D5972 and related specifications
- Stand alone system with Integrated Touch Screen Panel PC
- Direct Cooling system eliminates the need for solvent cooling baths
- One-stage cooling system provides temperatures as low as -45°C and a two-stage cooling system down to -80°C
- Freezing Point measured by light pulsed emission on I.R spectrum through a coaxial fiber optic with mirror

The freezing point detection system provides automated sample testing with the accuracy and repeatability in accordance with ASTM D1177, D1655, D2386, D5901, D5972 and related international specification. The sample is cooled in the test chamber with constant stirring. The sophisticated dynamic measurement system emits a light pulse every 0.5°C from a coaxial fiber optic cable positioned above the test sample. The light pulse is then reflected off the mirror of the fiber optic to an optical sensor. The advanced software package analyzes the response of the light pulse. The initial appearance of crystallization is monitored by light scattering. The sample is then warmed up, and the temperature at which the hydrocarbon crystals disappear is recorded as the freezing point. All clear and transparent fuels are readily measured by the detection system, regardless of sample color.

**Integrated Panel PC and Software Package**—The Automated Freezing Point Analyzer is a complete standalone system featuring an integrated panel PC with an advanced software package. The 6.4" TFT/LCD touch screen display has a resolution of 640x480 with a 262K color scheme. All analytical parameters are graphed and displayed in real time as well as recorded in Microsoft® Excel compatible file format. The software monitors the operation and performance of all the analyzer components for proper data measurement, including the solenoid valves, cooling system, pressure sensors, and the Platinum resistance PT100 Class A temperature probe.

**Cooling System**—For various user applications, the automated freezing point system is available with either one-stage cooling for temperatures as low as -45°C or two-stage cooling for temperatures as low as -80°C. The direct cooling system features integrated gas CFC free motors compressors thus eliminating the need for a solvent cooling bath. The direct system is capable of rapid cooling, approaching -80°C bath temperatures in approximately 15 minutes, and utilizes less electricity than standard cooling systems. The rapid cooling feature combined with a consistent cooling profile system provides repeatable results with high test reproducibility.

## Safety Features

- Audible alarm and displayed messages (at the end of the analysis and in case of errors and/or malfunctions)
- Pressure controller for 1st and 2nd stage motor compressor
- Thermostat for 2nd stage activation
- Thermo-switch for each cooling / heating jacket
- Motor compressors equipped with internal overload devices



*KLA-5-TS Automatic Freezing Point Analyzer with integrated touch screen PC*

**Multiple Configuration System**—These automated sample cooling and physical property measurement systems can be configured with one, two, three, four and six test positions with one of five possible analytical heads at each position: cloud point, pour point, cloud & pour point, cold filter plugging point and freezing point. Standard and customized multiple configuration systems are readily available.

## Specifications

Conforms to the specifications of:

ASTM D1177, D1655, D2386, D5901 (Withdrawn 2010); IP 16; ISO 3013

Temperature Range:

One-Stage: +30 to -45°C

Two-Stage: +30 to -80°C

Resolution: 0.06°C

Accuracy:  $\pm 0.1^\circ\text{C}$

Repeatability / Reproducibility: as per standard test methods or better

Data Storage: > 60,000 analyses

Electrical Requirements:  $\text{C}\ \text{E}$

115V  $\pm 15\%$  / 60Hz

220V  $\pm 15\%$  / 50 to 60Hz

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

26 x 23 $\frac{3}{4}$  x 31 $\frac{1}{2}$  (66x60x80)

Net Weight: 176.5 lbs (80kg)

## Ordering Information

### Catalog No.

**KLA-5-TS**

Automatic Freezing Point Analyzer with Touch Screen,  
(One-stage)

**KLA-5-TS/2**

Automatic Freezing Point Analyzer with Touch Screen,  
(Two-stage)

*Please specify voltage requirements when ordering.*

### Accessories

**KLA-PT100-CAL**

Certified Calibration Decade Box - PT100 Simulator

**KLA-DB-KIT**

Set of Connectors and Cables

*Extended Cooling Range down to -100°C Available Upon Request.*

# ANTIRUST PROPERTIES OF PETROLEUM PRODUCTS PIPELINE CARGOES



**K30160NACE Rust Preventing Characteristics Bath**

## Specifications

Conforms to the specifications of:

NACE TM-01-72; ASTM D665\*, D6158, D3603\*;

IP 135; ISO 7120; DIN 51585; FTM 791-4011; NF T 60-151

Testing Capacity: Six (6) 400mL sample beakers

Maximum Temperature: 104°C (220°F)

Temperature Control Stability:  $\pm 0.5^{\circ}\text{C}$  ( $\pm 1^{\circ}\text{F}$ )

Heater Range: 0-1500W

Drive Motor: explosion proof ball bearing type

Bath Medium: 11 gal (41.6L) white technical oil

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 13.0A

220-240V 50Hz, Single Phase, 6.8A

220-240V 60Hz, Single Phase, 6.8A

## Included Accessories

Steel Test Specimens (6)

Type 2 Plastic Specimen Holders (6)

Plastic Beaker Covers (6)

## Dimensions

32 $\frac{1}{2}$ x14 $\frac{1}{2}$ x27 (83x36x69)

Net Weight: 79 lbs (35.8kg)

## Shipping Information

Shipping Weight: 150 lbs (68.0kg)

Dimensions: 16.2 Cu. ft.

*This equipment has been modified for safe operation when testing volatile petroleum products in accordance with NACE Standard Test Method TM-01-72.*

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

 Software compatible, inquire with Koehler Customer Service.

## Test Method

Used to control corrosion in product pipelines caused by moisture condensed from gasoline and distillate fuels. Antirust properties are determined by immersing a polished steel test specimen in a stirred mixture of the sample and distilled water held at constant temperature.

## Rust Preventing Characteristics Oil Bath

- Conforms to NACE TM-01-72, ASTM D665\* and D3603\* specifications
- Accommodates six sample beakers
- Microprocessor temperature control with digital display and overtemperature protection

Six-place constant temperature bath with stirrers for rust preventing characteristics tests. Stirs sample-water mixtures at 1000rpm and controls temperature with  $\pm 0.5^{\circ}\text{C}$  ( $\pm 1^{\circ}\text{F}$ ) stability. Immerses test beakers at the proper depth per NACE specifications. 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 bath temperature exceed a programmed cut-off point. Stainless steel stirrer paddles are driven at 1000rpm by an improved pulley drive-roller bearing arrangement. Paddles move to a raised position for placement of sample beakers in the bath. Stainless steel bath includes perforated support shelf for beakers and cover plate. Long lasting polyester drive belt improves reliability. Drive train components are protected by a removable steel guard. All exterior surfaces have stainless steel or chemical resistant polyurethane enamel finishes.

*\*To order this equipment for ASTM and equivalent test methods, please turn to page 128.*

## Ordering Information

| Catalog No.                                     |                                                                                                                | Order Qty |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------|
| <b>Rust Preventing Characteristics Oil Bath</b> |                                                                                                                | <b>1</b>  |
| <b>K30160NACE</b>                               | Rust Preventing Characteristics Oil Bath, 115V 60Hz                                                            |           |
| <b>K30165NACE</b>                               | Rust Preventing Characteristics Oil Bath, 220-240V 50Hz                                                        |           |
| <b>K30166NACE</b>                               | Rust Preventing Characteristics Oil Bath, 220-240V 60Hz                                                        |           |
| <b>Accessories</b>                              |                                                                                                                |           |
| <b>332-002-007</b>                              | Test Beaker, 400mL, for NACE TM-01-72                                                                          | 6         |
| <b>250-000-09F</b>                              | ASTM 9F Thermometer<br>Range: 20 to 230°F                                                                      | 7         |
| <b>250-000-09C</b>                              | ASTM 9C Thermometer<br>Range: -5 to +110°C                                                                     |           |
| <b>K30130</b>                                   | Chuck for polishing test specimens<br>Includes locknut and shaft for mounting on accessory drive motor         | 1         |
| <b>K30150</b>                                   | Drive Motor<br>Drives K30130 Chuck. Mounted on base.                                                           |           |
|                                                 | 115V 60Hz                                                                                                      | 1         |
| <b>380-100-001</b>                              | Silicone Carbide Cloth, 100 grit<br>For preliminary grinding and final polishing of test specimens. Pack of 50 | 1         |
| <b>Test Specimens</b>                           |                                                                                                                |           |
| <b>K30110</b>                                   | Steel Test Specimens for ASTM D665/<br>NACE TM-01-72. Machined to ASTM/NACE specifications. Without holder     |           |
| <b>K30100</b>                                   | Test Specimen with Type 2 PMMA Holder for ASTM D665/NACE TM-01-72                                              |           |
| <b>K30101</b>                                   | Test Specimen with Type 2 PTFE Holder                                                                          |           |

# SILVER CORROSION OF AVIATION TURBINE FUELS

## Test Method

Tests the corrosiveness of aviation turbine fuels towards silver. A polished silver strip is immersed in a fuel sample at elevated temperature. After a specified test period, the strip is removed from the sample, washed and evaluated for corrosion.

## Water Bath for Silver Corrosion

- Conforms to IP 227 specifications
- Six sample capability

Fully insulated, thermostatically controlled water bath with constant water level device. Use together with K25370 Bath Conversion Kit to immerse six 350mL test tubes for silver strip corrosion tests. Stainless steel inner wall and powder coated steel outer wall construction.

| Ordering Information                    |                                                                                                                                      |           |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Catalog No.                             |                                                                                                                                      | Order Qty |
| K25310                                  | Water Bath,<br>115V 60Hz                                                                                                             | 1         |
| K25319                                  | Water Bath,<br>220-240V 50/60Hz                                                                                                      | 1         |
| K25370                                  | Bath Conversion Kit for IP 227                                                                                                       | 1         |
| <b>Accessories</b>                      |                                                                                                                                      |           |
| K25360                                  | Glassware Set for IP 227<br>Includes cold-finger condenser, glass cradle<br>and 350mL test tube                                      | 6         |
| K25280                                  | Silver Test Strip<br>Conforming to IP 227 specifications                                                                             | 6         |
| K25282                                  | ASTM D3241-IP 323 Color Standard                                                                                                     | 1         |
| 250-000-12C                             | ASTM 12C Thermometer<br>Range: -20 to +102°C                                                                                         | 1         |
| K25000                                  | Polishing Vise<br>Holds silver strip firmly in place without<br>marring the edges. Stainless steel,<br>mounted on a composition base | 1         |
| 380-240-001                             | Silicone Carbide Paper, 240-grit<br>For final polishing of strips prior to testing.<br>Pack of 50 sheets                             | 1         |
| 380-150-001                             | Silicone Carbide Paper, 150-grit<br>For polishing strips prior to testing.<br>Pack of 50 sheets                                      | 1         |
| 380-150-000                             | Silicone Carbide Grain, 150-grit<br>For polishing ends and sides of strips prior<br>to testing. 1 lb package                         | 1         |
| <b>Additional Accessories for D4814</b> |                                                                                                                                      |           |
| K25200                                  | Copper Strip Corrosion Test Bomb                                                                                                     | 4         |
| 332-004-004                             | Test Tube                                                                                                                            | 4         |

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



**K25310 Constant Temperature Bath**

## Specifications

Conforms to the specifications of:

IP 227; ASTM D130, D4814, D6074, D6158; FSPT DT-28-65; IP 154;  
ISO 2160; DIN 51759; FTM 791-5325

Testing Capacity: 6 samples for silver strip corrosion testing

Maximum Temperature: 221°F (105°C)

Temperature Control Stability: ±1°F (±0.5°C)

Heater Range: 0-750W

Bath Medium: 5 gal (18.9L) water

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 7.5A

220-240V 50/60Hz, Single Phase, 4A

Temperature Control: Analog

## Shipping Information

Shipping Weight: 29 lbs (13.2kg)

Dimensions: 5.3 Cu. ft.

# COLD FILTER PLUGGING POINT OF DISTILLATE FUELS



K45950 Cold Filter Plugging Point Bath

| Ordering Information                        |                                                                          |                  |
|---------------------------------------------|--------------------------------------------------------------------------|------------------|
| <b>Catalog No.</b>                          |                                                                          | <b>Order Qty</b> |
| <b>Cold Filter Plugging Point Apparatus</b> |                                                                          | 1                |
| <b>K45900</b>                               | Cold Filter Plugging Point Apparatus                                     |                  |
| <b>Vacuum System</b>                        |                                                                          | 1                |
| <b>K45920</b>                               | Vacuum System                                                            |                  |
| <b>Cooling Bath</b>                         |                                                                          |                  |
| <b>K45950</b>                               | Mechanically Refrigerated Cold Filter Plugging Point Bath, 115V 60Hz     | 1                |
| <b>K45995</b>                               | Mechanically Refrigerated Cold Filter Plugging Point Bath, 220-240V 50Hz |                  |
| <b>K45910</b>                               | Cooling Bath (Dry Ice Model)                                             |                  |
| <b>Accessories</b>                          |                                                                          |                  |
| <b>250-000-05C</b>                          | ASTM 5C Thermometer<br>Range: -38 to +50°C                               | 1                |
| <b>250-000-06C</b>                          | ASTM 6C Thermometer<br>Range: -80 to +20°C                               |                  |

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

 Software compatible, inquire with Koehler Customer Service.

## Test Method

Determines the low temperature flow characteristics of automotive diesel fuels and gas oils, including samples with flow improving additives, by measuring the temperature at which the sample ceases to flow through a wire mesh filter under standard test conditions.

## Cold Filter Plugging Point Test Equipment

- Conforms to ASTM D6371, IP 309 and DIN 51428 specifications
- Choice of mechanically refrigerated or dry ice cooled bath

Consists of Cold Filter Plugging Point Apparatus, Vacuum System and Cooling Bath.

**Cold Filter Plugging Point Apparatus**—Includes borosilicate glass test jar with graduation, brass jacket with plastic support ring, plastic stopper, plastic insulating ring and spacer, pipette and brass filter unit with stainless steel fine wire mesh screen.

**Vacuum System**—Connects to Cold Filter Plugging Point Apparatus to draw sample through filter screen. Consists of U-tube Manometer (without mercury), three-way stopcock, air vent tube, cork stopper with elbows, and large glass bottle. Vacuum pump is not included.

**Cooling Baths**—Choice of mechanically refrigerated or dry-ice cooled baths. Mechanically refrigerated model utilizes a cascade hermetic cooling system to attain temperatures as low as -90°F (-68°C). Cold Filter Plugging Point Apparatus inserts in composition top plate of bath. Insulated stainless steel tank and polished stainless steel cabinet.

Dry-ice model includes insulated copper interior and steel exterior with corrosion resistant polyurethane enamel finish. Composition top plate suspends Cold Filter Plugging Point Apparatus in freezing mixture at the required depth. Handles on exterior permit easy emptying of freezing mixture. Supplied with thermometer holder.

## Specifications

Conforms to the specifications of:  
ASTM D6371; IP 309; DIN 51428  
Electrical Requirements: **CE**  
Mechanically Refrigerated Baths  
115V 60Hz, Single Phase, 6A  
220-240V 50Hz, Single Phase, 3A

## Dimensions\*in.(cm):

Refrigerated Model (lxwxh):  
35x26x31 (89x66x78.75)  
Net Weight: 259 lbs (117.75kg)  
Dry-Ice Model (dia.xh):  
12x12 (30x30)

\*Cooling Bath

## Shipping Information

Shipping Weight:  
Refrigerated Model: 373 lbs (169.5kg)  
Dry-Ice Model: 19 lbs (8.6kg)

Dimensions:  
Refrigerated Model: 23¾ Cu. ft.  
Dry-Ice Model: 3 Cu. ft.

# AUTOMATED COLD FILTER PLUGGING POINT OF DISTILLATE FUELS

## Test Method

Determines the highest temperature at which a given volume of diesel, biodiesel or heating fuel fails to pass through a standardized wire mesh filtration device in a specified time when cooled under specified conditions. The Cold Filter Plugging Point (CFPP) of a fuel is suitable for estimating the lowest temperature at which a fuel will give trouble-free flow in certain fuel systems.

## Automatic Cold Filter Plugging Point Analyzer with Integrated Panel PC

- Conforms to ASTM D6371 and related specifications
- Stand alone system with Integrated Touch Screen Panel PC
- Direct Cooling system eliminates the need for solvent cooling baths
- One-stage cooling system provides temperatures as low as -45°C and a two-stage cooling system down to -80°C
- Option of internal or external vacuum generation system

The cold filter plugging point detection system provides automated sample testing with the accuracy and repeatability in accordance with ASTM D6371 and related international test methods. The sample is cooled according to the pre-selected temperature profile. A 20 mBar vacuum is applied to the sample at specific intervals across a 45 micron mesh filter into the aspiration glass cell assembly. If it takes more than 60 seconds for the sample to reach the upper barrier detector or more than 60 seconds to return below the detector upon release, then the test is complete and the cold filter plugging point has been reached.

**Integrated Panel PC and Software Package**—The Automated Cold Filter Plugging Point Analyzer is a complete standalone system featuring an integrated panel PC with an advanced software package. The 6.4" TFT/LCD touch screen display has a resolution of 640x480 with a 262K color scheme. All analytical parameters are graphed and displayed in real time as well as recorded in Microsoft® Excel compatible file format. The software monitors the operation and performance of all the analyzer components for proper data measurement, including the solenoid valves, cooling system, pressure sensors, and the Platinum resistance PT100 Class A temperature probe.

**Cooling System**—For various user applications, the automated cold filter plugging point system is available with either one-stage cooling for temperatures as low as -45°C or two-stage cooling for temperatures as low as -80°C. The direct cooling system features integrated gas CFC free motors compressors thus eliminating the need for a solvent cooling bath. The direct system is capable of rapid cooling, approaching -80°C bath temperatures in approximately 15 minutes, and utilizes less electricity than standard cooling systems. The rapid cooling feature combined with a consistent cooling profile system provides repeatable results with high test reproducibility.

**Vacuum System**—The automated cold filter plugging point analyzer can be configured with either an internal or external vacuum generator. The internal vacuum generator provides a smaller footprint for the complete CFPP system and consists of a 350 mBar micro-pump and an electronic pressure/vacuum regulator composed of a proportional valve, pressure/vacuum control sensor, regulator for reference vacuum generation at 20 mBar and a vacuum stabilizer. The external vacuum generator includes a vacuum pump, two glass bottles and a glass cork with a U-tube, funnel and manual flow regulating valve.

**Multiple Configuration System**—These automated sample cooling and physical property measurement systems can be configured with one, two, three, four and six test positions with one of five possible analytical heads at each position: cloud point, pour point, cloud & pour point, cold filter plugging point and freezing point. Standard and customized multiple configuration systems are readily available.



**KLA-4-TS Automatic CFPP Analyzer with Integrated Touch Screen PC**

## Specifications

Conforms to the specifications of: ASTM D6371; IP 309, 419; EN 116  
Temperature Range: One-Stage: +60 to -45°C Two-Stage: +60 to -80°C  
Resolution: 0.06°C Accuracy:  $\pm 0.1^\circ\text{C}$   
Repeatability / Reproducibility: as per standard test methods or better  
Data Storage: > 60,000 analyses  
Electrical Requirements: 115V  $\pm 15\%$  / 60Hz 220V  $\pm 15\%$  / 50 to 60Hz **CE**

## Dimensions WxDxH,in.(cm)

26 x 23 $\frac{3}{4}$  x 31 $\frac{1}{2}$ (66x60x80) Net Weight: 176.5 lbs (80kg)

## Included Accessories

Calibrated Aspiration Pipette complete with Filter Kit for CFPP  
Cord Cable without plug Calibrated Test Jar User Manual  
Connection Tube for Vacuum System Operating Software Spacer

## Safety Features

- Audible alarm and displayed messages (at the end of the analysis and in case of errors and/or malfunctions)
- Pressure controller for 1st and 2nd stage motor compressor
- Thermostat for 2nd stage activation
- Thermo-switch for each cooling / heating jacket
- Motor compressors equipped with internal overload devices

## Ordering Information

|                       |                                                                              |
|-----------------------|------------------------------------------------------------------------------|
| <b>Catalog No.</b>    |                                                                              |
| <b>KLA-4-TS</b>       | Automatic Cold Filter Plugging Point Analyzer with Touch Screen, (One-stage) |
| <b>KLA-4-TS/2</b>     | Automatic Cold Filter Plugging Point Analyzer with Touch Screen, (Two-stage) |
| <b>KLA-4-IVPS</b>     | Internal Vacuum System for Cold Filter Plugging Point Analyzer               |
| <b>KLA-4-VPS(115)</b> | External Vacuum System for Cold Filter Plugging Point, 115V                  |
| <b>KLA-4-VPS(220)</b> | External Vacuum System for Cold Filter Plugging Point, 220V                  |

*Please specify voltage requirements when ordering.*

## Accessories

|                      |                                          |
|----------------------|------------------------------------------|
| <b>KLA-PT100-CAL</b> | Calibration Decade Box - PT100 Simulator |
| <b>KLA-DB-KIT</b>    | Set of Connectors and Cables             |

*Extended Cooling Range down to -100°C Available Upon Request.*

# OCTANE ANALYZER FOR UNLEADED GASOLINES

## Test Method

Determines the Pump Octane Number (AKI), Research Octane Number (RON), and Motor Octane Number (MON) of unleaded gasoline, ethanol blended gasoline, leaded gasoline and Cetane Number for diesel fuels.

## Portable Octane Analyzer

- Test results equivalent to ASTM D2699 and D2700 test methods
- Measures all grades of unleaded gasoline and ethanol blended gasoline
- Test results equivalent to ASTM D613 for Cetane Number of diesel fuels (Optional with K88612)
- Displays results in 20 seconds
- Directly measures octane number for  $((R+M))/2$ , RON and MON
- Optional feature for cetane number determination of diesel fuels
- Includes RS-232 output, built-in printer and LCD display
- Results traceable to official knock engine laboratory
- GPS model available for use with GPS locator accessory

Measures octane number via near-infrared (NIR) transmission spectroscopy utilizing 14 near-infrared emitting diodes with narrow bandpass filters, a silicon detector system, and a fully integrated microprocessor. Simple octane number determination requires three easy steps: sampling a background signal, acquiring two absorption spectra of the gas sample, and then acquiring a second background signal. Analyzer is pre-calibrated for unleaded gasoline and ethanol-blended fuels, and can be calibrated for up to eight additional fuel types.

The analyzer is small, lightweight, and operates on "AA" batteries or AC. Before each reading, the unit standardizes itself to assure accuracy. The octane number is printed with time and date on the built-in printer. All data can be downloaded via the RS232 port to an external computer.

## Specifications

Accuracy and repeatability equivalent to ASTM approved CFR engines test methods (ASTM D2699, D2700)

Sample Holder: Sealed, cubical glass container (75mm optical path length)

Sample Volume: 8 Ounces (approx. 225 mL)

Operating Temperature Range: 7°C - 38°C

Pre-calibrated for unleaded & ethanol-blended gasoline

(Analyzer can be calibrated for up to 8 additional fuel types.)

Battery operated (6 AA batteries)

Electrical Requirements: **CE**

115/240V 50/60Hz

## Safety Features

Out of Temperature Range Warning: Analyzer displays Out of Range Warning Message when instrument in being used outside of its standard operating temperature range. Either above 38°C or below 7°C.

Out of Calibration Range Warning: Analyzer displays "Too High" or "Too Low" message when measurement reading is out of the instruments calibration range.

Bad Curve Warning: Analyzer warns user when light protective lid is not on during testing. External light source will greatly disrupt results.

## Included Accessories

|                        |                         |
|------------------------|-------------------------|
| Calibration Software   | RS232 Cable             |
| Aluminum Carrying Case | Printer Paper Roll (5)  |
| Sample Holder (3)      | Light Cover             |
| AA Battery (6)         | Sample Holder Label (6) |



*K88600 Portable Octane Analyzer*

## Dimensions wxdxh,in.(cm)

13½x4½x2½ (34x11½x6¼)

Net Weight: 12 lbs (5.5kg)

## Shipping Information

23x17x8½ (58½x43½x22)

Shipping weight: 25 lbs (11.5kg)

## Ordering Information

### Catalog No.

**K88600**

Portable Octane Analyzer

**K88600-GPS**

Portable Octane Analyzer GPS Model

Requires GPS Locator Feature (K88613)

### Accessories

**K88601**

Printer Paper, 10 Rolls

**K88603**

Sample Holder (additional)

**K88604**

Sample Holder (Box of 12)

**K88605**

Light Shield

**K88606**

RS232 Cable

**K88607**

Aluminum Sample Carrying Case w/12 Sample Holders

**K88608**

Sample Holder Lids, Quantity 12

**K88609**

Sample Holder Labels, Quantity 12

**K88610**

25 Sample Memory

### Optional Features

**K88612**

Cetane Number Calibration

**K88602**

Additional Fuel Calibration

**K88613**

GPS Locator (for K88600-GPS model only)

# DENSITY/RELATIVE DENSITY OF LIGHT HYDROCARBONS BY PRESSURE THERMOHYDROMETER

## Test Method

Density and relative density measurements of light hydrocarbons, including LPG, are used for transportation, storage and regulatory purposes. The measurement is made by floating a thermohydrometer in a sample that has been introduced into a pressure cylinder.

## Pressure Hydrometer Cylinder

- Conforms to ASTM D1657 and related specifications
- Built-in safety relief valve

Transparent plastic cylinder mounted between machined aluminum end plates and surrounded by stainless steel safety guard. Use together with ASTM 310H Thermohydrometer to determine density or relative density of LPG and light hydrocarbons. Equipped with inlet, outlet and vapor vent valves for admitting sample and purging cylinder. End plates have positive sealing buna-N O-rings and are joined by sturdy steel support rods. Top plate detaches easily without tools for insertion or removal of thermohydrometer. Safety relief valve prevents unsafe pressure build-up inside cylinder. Mounted on a finished steel base.

## Specifications

Conforms to the specifications of:

ASTM D1657; GPA 2140;

IP 235; ISO 3993; NF M 41-008

Safety relief valve: 200psi (1.4MPa)

## Dimensions

dia.xh.in.(cm)

8½x23½ (21x60)

Net Weight: 5 lbs (2.3kg)

## Ordering Information

### Catalog No.

**K26150** Pressure Hydrometer Cylinder

### Accessories

**251-000-001** ASTM 101H Thermohydrometer  
Nominal Relative Density Range: 0.500 to 0.650  
Standard Temperature, °F: 60/60  
Temperature Range, °F: 30 to 90

**251-000-004** ASTM 310H Thermohydrometer  
Density Range kg/m<sup>3</sup>: 500-650  
Standard Temperature, °C: 15  
Temperature Range, °C: 0 to 35



K26150 Pressure Hydrometer Cylinder

## Constant Temperature Water Bath

- Conforms to ASTM D1657 and related specifications
- Mechanically refrigerated for convenient sub-ambient temperature operation

Immerses two Pressure Hydrometer Cylinders at 60°F (15°C) for density and relative density determinations of LPG and other light hydrocarbons. Mechanically refrigerated cooling system maintains sub-ambient temperature. Thermistor activated solid state temperature controller and 750W copper immersion heater maintain bath temperature with ±0.5°F (±0.2°C) stability. A ½ hp ball bearing stirrer circulates the bath medium to assure temperature uniformity. Stainless steel tank is fiberglass insulated. Equipped with overflow standpipe/drain. Steel exterior has a durable polyurethane enamel finish.

## Specifications

Conforms to the specifications of: ASTM D1657; IP 235; ISO 3993

Controller Sensitivity: ±0.5°F (±0.2°C)

Capacity: two (2) K26150 cylinders

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 12.5A

220-240V 50 or 60Hz, Single Phase, 6.4A

## Dimensions

Bath interior: 12x18x22(30x46x56)

Overall: 18x20x49 (46x51x124)

Net Weight: 158 lbs (71.7kg)

## Shipping Information

Shipping Weight: 186 lbs (84.4kg)

Dimensions: 15.4 Cu. ft.

## Ordering Information

### Catalog No.

**K25900** Constant Temperature Water Bath, 115V 60Hz  
**K25990** Constant Temperature Water Bath, 220-240V 60Hz  
**K25995** Constant Temperature Water Bath, 220-240V 50Hz

### Accessories

**250-000-12F** ASTM 12F Thermometer. Range -5 to +215°F  
**250-000-12C** ASTM 12C Thermometer. Range -20 to +102°C

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

# HYDROCARBON TYPES IN LIQUID PETROLEUM PRODUCTS



**K41506 Fluorescent Indicator Absorption Apparatus**

## Specifications

Conforms to the specifications of:

ASTM D1319; IP 156; NF M 07-024

Electrical Requirements: **CE**

115V 60Hz

220-240V 50/60Hz

## Included Accessories

Syringe, 1mL

Bottles (2)

O-Rings

Ball-and-Socket Joint Clamps

Mounting Brackets (2)

Integrated Electric Vibration

Handheld UV Lamp

## Dimensions

l x w x h, in. (cm)

8x26x82 (20x66x208)

Net Weight: 100 lbs (45.5kg)

## Shipping Information

Shipping Weight: 121 lbs (55kg)

Dimensions: 12 Cu. ft.

## Test Method

Determines saturates, olefins and aromatics in petroleum fractions that distill below 315°C.

## Fluorescent Indicator Absorption Apparatus

- Conforms to ASTM D1319 specifications
- Quick connections for columns for faster set-up and analysis
- Integrated vibration system for dry silica gel packing
- Handheld UV Lamp
- Two, four, or six column models available

A complete system for conducting FIA analyses of a single or up to six samples simultaneously. Each system is complete with an upper multi-position air pressure manifold with independently-operated gauges, pressure regulators and ball O-ring joints allowing for individual pressure control at each column. Each pressure regulator may be set at any point from 0-15 psi and will maintain the set pressure regardless of changes in back pressure. An integral pressure gauge on each station continuously registers the active pressure on each column. The ball O-ring connection system connects the pressure regulators to the upper columns, and the proper seal is achieved by applying moderate clamping pressure of stainless steel clamps without utilizing any grease. Convenient O-ring compression type fittings simplify the connection of the analyzer tubes (3mm OD x 1200mm) to the upper columns. The internal geometry of the fittings is optimized for transition between tubing diameters, and a simple twist of the connection fitting releases the analyzer tube. O-ring compression type fittings are also used to cap the end of each analyzer tube with the column support tips. The tips contain an internal porous polyethylene disc in order to support the silica gel packing in each analyzer tube. An integrated electric vibration system is mounted to the upper chassis so that the columns can be vibrated to facilitate the dry gel packing procedure, and features an on/off and amplitude selector switch. The complete unit also includes a 1mL syringe with 4" needle, two gel bottles for pouring silica gel, extra O-rings, stainless steel ball-and-socket joint clamps, and two mounting brackets with screws for stabilizing chassis.

## Ordering Information

### Catalog No.

- |               |                                                                         |
|---------------|-------------------------------------------------------------------------|
| <b>K41502</b> | Fluorescent Indicator Absorption Apparatus, Two-Position, 115V 60Hz     |
| <b>K41592</b> | Fluorescent Indicator Absorption Apparatus, Two-Position, 230V 50/60Hz  |
| <b>K41504</b> | Fluorescent Indicator Absorption Apparatus, Four-Position, 115V 60Hz    |
| <b>K41594</b> | Fluorescent Indicator Absorption Apparatus, Four-Position, 230V 50/60Hz |
| <b>K41506</b> | Fluorescent Indicator Absorption Apparatus, Six-Position, 115V 60Hz     |
| <b>K41596</b> | Fluorescent Indicator Absorption Apparatus, Six-Position, 230V 50/60Hz  |

### Accessories

- |                 |                                   |
|-----------------|-----------------------------------|
| <b>K41500-4</b> | Silica Gel, 500 Gram Amber Bottle |
| <b>K41500-5</b> | Silica Gel, Dyed, 40 Gram Bottle  |
| <b>K41579</b>   | Standup UV Lamp, 115V 60Hz        |
| <b>K41580</b>   | Standup UV Lamp, 230V 50/60Hz     |

## VOLATILITY AND RESIDUES IN LIQUEFIED PETROLEUM (LP) GASES

### Volatility of Liquefied Petroleum (LP) Gases Residues in Liquefied Petroleum (LP) Gases

#### Test Method

The volatility of liquefied petroleum (LP) gases is determined by allowing a precooled sample to weather under specified conditions and observing the temperature when 95% has evaporated. Residues in LP gases are determined by weathering of a precooled sample and determination of the volume remaining at 100°F (37.8°C).

#### Precooling Apparatus

- Conforms to ASTM and GPA specifications
- Consists of brass cooling vessel with built-in 20 ft. (6m) copper cooling coil. Includes compression fittings and 1/8" needle valve at the downstream end.

#### Specifications

Conforms to the specifications of: ASTM D1837; D2158; GPA 2140; ISO 13757

**Dimensions:** \*dia.xh.in.(cm) 3x11 1/4 (7.6x29.9)

\*Cooling Vessel

#### Ordering Information

Catalog No.  
K48100

Precooling Apparatus

#### Accessories

|             |                                           |
|-------------|-------------------------------------------|
| 332-010-001 | Weathering Tube, 100mL                    |
| 339-000-001 | Stand, for weathering tube                |
| 337-000-002 | Clamp, for weathering tube                |
| 338-000-001 | Clamp Holder                              |
| 362-001-001 | Syringe, 1mL (ASTM D2158)                 |
| K481-0-5    | Needle, 8"/203mm (ASTM D2158)             |
| 250-000-99F | ASTM 99F Thermometer, Range: -55 to +41°F |
| 250-000-99C | ASTM 99C Thermometer, Range: -50 to +5°C  |
| 250-000-05F | ASTM 5F Thermometer, Range: -36 to +120°F |
| 250-000-05C | ASTM 5C Thermometer, Range: -38 to +50°C  |
| 250-000-57F | ASTM 57F Thermometer, Range: -4 to +122°F |
| 250-000-57C | ASTM 57C Thermometer, Range: -20 to +50°C |

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

## FILTERABILITY OF DIESEL FUELS BY LOW-TEMPERATURE FLOW TEST

#### Test Method

Determines the filterability of Diesel fuels and Biodiesel blend fuels in some automotive equipment at low temperatures. The Low Temperature Flow Test results are indicative of the low temperature flow performance of the test fuel in some diesel vehicles. The test method is especially useful for the evaluation of fuels containing flow improver additives in a range of +10°C to -30°C.

#### Automatic Low Temperature Filterability Test Analyzer (LTFT)

Up to (6) 300 ml test vessels are cooled at a specified rate of 1°C/h, and at every °C of cooling, a vacuum of 20 kPa is applied to a filter assembly immersed in the first sample. If the sample recovered in a graduated receiver vessel reaches the 180 ml in 60 sec., the analysis continues to the further 1°C test temperature (passed). When the sample doesn't reach the 180 ml within the 60 sec., the test is failed. The temperature of the last passing result test has to be recorded as minimum LTFT pass temperature.

The instrument is a six place floor model, equipped with a built in cooling system with a single stage CFC free motor compressor for temperatures as low as -45°C. Integrated Vacuum System consisting of a 350 kPa micropump, vacuum stabilizer and electronic control for vacuum regulation of 20 kPa. Fully automatic, controlled by an integrated panel pc with touch screen and a large display. All the parameters and the current status of the analysis are shown in real time.

#### Specifications

Conforms to the Specifications of: ASTM D4539

Temperature Range: +80°C to -80°C

Resolution: 0.06°C

Accuracy: ±0.1°C

Repeatability / Reproducibility: Meets or exceeds ASTM specifications

Storage Capacity: Up to 60,000 analyses

Interface: USB Port (2)

Electrical Requirements: C E

115V ±15%, 60Hz

220V ±15%, 50/60Hz

**Dimensions:** wxdxh.in.(cm)

38 1/2 x 23 1/2 x 51 1/4 (98x60x130)

Net Weight: 176.5 lbs (80kg)



KLA-7 LTFT

#### Ordering Information

Catalog No.  
KLA-7

Automatic Low Temperature Filterability Test Analyzer (LTFT), 115V 60Hz

KLA-7 (220)

Automatic Low Temperature Filterability Test Analyzer (LTFT), 220V 50/60Hz

#### Accessories

KLA-PT100-CAL

Calibration Box and Cables

KLA-DB-KIT

Kit of Connectors and Cables for Cold range

## 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.

### **Oxidation Stability of Gasoline (Induction Period Method) .....Pages 80-84**

ASTM D525; IP 40; DIN 51780; FTM 791-3352  
Corrosion Resistant Steel Forceps  
Oven  
Distilled Water  
Chromic Acid or equivalent detergent cleaning solution  
Toluene  
Acetone  
Oxygen

### **Oxidation Stability of Aviation Fuels (Potential Residue Method) .....Pages 80-84**

ASTM D873; IP 138; DIN 51799; FTM 791-3354  
Corrosion Resistant Steel Forceps  
Drying Oven  
Filtering Crucible  
Oxygen  
Toluene  
Distilled Water  
Acetone

### **Existent Gum in Fuels by Jet Evaporation .....Page 86-87**

ASTM D381; IP 131; ISO 6246; DIN 51784; FTM 791-3302  
Analytical Balance  
Desiccator  
Filtering Funnel, Sintered Glass  
n-Heptane  
Air Supply (for Air-Intake Method)  
Toluene  
Acetone  
Graduated Cylinder  
Chromic Acid or equivalent detergent cleaning solution  
Distilled Water  
Oven

### **Copper Strip Corrosion by Liquefied Petroleum (LP) Gases .....Page 89**

ASTM D1838; GPA 2140; ISO 6251  
Acetone  
2,2,4-Trimethylpentane  
Cotton Wool

### **Copper Corrosion From Petroleum Products by the Copper Strip Tarnish Test .....Pages 90-91**

ASTM D130; FSPT DT-28-65; IP 154; ISO 2160; DIN 51759; FTM 791-5325  
Filter Paper  
Cotton Wool  
Isooctane or volatile, sulfur-free hydrocarbon solvent  
Stainless Steel Forceps  
Stoddard Solvent  
Kerosene

### **Vapor Pressure of Petroleum Products (Reid Method) ....Pages 92-94**

ASTM D323, D1267; GPA 2140; IP 69, 161; ISO 3007, 4256; DIN 51616, 51754; FTM 791-1201  
Dead-Weight Tester  
Petroleum Naphta  
Acetone  
Air Supply

### **Wax Appearance Point of Distillate Fuels .....Page 94**

ASTM D3117  
Isopropanol  
Solid Carbon Dioxide  
Liquid Nitrogen

### **Freezing Point of Aviation Fuels .....Page 96-97**

ASTM D2386; IP 16; ISO 3013; DIN 51421; FTM 791-1411  
Ethanol  
Methanol  
Solid Carbon Dioxide  
Liquid Nitrogen  
Acetone  
Isopropanol

### **Silver Corrosion by Aviation Turbine Fuels .....Page 99**

IP227; ASTM D130; FSPT DT-28-65; IP 154; ISO 2160, DIN 51759; FTM 791-5325  
2,2,4-Trimethylpentane  
Ashless Filter Paper  
Stainless Steel Forceps  
Cotton Wool

### **Antirust Properties of Petroleum Products Pipeline Cargoes .....Page 98**

NACE TM-0172  
Naphtha or Acetone  
Chromic Acid

### **Cold Filter Plugging Point of Distillate Fuels .....Pages 100-101**

ASTM D6371; IP 309; DIN 51428  
Heptane  
Lintless Filter Paper  
Vacuum Pump

# LUBRICATING OILS

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| <b>Oxidation Stability of Distillate Fuel Oil (Accelerated Method)</b> ASTM D2274 .....                                                                                                                 | 119-122 | <b>Cloud Point of Petroleum Oils</b> ASTM D2500; IP 219; ISO 3015; DIN 51597 .....                                                                                                                                                           | 132-133 |
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## For information on additional test methods for Lubricating Oils:

- Evaporation Loss of Lubricating Greases and Oils  
–please refer to pages 148-149
- Estimating Apparent Vapor Pressures and Molecular Weights of Lubricating Oils  
–please refer to pages 92-94
- Please refer to the Viscosity, Flash Point and General Tests Sections
- Additional test methods are available upon request  
–please call or write for information.



# FOAMING CHARACTERISTICS OF LUBRICATING OILS

## Test Method

Foaming of lubricating oils in applications involving turbulence, high speed gearing or high volume pumping can cause inadequate lubrication, cavitation, overflow and premature oxidation. The sample is blown with a controlled volume of air at different specified temperatures, including a newer high temperature test at 150°C. The resultant foam is measured at the end of each aeration period and at different intervals afterward. In the high temperature test, the amount of time required for the foam to collapse to "0" after the aeration period is also measured.

## Foaming Characteristics Test Baths

- Dual-twin models for standard foaming characteristics tests
- High temperature liquid bath for 'Sequence IV' tests
- Automatic time sequence models for both tests
- Custom configurations for specialized applications

**Dual Twin Foaming Characteristics Test Apparatus**—Performs two tests at 75°F (24°C) and two tests at 200°F (93.5°C). Consists of two 12x18" (30.5x45.7cm) constant temperature baths with 1000mL test cylinders, certified diffusers, air delivery tubes, and flowmeters (94mL/min.) for each sample. Baths are equipped with microprocessor temperature controls, copper immersion heaters and ½hp circulation stirrers to maintain temperature uniformity of ±1°F (±0.5°C). Microprocessor PID control provides quick temperature stabilization without overshoot and the bath 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 format. Test cylinders are held securely in place by quick-locking cams in the bath cover assembly. A separate stainless steel support rack is provided to hold the test cylinders after removal from the bath. Cold bath (24°C) has built-in coils for circulating exit air from the high temperature test cylinders prior to passing to a volume meter, and a separate coil for circulating cooling water or refrigerant when the ambient temperature exceeds the test temperature. Supplied with rubber stoppers and glass air outlet tubes for each cylinder. Bath controls are enclosed in a finished steel base with chemical resistant polyurethane enamel finish. *Communications software as seen on page 110 (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.*

**FTM 791-3213 Aircraft Lubricants Test**—Employs more severe conditions, smaller sample, increased air flow, and longer aeration period to test the foaming characteristics of aircraft-turbine lubricants. All models are available on special order for FTM 791-3213 testing. Please call or write for specifications and ordering information.

### Specifications

Conforms to the specifications of:  
ASTM D892; IP 146; DIN 51566;  
FTM 791-3211, 791-3213\*; NF T  
60-129

Temperature Control:

Digital Setpoint and Displays °C/°F  
switchable  
Built-in Overtemperature Cut-off  
Protection

### Included Accessories

Test Cylinders, 1000mL (4)  
Diffuser Stones, calibrated and  
certified (4)  
Air Delivery Tube Assemblies (4)  
Air Outlet Tubes (4)  
Rubber Stoppers (4)  
Bath Jars (2)  
Support Rack (1)  
Acrylic Safety Shield, 18"

*\*Requires modifications to standard equipment.*

*This equipment is available with a digital-indicating mass flow controller in place of the standard flowmeter. Please call or write for specifications and/or ordering information.*



Digital Flowmeter option  
is available for this unit.



Software compatible, inquire  
with Koehler Customer Service.



K43041  
Sequence IV  
Liquid Foaming  
Characteristics  
Apparatus

**High Temperature 'Sequence IV' Liquid Foam Test Bath**—For two tests at 150°C with a flow rate of 200mL/min. in accordance with ASTM D6082 specifications. Consists of a constant temperature bath with 1000mL test cylinders, certified diffusers, air delivery tubes and flowmeters. Microprocessor PID control provides quick temperature stabilization without overshoot and the bath 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 format. Quick response copper immersion heaters provide efficient high temperature operation, and a stirrer unit provides complete circulation for temperature uniformity of better than ±1°F (±0.5°C). Locking cams hold the test cylinders in a vertical position, and a separate rack is provided to hold the cylinders after removal from the bath. For operator safety, an acrylic heat shield surrounds the Borosilicate Glass bath jar. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.*

### Specifications

Conforms to the specifications of: ASTM D6082

Temperature Control:

Digital Setpoint and Displays °C/°F switchable  
Built-in Overtemperature Cut-off Protection

### Included Accessories

Test Cylinders, 1000mL (2)  
Diffuser Stones, calibrated and certified (2)  
Air Delivery Tube Assemblies (2)  
Air Outlet Tube (2)

Bath Jar (1)  
Support Rack (1)  
Rubber Stoppers (2)  
Acrylic Safety Shield, 18"

## FOAMING CHARACTERISTICS OF LUBRICATING OILS

| Ordering Information    |             |                             |                     |               |                               |                                                                |                                                                    |
|-------------------------|-------------|-----------------------------|---------------------|---------------|-------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------|
| Model                   | Catalog No. | Electrical C Requirements   | Bath Temperature    | Air Flow Rate | Bath Capacity                 | Dimensions lwxh, in. (cm)                                      | Shipping Information                                               |
| Dual-Twin               | K43002      | 115V<br>60Hz<br>15.6A       | 24°C<br>(75°F)      | 94mL/min      | 9 gal<br>(38.5L)<br>each bath | 32¼x15x31¼<br>(82x38x79.4)<br>Net Weight:<br>108 lbs (49kg)    | Shipping Wgt.<br>217 lbs<br>(98.4kg)<br>Dimensions<br>29.6 Cu. ft. |
|                         | K43092      | 220-240V<br>50/60Hz<br>8.1A | and                 |               |                               |                                                                |                                                                    |
| Automatic Time Sequence | K43003      | 115V<br>60Hz<br>16A         | 93.5°C<br>(200°F)   |               |                               | 32¼x15x31¼<br>(82x38x79.4)<br>Net Weight:<br>118 lbs (53.5kg)  | Shipping Wgt.<br>227 lbs<br>(103kg)<br>Dimensions:<br>33 Cu. ft.   |
|                         | K43093      | 220-240V<br>50/60Hz<br>8A   | (Operator variable) |               |                               |                                                                |                                                                    |
| Sequence IV Liquid      | K43041      | 115V<br>60Hz<br>14A         | 150°C<br>(302°F)    | 200mL/min     | 9 gal<br>(38.5L)              | 16¼x15x31¼<br>(42.5x38x79.4)<br>Net Weight:<br>62 lbs (28.1kg) | Shipping Wgt.<br>89 lbs<br>(40.4kg)<br>Dimensions<br>16.3 Cu. ft.  |
|                         | K43049      | 220-240V<br>50/60Hz<br>7A   | (Operator variable) |               |                               |                                                                |                                                                    |



K43092 Dual-Twin Foaming Characteristics Apparatus

**D892 and D6082 Dual Twin Foaming Characteristics Test Apparatus**—For four tests in accordance with control ASTM D6082 and ASTM D892 specifications. Dual liquid baths feature digital temperature control for Sequences I through IV. Four flowmeters maintain the required flow rate of 94 and 200mL/min to the air diffusers. Requires the use of an external chiller to perform the Sequence I and III tests at 24°C.

### Specifications

Conforms to the specifications of:

ASTM D892, D6082; IP 146; DIN 51566; FTM 791-3211; NF T 60-129

Temperature Control:

Digital Setpoint and Displays °C/°F switchable

Built-in Overtemperature Cut-off Protection

### Included Accessories

Test Cylinders, 1000mL (4)

Diffuser Stones, calibrated and certified (4)

Air Delivery Tube Assemblies (4)

Air Outlet Tubes (4)

Rubber Stoppers (4)

Bath Jars (2)

Support Rack (1)

Acrylic Safety Shield, 18"

### Accessories and Additional Ordering Information

For a complete listing of accessories and information on ordering a complete package for ASTM D892 and/or D6082 testing, please turn to page 110.

| Ordering Information |             |                             |                                                                                                                    |                        |                          |                                                             |                                                                     |
|----------------------|-------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------|-------------------------------------------------------------|---------------------------------------------------------------------|
| Model                | Catalog No. | Electrical C Requirements   | Bath Temperature                                                                                                   | Air Flow Rate          | Bath Capacity            | Dimensions lwxh, in. (cm)                                   | Shipping Information                                                |
| D892/D6082 Dual Twin | K43005      | 115V<br>60Hz<br>15.6A       | <b>Left (Cold) Bath:</b> Ambient to 93.5°C (200°F) External Chiller required to perform Sequence I and III at 24°C | 94mL/min and 200mL/min | 9 gal<br>(38.5L)<br>each | 32¼x15x31¼<br>(82x38x79.4)<br>Net Weight:<br>108 lbs (49kg) | Shipping Wgt.<br>217 lbs<br>(98.4kg)<br>Dimensions:<br>29.6 Cu. ft. |
|                      | K43095      | 220-240V<br>50/60Hz<br>8.1A | <b>Right (Hot) Bath:</b> Ambient to 150°C (302°F)                                                                  |                        |                          |                                                             |                                                                     |



Digital Flowmeter option is available for this unit.



Software compatible, inquire with Koehler Customer Service.

## FOAMING CHARACTERISTICS OF LUBRICATING OILS



**Advanced Communications Software Package for Data Management**

Test apparatus for ASTM D892 Sequence I, II and III

| Catalog No.        |                                                                            | Order Qty |
|--------------------|----------------------------------------------------------------------------|-----------|
| <b>K43002</b>      | Dual Twin Foam Test Apparatus<br>(or K43003 Automatic Time Sequence Model) | 1         |
| <b>387-115-001</b> | Air Pump                                                                   | 1         |
| <b>K43025</b>      | Diffuser Stone Test Apparatus                                              | 1         |
| <b>250-000-12F</b> | ASTM 12F Thermometer<br>(or 250-000-12C ASTM 12C Thermometer)              | 2         |
| <b>K43026</b>      | Wet Test Gas Meter<br>(not required for Alternative Procedure)             | 1         |
| <b>332-005-005</b> | Drying Tower                                                               | 1         |

Test apparatus for ASTM D6082 Sequence IV

| Catalog No.        |                               | Order Qty |
|--------------------|-------------------------------|-----------|
| <b>K43041</b>      | Sequence IV Foam Test Bath    | 1         |
| <b>K43025</b>      | Diffuser Stone Test Apparatus | 1         |
| <b>K43026</b>      | Wet Test Gas Meter            | 1         |
| <b>332-005-005</b> | Drying Tower                  | 1         |
| <b>387-115-001</b> | Air Pump                      | 1         |
| <b>250-000-41C</b> | ASTM 41C Thermometer          | 1         |

Test apparatus for ASTM D892 and D6082

| Catalog No.        |                                                               | Order Qty |
|--------------------|---------------------------------------------------------------|-----------|
| <b>K43005</b>      | D892 and D6082 Dual Twin Foam Test Apparatus                  | 1         |
| <b>K43025</b>      | Diffuser Stone Test Apparatus                                 | 1         |
| <b>K43026</b>      | Wet Test Gas Meter                                            | 1         |
| <b>332-005-005</b> | Drying Tower                                                  | 1         |
| <b>387-115-001</b> | Air Pump                                                      | 1         |
| <b>250-000-12F</b> | ASTM 12F Thermometer<br>(or 250-000-12C ASTM 12C Thermometer) | 2         |
| <b>250-000-41C</b> | ASTM 41C Thermometer                                          | 2         |

### Accessories

#### Catalog No.

- 387-115-001** Air Pump, oil-less. Delivers 100% oil-free air. 115V 60Hz
- 387-230-001** Air Pump, oil-less. 220-240V 50/60Hz
- K43026** Wet Test Gas Meter  
For volume measurements of air leaving the test cylinders.  
**Note:** One meter is required for each test cylinder.  
Not required for the 'Alternative Procedure' - Section 9.1.
- 332-005-005** Drying Tower. 300mm
- K43025** Diffuser Stone Test Apparatus  
For maximum pore diameter and permeability tests on diffuser stones. Consists of 90cm manometer, 500mL flask, flowmeter, graduate, delivery tube assembly and control valve.
- K33031** Refrigerated Recirculator  
Use with foam test baths for 24°C tests (Sequence I and III). Microprocessor based digital control and quiet running compressor provide reliable operation and accurate control within  $\pm 0.5^\circ\text{C}$ . For complete specifications, please contact Koehler Customer Service. 115V 60Hz, 8A
- K33032** Refrigerated Recirculator, 220-240V 50Hz, 4A
- 250-000-12F** ASTM 12F Thermometer. Range:  $-5$  to  $+215^\circ\text{F}$
- 250-000-12C** ASTM 12C Thermometer. Range:  $-20$  to  $+102^\circ\text{C}$
- 250-000-41C** ASTM 41C Thermometer. Range:  $98$  to  $152^\circ\text{C}$
- 344-100-01C** Certified Diffuser Stone. Calibrated and certified for compliance with ASTM specifications for pore diameter and permeability
- 344-100-001** Diffuser Stone, non-calibrated
- 344-005-001** Stainless Steel 'Mott' Diffuser
- 344-005-01C** Stainless Steel 'Mott' Diffuser Certified
- K43012** Test Cylinder  
Replacement 1000mL cylinder. Includes retaining ring.

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

# WATER SEPARABILITY OF PETROLEUM OILS AND SYNTHETIC FLUIDS

## Test Method

The ability of a lubricating oil to separate from water and resist emulsification is an important performance characteristic for applications involving water contamination and turbulence. Water separability is determined by stirring equal volumes of water and sample together at a controlled temperature to form an emulsion and observing the time required for separation of the emulsion to occur. This method is suitable for petroleum oils and synthetic fluids.

## Water Separability Tester

- Tests emulsion characteristics of lubricating oils
- Seven sample capacity
- Movable digital stirrer with microprocessor control incorporates advanced features for flexibility and ease of operation
- Clear, illuminated heating bath provides excellent visibility
- Microprocessor temperature control with digital display and built-in protection against overtemperature and low liquid level hazards
- Conforms to ASTM, ISO and related standards for water separability testing
- Optional sensor for direct measurement of sample temperature
- With built in drain for convenient draining of bath medium

Seven-sample Water Separability Tester provides full visibility and microprocessor control of all functions for simplified, accurate testing of up to seven samples at a time. Use for specification of new oils and monitoring of in-service petroleum oils and synthetic fluids.

**Seven position heating bath**—A full visibility bath immerses seven 100mL cylinders at the proper depth per ASTM and ISO specifications. Sample cylinders are held securely in place by stainless steel supports inside the bath. A microprocessor based heater controls bath operating controls bath fluid temperature with greater than  $\pm 1^{\circ}\text{C}$  accuracy and stability throughout the operating range of  $25^{\circ}\text{C}$  to  $84^{\circ}\text{C}$ . Large LED readouts display setpoint and actual temperatures in Celsius or Fahrenheit scale at the operator's option. For most samples, ASTM/ISO sample temperatures of  $54^{\circ}\text{C}$  and  $82^{\circ}\text{C}$  are attained within 10 minutes after placement of the test cylinders into the stabilized bath. Clear polycarbonate tank has backlighting for excellent visibility when viewing emulsion separations in the test cylinders. Cut-off circuits for low water level and over-temperature conditions provide protection in the event of equipment malfunction. Easy removal of top plate for filling or cleaning the bath. Polycarbonate jar is encased in a Polyester-Epoxy finished steel housing with a protective distortion-free viewing window and a solid foundation.

**Microprocessor sample stirrer**—To avoid sample movement, the sample stirrer housing pivots to each test position in the bath and locks securely in place at the required position in relation to the 100mL sample cylinder. The digital stirrer offers complete flexibility for test duration and stirring speed at the push of a button. Operating speed and count down time are prominently displayed on a large backlit LCD panel. A wide operating range of 0-2000rpm permits in-house customized testing with  $\pm 1\text{rpm}$  accuracy, and the operator may select a stirring time of up to 99.99 minutes. At the end of the selected interval, the stirrer automatically shuts off and alerts the operator with audible and visual signals that the settling period has commenced. For added convenience, all test parameters are stored in memory and repeated in subsequent tests until they are changed by the operator. Engaging the stirrer mechanism is visible to the operator and housed in a clear tube for added safety.

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



Software compatible, inquire with Koehler Customer Service.



K39400 Water Separability Tester

## Specifications

Conforms to the specifications of: ASTM D1401, D6074, D6158; ISO 6614; DIN 51599; FTM 791-3201; NF T 60-125

Stirrer Range: 0-2000rpm

Accuracy:  $\pm 1.0\text{rpm}$

Drive:  $\frac{1}{4}\text{hp}$  (75W), high torque

Bath Temperature Range:  $25^{\circ}\text{C}$  to  $84^{\circ}\text{C}$

Control Stability:  $\pm 0.05^{\circ}\text{C}$

Capacity: seven (7) 100mL graduated cylinders

Construction: Clear polycarbonate tank 10"x11.25"x9.5" (25.5x28x24cm)

Medium: Water or white technical oil

Medium Capacity: 15.15L (4 gal)

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 12A

220-240V 50/60 Hz, Single Phase, 12A

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

20.75x15.25x29.5

(52.7x38.75x 74.9)

Net Weight: 78 lbs (35.5kg)

**Included Accessories**

Seven 100mL Cylinders

## Ordering Information

| Catalog No.        |                                                                | Order Qty |
|--------------------|----------------------------------------------------------------|-----------|
| K39400             | Water Separability Tester, 115V 60Hz                           | 1         |
| K39496             | Water Separability Tester, 230V 50/60Hz                        |           |
| <b>Accessories</b> |                                                                |           |
| 332-002-018        | Cylinder 100mL, graduated from 5 to 100mL with 1.0mL divisions |           |
| 250-000-19F        | ASTM 19F Thermometer. Range: 120 to 134°F                      | 1         |
| 250-000-19C        | ASTM 19C Thermometer. Range: 49 to 57°C                        |           |
| 250-000-21F        | ASTM 21F Thermometer. Range: 174 to 188°F                      | 1         |
| 250-000-21C        | ASTM 21C Thermometer. Range: 79 to 87°C                        |           |
| K39252             | PTFE Policeman                                                 | 7         |
| K39251             | Test Tube Rack                                                 | 1         |

## DEMULSIBILITY CHARACTERISTICS OF LUBRICATING OILS



**K39190 Demulsibility Bath With Stirrers and Funnels**

### Accessories

| Catalog No. |                                                                                                                                                                                                                                                                                             | Order Qty |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| K39120      | Separatory Funnel<br>With 0-500mL graduations. Meets ASTM specifications.                                                                                                                                                                                                                   | 2         |
| K39130      | Solvent Tank. Immerses stirrer assembly for convenient cleaning after testing.                                                                                                                                                                                                              | 1         |
| K39140      | Forced Warm Air Dryer, 115V 60Hz<br>High output 1400W dryer and brass cylinder mounted on a sturdy base. Rapidly dries stirrer assembly after cleaning.                                                                                                                                     |           |
| K39149      | Forced Warm Air Dryer, 220-240V 50/60Hz                                                                                                                                                                                                                                                     | 1         |
| K39150      | Sampling Gauge and Centering Device<br>Per Fig. X1.1 of ASTM D2711. Aids in accurately obtaining 50mL samples from separatory funnels for the 'percent water in oil' determination.                                                                                                         | 1         |
| 360-000-003 | Digital Tachometer<br>Hand held non-contact LCD tachometer takes measurements up to 3 ft away with $\pm 1$ rpm accuracy. Supplied with four 1.5V AA batteries.                                                                                                                              | 1         |
| 250-000-09F | ASTM 9F Thermometer<br>Range: 20 to 230°F                                                                                                                                                                                                                                                   | 1         |
| 250-000-09C | ASTM 9C Thermometer<br>Range: -5 to +110°C                                                                                                                                                                                                                                                  |           |
| K39170      | Conditioning Bath, 115V 60Hz<br>Constant temperature water bath holds 8 separatory funnels in two removable 4-unit racks for conditioning prior to testing in Demulsibility Apparatus. Includes microprocessor digital temperature control, automatic water level control and gabled cover. | 1         |
| K39179      | Conditioning Bath, 220-240V 50/60Hz                                                                                                                                                                                                                                                         |           |

### Test Method

Tests the ability of medium to high viscosity oils to separate from water when water contamination and turbulence are encountered. The sample is stirred together with distilled water for 5 min. at constant temperature. After a specified settling period, the degree of separation is measured by volume and the percentage of water in oil is determined. For lighter oils and synthetic fluids, the ASTM D1401 Water Separability Test is used.

### Demulsibility Apparatus

- Conforms to the specifications of ASTM D2711
- Variable stirrer speed
- Choice of digital or analog bath models

**Stirrer**—Complete stirrer assembly per Fig. 1 and 2 of ASTM D2711, including variable high speed drive motor, stainless steel propeller shaft, top, center and bottom bearings, and steel motor housing with positioning plate. Entire assembly mounts vertically in K39190/K39199 Constant Temperature Bath. Built-in tachometer disc allows for precise stirrer speed adjustment.

**Constant Temperature Baths**—Standard model holds two K39103 Stirrers and two K39120 Separatory Funnels in proper alignment for demulsibility characteristics testing. Stirrers mount securely on a stainless steel support plate having brackets for testing and drainage positions. Separate motor speed controls are provided for each stirrer. All wetted parts are constructed of stainless steel.

Microprocessor digital temperature control with dual LED displays for setpoint and actual temperatures and an illuminated bath interior with window for viewing sample cylinders. Digital LED speed control is provided for each stirrer.

### Specifications

Conforms to the specifications of: ASTM D2711  
Capacity: Two (2) sample-water mixtures  
Maximum Temperature: 212°F (100°C)  
Temperature Control: Microprocessor digital control with LED display  
Bath Medium: 9 gal (38.5L) water  
Electrical Requirements: **CE**  
115V 60Hz  
220-240V 50/60 Hz

### Dimensions: WxDxH in (cm)

15¼x15x37 (39x38x94)  
Net Weight: 72 lbs (32.6kg)

### Shipping Information

Shipping Weight 133 lbs (60.3kg)  
Dimensions: 25.4 Cu. ft.

### Ordering Information

| Catalog No.                             |                                       | Order Qty |
|-----------------------------------------|---------------------------------------|-----------|
| K39190                                  | Demulsibility Bath, 115V, 60Hz        | 1         |
| K39199                                  | Demulsibility Bath, 220-240V, 50/60Hz |           |
| K39103                                  | Stirrer**                             | 2         |
| **Suitable for use with K39190 & K39199 |                                       |           |

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



Software compatible, inquire  
with Koehler Customer Service.

# AIR RELEASE PROPERTIES OF PETROLEUM OILS



K88500 Air Release Value Apparatus

## Test Method

The ability of a turbine, hydraulic, or lubricating oil to separate entrained air is a key performance characteristic in applications where agitation causes a dispersion of air bubbles in the oil. To determine air release properties, the sample is heated to a specified test temperature and blown with compressed air. After the air flow is stopped, the time required for the air entrained in the oil to reduce in volume to 0.2% is the air bubble separation time.

## Air Release Value Apparatus

- Conforms to ASTM D3427, IP 313 and related specifications
- High accuracy temperature control with digital setpoint and display
- Digital control panel leads user from start to finish of test operation
- Automatic calculation of final sample density for determination of air release value
- Redundant overtemperature protection circuitry assures safe operation

The Koehler Air Release Value Apparatus consists of a test vessel and air flow control equipment for delivering heated air at the specified flow rate to a lubricating oil sample maintained at constant temperature. Microprocessor-based control panel guides user from start to finish of test operation and provides density calculation and timing operation for measuring the air release value of the test sample. The system includes drying oven for warming test oil at temperatures of up to 100°C; circulating bath with digital temperature controller and air bath for sinker; compressed air heater with digital temperature controller, overtemperature and overpressure protection circuitry; pressure gauge; thermometer. Optional Windows® software automatically measures the time for air release.

## Specifications

Conforms to the specifications of:  
ASTM D3427; IP 313; ISO 9120;  
DIN 51381; NF E 48-614  
Temperature Range:  
ambient to 75°C (167°F)  
Electrical Requirements: **CE**  
115V 60Hz, 3.0A  
230V 50Hz, 1.5A  
230V 60Hz, 1.5A

## Dimensions

l x w x h, in. (cm)  
24 x 28 x 38 ¼ (61 x 71 x 97)  
(Air Release Value Apparatus only)

Net Weight for complete system:  
225 lbs (103kg)

## Included Accessories

ASTM 12C Thermometer  
Sinkers, 5mL and 10mL  
Drying oven  
Pressure gauge  
Circulating Bath  
Air Bath for Sinker  
Balance  
Platinum Wire  
Jacketed Test Vessel

## Shipping Information

Shipping Weight for complete system:  
300 lbs (136kg)  
Dimensions: 50.7 Cu. ft.

## Ordering Information

| Catalog No. |                                           | Order Qty |
|-------------|-------------------------------------------|-----------|
| K88500      | Air Release Value Apparatus,<br>115V 60Hz | 1         |
| K88501      | Air Release Value Apparatus,<br>230V 50Hz |           |
| K88502      | Air Release Value Apparatus,<br>230V 60Hz |           |

## OXIDATION STABILITY – RPVOT & TFOUT

**Oxidation Stability of Steam  
Turbine Oils by Rotating Pressure Vessel (Bomb)  
Oxidation Stability of Inhibited Mineral  
Insulating Oil by Rotating Pressure Vessel (Bomb)  
Oxidation Stability of Gasoline  
Automotive Engine Oils by Thin  
Film Oxidation Uptake (TFOUT)**

### Test Method

The RPVOT (RBOT) procedure employs severe oxidation conditions to rapidly determine oxidation stability. Suitable for both new and in-service oils, the RPVOT (RBOT) method is applicable to many types of petroleum oils. The sample is oxidized in the presence of water and a copper catalyst in a stainless steel pressure vessel under an initial pressure of 90psi (620kPa). Pressure inside the vessel is recorded electronically or mechanically while the vessel is rotated at 100rpm at constant temperature, and the amount of time required for a specified drop in pressure is the oxidation stability of the sample. A variation of the RPVOT (RBOT) method is the "Thin Film Oxidation Uptake Test" (TFOUT) for gasoline automotive engine oils.

### RPVOT (RBOT) Test Apparatus

- 2, 3 and 4-unit systems
- Oxidata® Pressure Measurement System
- Conforms to ASTM D2112, D2272 and IP 229 specifications for RPVOT (RBOT) testing
- Conforms to ASTM D4742 specifications for TFOUT testing

For product specifications and ordering information:

|                                             |                 |
|---------------------------------------------|-----------------|
| <i>Oxidation Pressure Vessels</i>           | <i>Page 114</i> |
| <i>Oxidation Baths</i>                      | <i>Page 116</i> |
| <i>Beakers and Accessories</i>              | <i>Page 117</i> |
| <i>Catalysts</i>                            | <i>Page 117</i> |
| <i>Pressure Recorder</i>                    | <i>Page 117</i> |
| <i>Oxidata® Pressure Measurement System</i> | <i>Page 115</i> |
| <i>Complete Systems, 2, 3 and 4-Unit</i>    | <i>Page 118</i> |

### Oxidation Pressure Vessel

- Polished stainless steel construction
- Can be converted for use in the Thin Film Oxidation Uptake Test (TFOUT)

Consists of pressure vessel body, cap and stem with inlet needle valve in accordance with ASTM specifications. Vessel holds one borosilicate glass sample container between two PTFE discs. Closure ring tightens by hand to seal cap to pressure vessel body. Vessel connects to pressure recorder or rotary transducer and rotates on magnetic carriage in RBOT bath. Withstands working pressure of 500psi (3450kPa) per ASTM specifications. Stainless steel construction ensures proper rate of heat transfer. Closure ring is constructed of chrome plated steel. Includes PTFE fluorocarbon wear disc and sample container cover disc.



*Oxidata® Pressure Measurement System*

### Oxidata® Pressure Measurement Systems

- Electronic pressure measurement systems exclusively designed for RPVOT (RBOT), TFOUT and other ASTM oxidation test methods
- Powerful Oxidata® software for Windows® and Windows 95® environments
- Monitors up to twelve pressure and four temperature channels
- **Can be installed to most manufacturer's RPVOT(RBOT)/TFOUT test apparatus**

Complete electronic measurement systems for plotting pressure versus time and temperature in RPVOT (RBOT) and TFOUT testing. Each system includes transducers, bomb couplings, RTD probe assembly, multiplexer, data acquisition card, software, and mounting and connecting hardware. Systems are available in two, three and four pressure vessel configurations, and additional channels can be added for up to a total of twelve pressure and four temperature channels.

Koehler pressure measurement systems for RPVOT (RBOT) and TFOUT feature Oxidata®, a high accuracy pressure measurement software package designed exclusively for ASTM oxidation test methods. Designed to run in a Windows® or Windows 95® environment, Oxidata® monitors up to twelve samples simultaneously, with graphical or tabular display of results. Each channel can be independently configured for any of the applicable ASTM standard test methods without compromising the independence or accuracy of the other channels. Independent start and stop times and user programmable end points add even greater flexibility.

The software plots your data on screen on line, real time, and automatically saves your data on disk or to the hard drive during the test to prevent loss of valuable data. Multiple display options include the ability to view the status of all twelve pressure channels on screen simultaneously and then click on any one channel for a graph display; or to view four channels in graphical format simultaneously. Powerful program features allow you to change axes, have colored plot lines and zoom in on a specific plot sector to view data in greater detail.

### Ordering Information

#### Catalog No.

**K70000**

Oxidation Pressure Vessel

**K70092**

Aluminum Insert

Converts standard K70000 Oxidation Pressure Vessel for use in the TFOUT method

# OXIDATION STABILITY – RPVOT & TFOUT

## Oxidata® Features and Specifications

- On-line, real time monitoring of up to twelve samples simultaneously - results plot directly to the screen for instant monitoring or printout of results
- Menu options for RPVOT (RBOT) or TFOUT testing, as well as for other ASTM fuel and lubricant oxidation tests
- Programmable automatic end point detection with graphical and tabular representation
- Each channel can be configured and operated independently with different start/stop times and different ASTM test methods
- Zoom in feature allows for magnification of any plot sector on any channel for a more detailed study
- Monitors and reports temperatures of as many as four baths simultaneously using accessory RTD's, and calculates and displays average temperature for each bath. Exports data to spreadsheet programs such as Microsoft Excel®, Lotus 1-2-3®, etc.
- Temperature and pressure calibration capability
- Data is saved directly to the hard drive during testing to prevent loss of valuable data
- Operates in Windows® 2000 or higher
- Simple upgrade from existing Koehler data acquisition systems

## Included Accessories (for the pressure measurement systems)

Rotary transducers (connects directly to bomb)

Data acquisition box with USB interface

Oxidata® software

Multiplexer

RTD probe assembly (1)

Mounting Bracket for bath

Connecting cables and hardware

## Computer Requirements

Processor: Intel® Pentium II or similar (minimum)

Memory (RAM): 256MB or higher

Speed: 500 MHz or higher

Windows® 2000 or higher

Disk Space: 15 MB free space (minimum)

Communications Port: One USB port

Other Software: Microsoft® Excel (97 or above)

One RS232 port for temperature controller (optional)



*Oxidata® Software automatically calculates and displays the endpoint of RPVOT (RBOT)/TFOUT test methods.*



*Real-time plot screen displays pressure versus time for up to twelve samples simultaneously.*

## Ordering Information

*The ordering information below is for installation to Koehler equipment. For other makes of equipment, a few basic hardware items may also be required - please contact your Koehler representative for assistance.*

### Catalog No.

### RBOT/TFOUT Electronic Pressure Measurement System C €

|                  |                                     |
|------------------|-------------------------------------|
| <b>K70502-XP</b> | Two-Unit System, 115V 60Hz          |
| <b>K70592-XP</b> | Two-Unit System, 220-240V 50/60Hz   |
| <b>K70503-XP</b> | Three-Unit System, 115V 60Hz        |
| <b>K70593-XP</b> | Three-Unit System, 220-240V 50/60Hz |
| <b>K70504-XP</b> | Four-Unit System, 115V 60Hz         |
| <b>K70594-XP</b> | Four-Unit System, 220-240V 50/60Hz  |

## Oxidata® Retrofit Kits

To upgrade your existing Koehler electronic pressure measurement system to the Oxidata® software, please refer to page 118.

# OXIDATION STABILITY – RPVOT & TFOUT

## Oxidation Baths

- Two, three and four-pressure vessel models
- Conforming to ASTM requirements for RPVOT (RBOT) and TFOUT testing

Constant temperature bath rotates oxidation pressure vessels at 100rpm at an angle of 30° in accordance with ASTM specifications. Includes drive system and oil bath with electronic solid state temperature control. Meets ASTM requirements for heat transfer capability and temperature control precision.

A convenient carriage arrangement allows the oxidation vessels to be inserted quickly and securely in the drive system. A strong magnet holds the vessel in place while locating pins in the carriage engage the base of the vessel. PTFE guides support the pressure vessel stem for added stability. If the vessel becomes obstructed for any reason, the magnetic carriage releases it to prevent damage. A chain and sprocket drive system powered by a heavy duty capacitor start motor rotates the vessel carriages at 100rpm. Drive shafts ride on PTFE fluorocarbon bearings which provide extended service and are compatible with silicone heat transfer fluids and other types of bath oils.

Bath temperature is controlled within ASTM specified limits by an electronic solid state controller with °C/°F switchable digital setpoint and display. Overtemperature protection is provided by a built-in limit control that automatically interrupts power to the bath when bath liquid temperature exceeds 16.7°C (30°F) above the temperature setting or 177°C (350°F). Power must then be manually restored by the operator after checking the cause of the problem. Pressure vessel carriage vanes circulate the bath oil during testing to ensure temperature uniformity, and an auxiliary stirrer can be operated between tests to prevent sludging of non-silicone bath oils.

The bath interior is constructed of welded stainless steel and is fully insulated. A hinged section of the bath cover provides easy access to the vessel carriages. Vapor barriers in the cover close around the vessel stems to contain vapors from the hot bath medium. A chemical resistant polyurethane finish protects the bath exterior and control cabinet.



## Specifications

Conforms to the specifications of: ASTM D2112, D2272, D4742; IP 229

Capacity: 2, 3 or 4 oxidation pressure vessels

Temperature Control:

Maximum Temperature: 200°C (392°F)

Control Stability: ±0.02°C (±0.04°F)

Heater Range:

2 and 3-pressure vessel models: 0-2750W

4-pressure vessel models: 0-3750W

Recommended Bath Medium: high temperature silicone heat transfer fluid (355-001-002 or 355-001-004—page 8)

Drive System: 100rpm positive drive transmission powered by a continuous duty ½hp ball bearing motor with built-in gear reducer

## Ordering Information

| Catalog No    | Capacity            | Electrical Requirements C € | Bath Capacity, gal (L) | Dimensions, lwxh,in.(cm) | Net Weight           | Shipping Weight                   |
|---------------|---------------------|-----------------------------|------------------------|--------------------------|----------------------|-----------------------------------|
| <b>K70200</b> | 2 oxidation vessels | 220-240V 60Hz, 17.17A       | 18 (68)                | 28x26x33<br>(71x66x84)   | 237 lbs<br>(107.5kg) | 356 lbs (161.5kg)<br>25.3 Cu. ft. |
| <b>K70290</b> |                     | 220-240V 50Hz, 17.17A       |                        |                          |                      |                                   |
| <b>K70300</b> | 3 oxidation vessels | 220-240V 60Hz, 17.17A       | 25 (95)                | 37x26x33<br>(94x66x84)   | 284 lbs<br>(129kg)   | 416 lbs (188.7kg)<br>32 Cu. ft.   |
| <b>K70390</b> |                     | 220-240V 50Hz, 17.17A       |                        |                          |                      |                                   |
| <b>K70400</b> | 4 oxidation vessels | 220-240V 60Hz, 21.5A        | 32 (121)               | 46x26x33<br>(117x66x84)  | 375 lbs<br>(170kg)   | 542 lbs (245.9kg)<br>40.3 Cu. ft. |
| <b>K70490</b> |                     | 220-240V 50Hz, 21.5A        |                        |                          |                      |                                   |

- For verifying bath temperature in accordance with ASTM and IP test method specifications

## Ordering Information

### Catalog No.

**250-001-37C** IP 37C Thermometer. Range: 144 to 156°C  
For RPVOT (RBOT) method.

**250-000-96C** ASTM 96C Thermometer. Range: 120 to 150°C  
For ASTM D2112 method.

**250-000-100C** ASTM 100C Thermometer. Range: 145 to 205°C  
For TFOUT method.

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

## OXIDATION STABILITY – RPVOT & TFOUT

### Oxidation Pressure Vessel Accessories

- Sample beakers for RBOT and TFOUT methods
- Oxygen charging accessories

| Ordering Information                         |                                                                                                   |
|----------------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>Catalog No.</b>                           |                                                                                                   |
| <b>Sample Beakers</b>                        |                                                                                                   |
| <b>K70040</b>                                | RPVOT (RBOT) Sample Beaker<br>Borosilicate glass, 175mL<br>Meets ASTM D2112, D2272 specifications |
| <b>K70091</b>                                | TFOUT Sample Container<br>Borosilicate glass. Meets ASTM D4742 specifications                     |
| <b>Oxygen Charging Accessories</b>           |                                                                                                   |
| <b>K70080</b>                                | Charging Hose. 6 ft (1.8m), with connections                                                      |
| <b>K70082</b>                                | Female Quick Disconnect Coupling, for charging hose                                               |
| <b>K70081-1</b>                              | Male Quick Disconnect Coupling, ¼" NPT,<br>for oxidation pressure vessel                          |
| <b>K70013</b>                                | Oxygen Pressure Regulator                                                                         |
| <b>Oxidation Pressure Vessel Accessories</b> |                                                                                                   |
| <b>K70050</b>                                | Silicone O-ring<br>Replacement seal for pressure vessel lid-body<br>connection                    |
| <b>K70049</b>                                | Sample Beaker Cover (PTFE disk)                                                                   |
| <b>K70048</b>                                | TFOUT Sample Beaker Cover (PTFE disk)                                                             |
| <b>K70000-03008</b>                          | Spring. Inserts in pressure vessel to hold<br>RPVOT (RBOT) beaker and cover in place              |
| <b>K700-0-3A</b>                             | Spring. Inserts in pressure vessel to hold<br>TFOUT container and cover in place                  |

### Pressure Recorder

- Conforms to ASTM D2112, D2272, D4742 and IP 229 specifications  
Records pressure inside oxidation bomb on 24-hour charts. Range 0 to 200psi, accurate to within 2% of scale range, 24-hour spring wound chart movement. Housed in a finished metal case. Includes cartridge pen.

| Ordering Information |                                             |
|----------------------|---------------------------------------------|
| <b>Catalog No.</b>   |                                             |
| <b>K70010/24</b>     | Pressure Recorder, 24-hour                  |
| <b>Accessories</b>   |                                             |
| <b>K70018</b>        | Replacement Cartridge Pen                   |
| <b>308-000-004</b>   | Recorder Chart, 24-hour<br>Box of 60 charts |

*Oxidata® pressure measurement equipment is now available for the RPVOT (RBOT) and TFOUT Methods. Please refer to page 115.*

### Pressure Vessel Support Racks

- For convenient handling of oxidation pressure vessel during assembly and disassembly

Securely holds vessel-recorder assembly in an upright position. Convenient for assembling and disassembling vessel. Equipped with drainage trough for bath oil remaining on the vessel exterior after testing.

| Ordering Information |                                      |
|----------------------|--------------------------------------|
| <b>Catalog No.</b>   |                                      |
| <b>K70017</b>        | Pressure Vessel Support Rack, 2-Unit |
| <b>K70011</b>        | Pressure Vessel Support Rack, 3-Unit |
| <b>K70012</b>        | Pressure Vessel Support Rack, 4-Unit |

### Catalysts

- For Rotating Pressure Vessel Oxidation Test (RPVOT)
- For Thin Film Oxidation Uptake Test (TFOUT)

| Ordering Information                           |                                                                                                                                                              |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Catalog No.</b>                             |                                                                                                                                                              |
| <b>Copper Catalyst for RPVOT (RBOT) Method</b> |                                                                                                                                                              |
| <b>K70030</b>                                  | Copper Catalyst Coil<br>Prepared in accordance with ASTM specifications<br>and packed in a sealed glass container with<br>nitrogen atmosphere. Ready to use. |
| <b>K70090</b>                                  | Copper Catalyst Wire<br>1.63mm electrolytic copper wire in 500 ft (152m) lengths.                                                                            |
| <b>K70002</b>                                  | Winding Mandrel<br>Machined aluminum mandrel for winding copper wire into<br>coils meeting ASTM specifications.<br>Mounts on K70003/K70004 Drive Unit        |
| <b>K70003</b>                                  | Drive Unit for Winding Mandrel<br>Slow speed gear motor mounted on a sturdy base.<br>Facilitates coil winding procedure. 115V                                |
| <b>K70004</b>                                  | Drive Unit for Winding Mandrel<br>Similar to K70003 but for operation on 220-240V                                                                            |
| <b>Catalyst Package for TFOUT Method</b>       |                                                                                                                                                              |
| <b>K70093</b>                                  | Catalyst Package A<br>For simulating IIID engine<br>test. Includes 3 catalyst packages                                                                       |
| <b>K70095</b>                                  | Catalyst Package B<br>For simulating IIIE engine test.<br>Includes 3 catalyst packages                                                                       |

## OXIDATION – RPVOT & TFOUT

### 2 Unit RBOT System:

|             |                                                                  |                                                                       |
|-------------|------------------------------------------------------------------|-----------------------------------------------------------------------|
| K70200      | Oxidation Bath (or K70290)                                       |                                                                       |
| K70000      | Oxidation Pressure Vessel (2)                                    |                                                                       |
| K70502-XP   | Oxidata® Pressure Measurement System (or K70592-XP)              |                                                                       |
| K70002      | Winding Mandrel                                                  |                                                                       |
| K70003      | Drive Unit (or K70004)                                           |                                                                       |
| K70017      | Pressure Vessel Support Rack                                     |                                                                       |
| 250-001-37C | IP 37C Bath Thermometer                                          |                                                                       |
| K70080      | Charging Hose                                                    |                                                                       |
| K70082      | Female Quick Disconnect Coupling for charging hose               |                                                                       |
| K70081-1    | Male Quick Disconnect Coupling for oxidation pressure vessel (2) |                                                                       |
| K70013      | Oxygen Pressure Regulator                                        | } Order sufficient quantity to meet anticipated testing requirements. |
| K70030      | Copper Catalyst Coils                                            |                                                                       |
| K70090      | Copper Catalyst Wire, 500 ft.                                    |                                                                       |
| K70040      | Sample Container                                                 |                                                                       |
| K70050      | Silicone O-ring                                                  |                                                                       |

### 3-Unit RBOT System:

|             |                                                                  |                                                                       |
|-------------|------------------------------------------------------------------|-----------------------------------------------------------------------|
| K70300      | Oxidation Bath (or K70390)                                       |                                                                       |
| K70000      | Oxidation Pressure Vessel (3)                                    |                                                                       |
| K70503-XP   | Oxidata® Pressure Measurement System (or K70593-XP)              |                                                                       |
| K70002      | Winding Mandrel                                                  |                                                                       |
| K70003      | Drive Unit (or K70004)                                           |                                                                       |
| K70011      | Pressure Vessel Support Rack                                     |                                                                       |
| 250-001-37C | IP 37C Thermometer                                               |                                                                       |
| K70080      | Charging Hose                                                    |                                                                       |
| K70082      | Female Quick Disconnect Coupling for charging hose               |                                                                       |
| K70081-1    | Male Quick Disconnect Coupling for oxidation pressure vessel (3) |                                                                       |
| K70013      | Oxygen Pressure Regulator                                        | } Order sufficient quantity to meet anticipated testing requirements. |
| K70030      | Copper Catalyst Coils                                            |                                                                       |
| K70090      | Copper Catalyst Wire, 500 ft.                                    |                                                                       |
| K70040      | Sample container                                                 |                                                                       |
| K70050      | Silicone O-ring                                                  |                                                                       |

### 4-Unit RBOT System:

|             |                                                                  |                                                                       |
|-------------|------------------------------------------------------------------|-----------------------------------------------------------------------|
| K70400      | Oxidation Bath (or K70490)                                       |                                                                       |
| K70000      | Oxidation Pressure Vessel (4)                                    |                                                                       |
| K70504-XP   | Oxidata® Pressure Measurement System (or K70594-XP)              |                                                                       |
| K70508      | Mounting Bracket for Four-Unit XP System                         |                                                                       |
| K70002      | Winding Mandrel                                                  |                                                                       |
| K70003      | Drive Unit (or K70004)                                           |                                                                       |
| K70012      | Pressure Vessel Support Rack                                     |                                                                       |
| 250-001-37C | IP 37C Thermometer                                               |                                                                       |
| K70080      | Charging Hose                                                    |                                                                       |
| K70082      | Female Quick Disconnect Coupling for charging hose               |                                                                       |
| K70081-1    | Male Quick Disconnect Coupling for oxidation pressure vessel (4) |                                                                       |
| K70013      | Oxygen Pressure Regulator                                        | } Order sufficient quantity to meet anticipated testing requirements. |
| K70030      | Copper Catalyst Coil                                             |                                                                       |
| K70090      | Copper Catalyst Wire, 500 ft.                                    |                                                                       |
| K70040      | Sample Container                                                 |                                                                       |
| K70050      | Silicone O-ring                                                  |                                                                       |

### For TFOUT testing, make the following substitutions:

|        |                                                                    |   |
|--------|--------------------------------------------------------------------|---|
| K70091 | Sample Beaker (replaces K70040)                                    |   |
| K70092 | Aluminum Insert (2, 3 or 4)                                        |   |
| K70095 | TFOUT Catalyst Package (in lieu of K70030, K70090, K70002, K70003) | } |

250-000-100C ASTM 100C Thermometer (replaces 250-001-37C)

### Oxidata® Retrofit Kits

To upgrade existing DOS-based Koehler electronic pressure measurement systems to the Oxidata® system. Kits include Oxidata® software, data acquisition card, multiplexer board, RTD probe assembly and connecting cables. Does not include rotary transducers or bath mounting bracket. For information on upgrading other makes of equipment to the Oxidata® system, please contact your Koehler representative.

#### Ordering Information

##### Catalog No.

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>K70502RETRO</b> | 2-Unit Oxidata® Pressure Measurement System without Transducers, 115V 60Hz        |
| <b>K70592RETRO</b> | 2-Unit Oxidata® Pressure Measurement System without Transducers, 220-240V 50/60Hz |
| <b>K70503RETRO</b> | 3-Unit Oxidata® Pressure Measurement System without Transducers, 115V 60Hz        |
| <b>K70593RETRO</b> | 3-Unit Oxidata® Pressure Measurement System without Transducers, 220-240V 50/60Hz |
| <b>K70504RETRO</b> | 4-Unit Oxidata® Pressure Measurement System without Transducers, 115V 60Hz        |
| <b>K70594RETRO</b> | 4-Unit Oxidata® Pressure Measurement System without Transducers, 220-240 50/60Hz  |

##### Accessories

|               |                                                                                          |
|---------------|------------------------------------------------------------------------------------------|
| <b>K70500</b> | Rotary Transducer<br>Includes electronic transducer and rotating stainless steel housing |
| <b>K70519</b> | RTD Kit, for monitoring the temperature of an additional bath                            |

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

# OXIDATION STABILITY AND CORROSIVENESS OF PETROLEUM OILS

## Test Method

Various methods are available for testing the resistance to oxidation and/or the corrosiveness of lubricants, insulating oils, hydraulic oils and distillate fuel oils. The samples are subjected to a metered flow of air at elevated temperatures, sometimes in the presence of a metal catalyst. Each of the tests referenced on this page are also represented on other pages in this section of the catalog.

## High Temperature Convertible Oxidation Bath

- Conforms to various ASTM, Federal and International Standards
- Removable racks hold different types of glassware for different tests
- Equipped with flowmeters or digital mass flow controls to measure and control the required flow rates
- Microprocessor digital temperature control

High temperature liquid bath for oxidation stability and corrosiveness tests at temperatures of up to 200°C. Available in different configurations for convertibility between several oxidation stability and corrosivity test methods including Cummins oxidation test. Removable rack/top plate assemblies remove and install with minimum effort to easily convert the bath between test methods. For most test methods, twelve sets of glassware can be accommodated in each rack assembly. Select flowmeters or digital mass flow control to maintain air flow at the required rates. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath 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 format. *Communication software (RS232, etc.) ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.*

## Specifications

Conforms to the specifications of\*:

ASTM D943, D2274, D2440, D2893, D4310, D4636, D4871\*\*, D5968, D6594; DIN 51394, 51586, 51587; FTM 791-5307, 791-5308

\*with the appropriate glassware rack and flow control equipment installed –see ordering information.

**\*\*Modified versions of this equipment are available for D4871 (UOT) test method.**

Capacity: Twelve (12) sets of glassware. For ASTM D5968, FTM 791-5307, and FTM 791-5308, only ten (10) sets of glassware.

Temperature Range: Ambient to 200°C

Temperature Control Accuracy: 0.2°F (0.1°C)

Bath Medium: Silicone heat transfer fluid

Flow Rate: As specified for ASTM or applicable specifications

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 27.3A

220-240V 50/60Hz, Single Phase, 14.6A

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

Bath (without glassware): 25½x24x42(65x61x107)

## Shipping Information (without glassware)

Shipping Weight: 213 lbs (96.6kg)

Dimensions: 29 Cu. ft.



K12230 High Temperature Convertible Oxidation Bath

## Ordering Information

### Catalog No.

*Please contact your Koehler representative for information on glassware racks and airflow control options prior to order placement.*

**K12230** High Temperature Convertible Oxidation Bath, 115V 60Hz

**K12239** High Temperature Convertible Oxidation Bath, 220-240V 50/60Hz

### Accessories

**K1223-R943** Sample Rack for D943, D2274, D2983, D4310 testing

**K1223-R2440** Sample Rack for D2440 testing

**K1223-R4636** Sample Rack for D4636, D5968, D6594 testing

**K1223-3L** Flowmeter Stand with Flowmeters for D943, D2274, D2440, D4310 testing (range 3 ±0.1 L/hr)

**K1223-10L** Flowmeter Stand with Flowmeters for D2893, D4636, D5968, D6594 testing (range to 10 ±0.5 L/hr)

To order glassware and other accessories please refer to the pages in this section of the catalog that correspond to the test methods that you will be following.



Digital Flowmeter option is available for this unit.



Software compatible, inquire with Koehler Customer Service.

## OXIDATION

### Oxidation Characteristics of Inhibited Mineral Oils

### Sludging and Corrosion Tendencies of Inhibited Mineral Oils

### Oxidation Stability of Distillate Fuel Oil (Accelerated Method)

### Oxidation Characteristics of Extreme-Pressure Lubrication Oils

#### Test Method

Evaluates oxidation stability by subjecting the sample to a temperature of 95°C in the presence of oxygen or dry air. For inhibited mineral oils, the sample is reacted with oxygen in the presence of water and an iron-copper catalyst.

#### Oxidation Stability Apparatus

- Thirty and sixty-place liquid baths for high volume testing requirements
- Eight and twelve-place liquid baths for benchtop placement
- Twelve-place solid block bath
- Conforming to ASTM and related test method specifications
- Special baths for ASTM D2893 and AOCS CD12-57 tests

For product specifications and ordering information:

30 and 60-place Oxidation Baths - page 121

Solid-Block Oxidation Bath - page 121

Oxidation Cell Glassware and Accessories - page 122

Iron-Copper Catalyst and Thermometers - page 122

#### Eight and Twelve-Place Oxidation Baths

Conforming to ASTM and related test method specifications. Constant temperature baths with solid state temperature control, calibrated flowmeters and condenser water manifold for oxidation stability tests on fuels and lubricants. Individual flowmeters and control valves for each oxidation cell deliver air flow at the rate of 3L/h. Condenser water manifold has individual control valves for each cell. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by a redundant overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Display provides actual setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Double-wall insulated baths are equipped with copper immersion heaters and a 1/80 hp circulation stirrer. Stainless steel bath interior has a built-in support rack and overflow/drain to immerse the test cells at the required depth. Order oxidation cell glassware and accessories separately.

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

8-place model: 17½x25x42 (44x64x107)

12-place model: 22x14x42 (57.15x35.56x107)

#### Shipping Information:

Shipping Weight:

8-place model: 137 lbs (62.1kg)

12-place model: 213 lbs (96.6kg)

Dimensions:

8-place model: 29 Cu. ft.

12-place model: 29 Cu. ft.



K12219 Oxidation Stability Bath

#### Specifications

Conforms to the specifications of:

ASTM D943, D2274, D2893\*, D4310, D6158; AOCS CD12-57\*\*

DIN 51586, 51587; ISO 4263, ISO 12205; NF M 07-047; NF T 60-150

Test Capacity: 8 or 12 oxidation cells

Temperature Range: ambient to 212°F (100°C)

Temperature Control Stability: ±0.2°F (±0.1°C)

Bath Medium: white technical oil

Bath Capacity:

8-place model: 10 gal (37.8L)

12-place model: 19 gal (71.9L)

Electrical Requirements: ☼ ☼

8-place model: 115V 60Hz, Single Phase, 13.0A

220-240V 50/60Hz, Single Phase, 6.8A

12-place model: 115V 60Hz, Single Phase, 32.6A

220-240V 50/60Hz, Single Phase, 17.0A

#### Ordering Information

##### Catalog No.

K12200 Oxidation Bath, 8-Unit, 115V 60Hz

K12290 Oxidation Bath, 8-Unit, 220-240V 50/60Hz

K12212 Oxidation Bath, 12-Unit, 115V 60Hz

K12219 Oxidation Bath, 12-Unit, 220-240V 50/60Hz

\*Modified versions of this equipment are available for ASTM D2893

\*\*"Oxidation Characteristics of Extreme Pressure Lubricating Oils" and AOCS CD12-57 "Fat Stability-Active Oxygen Method." Information will be furnished upon request.



Digital Flowmeter option  
is available for this unit.



Software compatible, inquire  
with Koehler Customer Service.

## OXIDATION

### 30- and 60-Place Oxidation Baths

- Convenient operation and servicing of thirty or sixty test cells
- Complete bath temperature, water level, air flow and condenser water systems

Constant temperature water baths for high volume oxidation stability applications. Provides temperature control, metered air flow and condenser water supply controls for as many as thirty or sixty cells in a single system, eliminating the need for multiple water and electrical feeds and oxygen supply tanks. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by a redundant overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Display provides actual setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. A 6 or 12kW heat exchanger with heavy duty magnetic drive circulation pump provides rapid and uniform heat transfer throughout the bath. Bath liquid depth is automatically maintained within ASTM specified tolerances by an electronic water level control system. Two banks of individually controlled flowmeters maintain the required oxygen flow rate to each test cell, and condenser water control valves for each cell are mounted on manifolds along the sides of the bath. A centrally mounted trough collects condenser waste water for convenient disposal or recirculation through an external cooling device. Bath interior is constructed of heavy gauge welded stainless steel. All components are easily accessible for servicing if required. Supplied with a sturdy finished angle-iron frame for floor standing installation. Order oxidation cell glassware and accessories separately.

#### Specifications

Conforms to the specifications of:

ASTM D943, D2274, D2893\*, D4310, D6158; ISO 4263, 12205

AOCS CD12-57\*; DIN 51586, DIN 51587; NF M 07-047; NF T 60-150

Temperature Control Stability:  $\pm 0.1^\circ\text{C}$  ( $\pm 0.2^\circ\text{F}$ )

Oxygen Flow Rate: 3L/h to each test cell, individually controlled

Bath Capacity:

30-place model: 60 gal (227L)

60-place model: 114 gal (432L)

Electrical Requirements: **CE**

30-place model: 220-240V 50/60Hz, Single Phase, 28A

60-place model: 220-240V 50/60Hz, Single Phase, 54A

Other electrical configurations are available upon request.

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

30-place model: 43x55x52 (109x140x132)

60-place model: 43x78x52 (109x198x132)

#### Shipping Information

Shipping Weight:

30-place model: 892 lbs (404.6kg)

60-place model: 995 lbs (451.3kg)

Dimensions:

30-place model: 94 Cu. ft.

60-place model: 148 Cu. ft.

#### Ordering Information

##### Catalog No.

**K12330** 30-Place Oxidation Stability Bath, 220-240V 60Hz

**K12339** 30-Place Oxidation Stability Bath, 220-240V 50Hz

**K12300** 60-Place Oxidation Stability Bath, 220-240V 60Hz

**K12395** 60-Place Oxidation Stability Bath, 220-240V 50Hz

*Photograph, thermometers, and additional accessories for oxidation stability testing appear on page 122.*

*\*Modified versions of this equipment are available for ASTM D2893 "Oxidation Characteristics of Extreme Pressure Lubricating Oils" and AOCS CD12-57 "Fat Stability Active Oxygen Method." Information will be furnished upon request.*

*Available option for 30- and 60-place Oxidation Baths—temperature/pressure recorder with built-in alarms for low pressure and over/under temperature. Please call or write for specifications and ordering information.*



Software compatible, inquire with Koehler Customer Service.



Advanced Communications Software Package for Data Management

### 12-Place Solid-Block Oxidation Bath

- Accommodates twelve oxidation cells
- Microprocessor digital temperature control

Constant temperature aluminum block oxidation bath with flowmeters and condenser water manifold for twelve cells. Insulated solid block design provides efficient operation at temperatures of up to 450°F (232°C). Microprocessor temperature control unit features digital setpoint and display and built-in overtemperature protection. Includes individual flowmeters and control valves for each cell, delivering air flow at the rate of 3L/h. Condenser water manifold has individual control valves for each cell. Order oxidation cell glassware and accessories separately.

#### Specifications

Conforms to the specifications of:

ASTM D943, D2274, D2893\*, D4310, D6158; AOCS CD12-57\*;

DIN 51586, 51587; ISO 4263, 12205; NF M 07-047; NF T 60-150

Testing Capacity: 12 oxidation cells

Maximum Temperature: 450°F

Temperature Control Stability:  $\pm 0.2^\circ\text{F}$  ( $\pm 0.1^\circ\text{C}$ )

Air Flow Rate: 3L/h

Electrical Requirements: 220-240V 50/60Hz, Single Phase, 16A **CE**

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

30x10x43 (76x25x109)

Net Weight: 345 lbs (156.5kg)

#### Shipping Information

Shipping Weight: 440 lbs (199.6kg)

Dimensions: 12 Cu. ft.

*Solid block baths meet temperature control and other requirements of ASTM and related methods. While the aluminum block design offers operating advantages over the standard oil bath, it should be noted that many applicable specifications for this test call for a liquid bath medium.*

#### Ordering Information

##### Catalog No.

**K12201** 12-Place Solid Block Oxidation Bath, 220-240V 50/60Hz

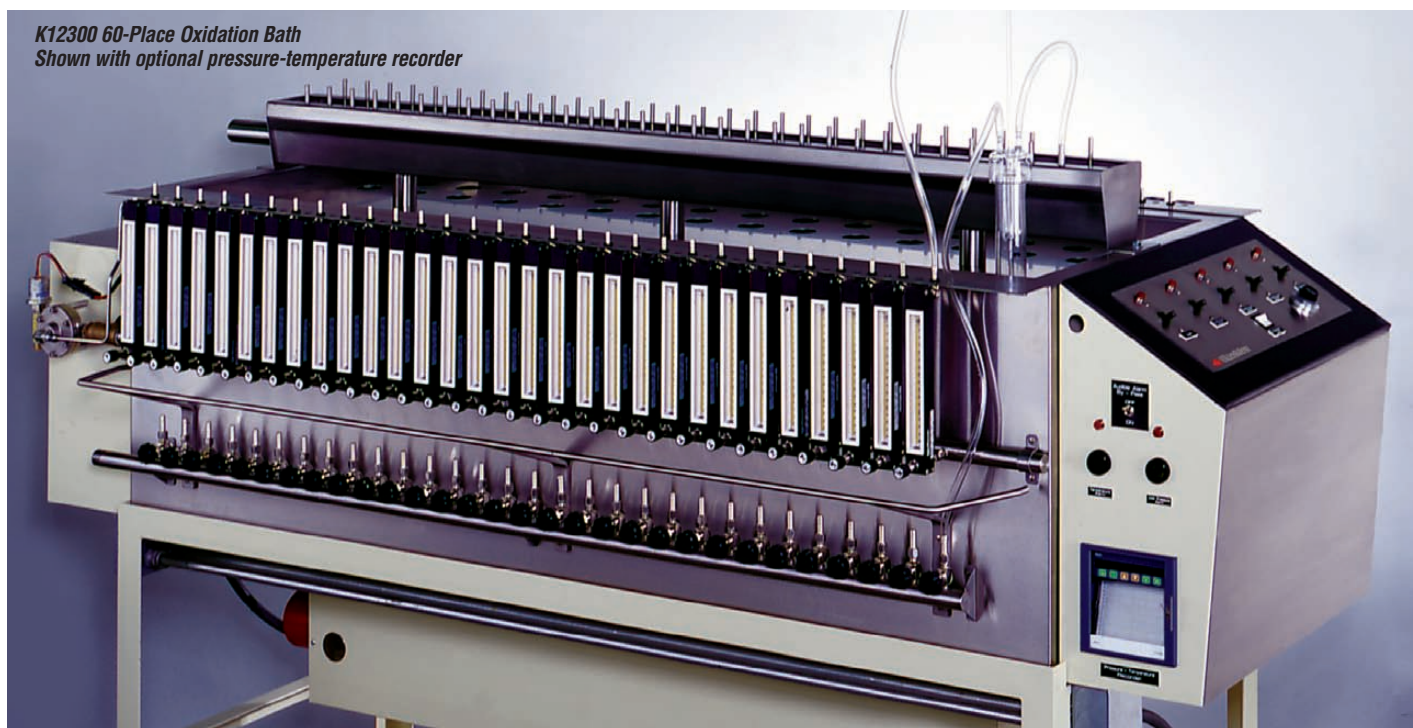
*\*Modified versions of this equipment are available for ASTM D2893 "Oxidation Characteristics of Extreme Pressure Oils" and AOCS CD12-57 "Fat Stability-Active Oxygen Method." Information will be furnished upon request.*



Digital flowmeter option is available for this unit.



## OXIDATION



### Oxidation Cell Glassware and Accessories

### Iron-Copper Catalyst

For ASTM D943 and D4310

#### Ordering Information

##### Catalog No.

|                      |                                                                                                                                                                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>K12281</b>        | Oxidation Cell Assembly for ASTM D943 and D4310<br>Includes oxidation cell, condenser, oxygen delivery tube, thermometer bracket, oil level indicator strip, syringe sampling tube, sampling tube holder, spacer, PTFE stopper and O-rings |
| <b>K122-0-18</b>     | Oxygen Delivery Tube                                                                                                                                                                                                                       |
| <b>K122-0-19</b>     | Oxidation Test Tube                                                                                                                                                                                                                        |
| <b>K122-0-20</b>     | Condenser                                                                                                                                                                                                                                  |
| <b>K122-0-21</b>     | Thermometer Bracket                                                                                                                                                                                                                        |
| <b>K122-0-22</b>     | Oil Level Indicator Strip                                                                                                                                                                                                                  |
| <b>K122-0-23</b>     | Syringe Sampling Tube Holder                                                                                                                                                                                                               |
| <b>K122-0-27</b>     | PTFE Stopper                                                                                                                                                                                                                               |
| <b>K122-0-28</b>     | Syringe Sampling Spacer                                                                                                                                                                                                                    |
| <b>K122-0-30</b>     | Syringe Sampling Tube                                                                                                                                                                                                                      |
| <b>AS568-009-V14</b> | O-rings                                                                                                                                                                                                                                    |

For ASTM D2274, order one each K122-0-18 Oxygen Delivery Tube, K122-0-19 Oxidation Test Tube, and K122-0-20 Condenser for each cell.

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



Digital Flowmeter option  
is available for this unit.

#### Ordering Information

##### Catalog No.

|                    |                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>K12210</b>      | Catalyst Coil<br>Low-metalloid steel wire and electrolytic copper wire wound in a double spiral conforming to ASTM specifications. Packed in a sealed glass tube with a nitrogen atmosphere. Ready for use. |
| <b>K24000</b>      | Wire Coiling Mandrel<br>Mounts on bench for winding steel and copper wire into catalyst coils meeting ASTM specifications.                                                                                  |
| <b>K12250</b>      | Steel Wire<br>Low metalloid steel wire, 0.0625" (1.59mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths.                                                                                |
| <b>K12260</b>      | Copper Wire<br>Electrolytic copper wire, 0.064" (1.63mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths.                                                                                |
| <b>380-100-001</b> | Silicone Carbide Paper<br>Used to polish steel and copper wire prior to winding into catalyst coils. 100 grit.                                                                                              |

### Thermometers

#### Ordering Information

##### Catalog No.

|                    |                                                                             |
|--------------------|-----------------------------------------------------------------------------|
| <b>250-002-001</b> | Oxidation Cell Thermometer<br>Range: 80 to 100°C. For ASTM D943 and D4310.  |
| <b>250-000-40C</b> | ASTM 40C Thermometer<br>Range: 72 to 126°C. For constant temperature baths. |

# OXIDATION STABILITY OF MINERAL INSULATING OILS



**K12100 Oxidation Stability Bath**

## Specifications

Conforms to the specifications of:

ASTM D2440

Capacity: Six samples

Temperature Range: ambient to 260°F (127°C)

Circulator: ½hp impeller

Bath Capacity/Medium: 2.5 gal (9.5L) white technical oil

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 8.1A

220-240V 50/60Hz, Single Phase, 4.2A

## Included Accessories

Oil Receptacle and Head (6)

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

14x15x22 (36x38x56)

Net Weight: 31 lbs (14.1kg)

## Shipping Information

Shipping Weight: 61 lbs (27.7kg)

Dimensions: 14.4 Cu. ft.



Digital Flowmeter option  
is available for this unit.



Software compatible, inquire  
with Koehler Customer Service.

## Test Method

Determines oxidation stability of mineral transformer oils by measuring the amount of sludge and acid formed under prescribed accelerated aging conditions.

## Oxidation Stability Bath

- Conforms to ASTM D2440 specifications
- Microprocessor temperature control with digital display and overtemperature cut-off
- Six-sample testing capacity

Constant temperature oil bath for testing oxidation stability of mineral insulating oils. Immerses six oil receptacles at the required depth per ASTM specifications at 110°C ± 0.5°C, and controls oxygen flow to each sample at the rate of 1L/h ± 0.1L/h through six independent flowmeters mounted on a common manifold. Insulated double-wall stainless steel bath has microprocessor temperature control with °C/°F switchable digital setpoint and display. Operator and equipment are protected by an overtemperature control circuit which automatically interrupts power to the unit when bath temperature exceeds a 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. Order bath thermometer drying tower and catalyst separately.*

## Ordering Information

| Catalog No.        |                                                                                                    | Order Qty |
|--------------------|----------------------------------------------------------------------------------------------------|-----------|
| K12100             | Oxidation Stability Bath,<br>115V 60Hz                                                             | 1         |
| K12190             | Oxidation Stability Bath,<br>220-240V 50/60Hz                                                      |           |
| <b>Accessories</b> |                                                                                                    |           |
| K12130             | Copper Catalyst Coils<br>Sealed in a glass jar with a nitrogen<br>atmosphere. Pack of 24 (12 sets) | 1         |
| 332-005-010        | Drying Tower<br>250mL with ground glass stopper<br>and side tubes                                  | 1         |
| 332-005-011        | Glass Filter Crucible                                                                              | 1         |
| 250-000-95C        | ASTM 95C Thermometer<br>Range: 100 to 130°C                                                        | 1         |
| 355-001-001        | White Technical Oil<br>1 gal container. See page 8 for specifications.                             | 3         |
| 355-001-003        | White Technical Oil<br>5 gal container. See page 8 for specifications.                             | 1         |

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

## CORROSIVENESS AND OXIDATION STABILITY



**K35100 FTM 791-5307 Model with accessory glassware**

### Specifications

Conforms to the specifications of:

ASTM D4636, D5968, D6594; FTM 791-5307, 791-5308;

IHC BT-10; DIN 51394

Capacity: 6 test cells

Temperature Range: 125 to 750°F (51.7 to 399°C)

Temperature Control Stability: ±1°F (±0.5°C)

Air Flow Rate: ASTM D4636/FTM 791-5307: 10L/h

FTM 791-5308: 3L/h and 5L/h (dual range flowmeters)

IHC BT-10: 3L/h (50mL/min.)

Electrical Requirements: 220-240V 50/60Hz, Single Phase, 15.9A CEE

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

32½ x 14½ x 41½ (83 x 37 x 105)

Net Weight: 271 lbs (122.9kg)

### Shipping Information

Shipping Weight: 375 lbs (170.1kg)

Dimensions: 18.5 Cu. ft.



Digital Flowmeter option  
is available for this unit.



Software compatible, inquire  
with Koehler Customer Service.

## Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants, and Other Highly Refined Oils

### Test Method

Evaluates the ability of a lubricant to resist oxidation and the formation of corrosive acid compounds by subjecting a sample to accelerated oxidation conditions in a catalytic environment. The sample is maintained at elevated temperature and subjected to a controlled air flow while in the presence of a series of test specimens made of metals commonly found in actual service conditions.

### Corrosiveness and Oxidation Stability Test Apparatus

- Models for ASTM, Federal and IHC test methods
- Six-sample testing capability
- Solid aluminum block design
- Microprocessor temperature control with digital display and overtemperature protection

Constant temperature block baths for corrosivity and oxidation stability determinations on hydraulic oils, aircraft turbine lubricants, transmission fluids and other highly refined oils. Insulated aluminum block provides safe, efficient performance at operating temperatures of up to 750°F (399°C). Microprocessor temperature control has °C/°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 a 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.* Air flow is controlled at the specified rate by six individually adjustable flowmeters mounted on a common manifold. Includes inlet valve and outlet fitting for condenser water supply and support rack for glassware.

### Ordering Information

| Catalog No.                                                              | Order Qty |
|--------------------------------------------------------------------------|-----------|
| <b>Corrosivity and Oxidation Stability Test Apparatus</b>                | <b>1</b>  |
| <b>K35100</b> ASTM D4636, D5968 and FTM 791-5307 Model, 220-240V 50/60Hz |           |
| <b>K35000</b> FTM 791-5308 Model, 220-240V 50/60Hz                       |           |
| <b>K35300</b> IHC BT-10 Model, 220-240V 50/60Hz                          |           |
| <b>Thermometers</b>                                                      |           |
| <b>250-000-08F</b> ASTM 8F Thermometer Range: 30 to 760°F                |           |
| <b>250-000-08C</b> ASTM 8C Thermometer Range: -2 to +400°C               |           |

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

## CORROSIVENESS AND OXIDATION STABILITY

| Glassware, Test Specimens and Accessories        |                                                                                                               |           | Metal Test Specimens                                                                   |                                                     |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------|-----------------------------------------------------|
| Catalog No.                                      |                                                                                                               | Order Qty | Catalog No.                                                                            |                                                     |
| <b>ASTM D4636, D5968, D6594 and FTM 791-5307</b> |                                                                                                               |           | <b>Washer Shaped Specimens for ASTM D4636 Standard Procedure and for FTM 791-5307</b>  |                                                     |
| K351-0-1                                         | Sample Tube                                                                                                   | 6         | K35110                                                                                 | Bronze                                              |
| K351-0-2                                         | Sample Tube Head                                                                                              | 6         | K35120                                                                                 | Mild Steel                                          |
| K351-0-3                                         | Air Tube                                                                                                      | 6         | K35130                                                                                 | Aluminum Alloy                                      |
| K351-0-4                                         | Thermocouple Tube                                                                                             | 6         | K35140                                                                                 | Magnesium                                           |
| K351-0-5                                         | Condenser, Allihn Type                                                                                        | 6         | K35150                                                                                 | Steel M50                                           |
| K351-0-6                                         | Oil Sampling Tube (for D4636)                                                                                 | 6         | K35160                                                                                 | Silver                                              |
| K351-0-7                                         | Spacer                                                                                                        | 36        | K35170                                                                                 | Titanium                                            |
| K351-0-8                                         | PTFE Adapter                                                                                                  | 6         |                                                                                        |                                                     |
| K351-0-13                                        | Oil Sampling Tube (for D5968 and FTM 791-5307)                                                                |           | <b>Square Shaped Specimens for ASTM D4636 Alternate Procedure and for FTM 791-5308</b> |                                                     |
| K351-0-14                                        | Specimen Hanger (for D6594)                                                                                   |           | K35010                                                                                 | Copper                                              |
| K293-0-12                                        | Thermocouple, Type J                                                                                          | 6         | K35020                                                                                 | Mild Carbon Steel                                   |
| K29319                                           | Digital Thermometer, 220-240V                                                                                 | 1         | K35030                                                                                 | Aluminum Alloy                                      |
|                                                  | Microprocessor based digital thermocouple thermometer with ten-channel input.                                 |           | K35040                                                                                 | Magnesium Alloy                                     |
|                                                  | Monitors Type J thermocouples from sample tubes.                                                              |           | K35050                                                                                 | Cadmium Plated Steel                                |
| K35090                                           | Test Panel Assembly Fixture                                                                                   | 1         | K35060                                                                                 | Silver                                              |
|                                                  | Holds square-shaped metal specimens for tying with cord (for ASTM D4636 Alternate Procedure and FTM 791-5308) |           | K35070                                                                                 | Solid Cadmium (non standard)                        |
| K35095                                           | Test Panel Assembly Fixture                                                                                   | 1         | K35080                                                                                 | Titanium (non standard)                             |
|                                                  | Holds square-shaped metal specimens for tying with cord (for ASTM D5968)                                      |           | <b>Square Shaped Specimens for ASTM D5968 and D6594</b>                                |                                                     |
| <b>FTM 791-5308</b>                              |                                                                                                               |           | K35010                                                                                 | Copper                                              |
| K350-0-23                                        | Test Tube                                                                                                     | 6         | K35011                                                                                 | Lead                                                |
| K350-0-24                                        | Air Tube                                                                                                      | 6         | K35012                                                                                 | Tin                                                 |
| K350-0-25                                        | Condenser                                                                                                     | 6         | K35013                                                                                 | Phosphor Bronze                                     |
| K35090                                           | Test Panel Assembly Fixture                                                                                   | 1         | <b>Rectangular Shaped Specimens for IHC BT-10</b>                                      |                                                     |
|                                                  | Holds square-shaped metal specimens for tying with cord.                                                      |           | K353-0-5                                                                               | Aluminum                                            |
|                                                  |                                                                                                               |           | K353-0-6                                                                               | Copper                                              |
|                                                  |                                                                                                               |           | K353-0-7                                                                               | Steel                                               |
|                                                  |                                                                                                               |           | K353-0-8                                                                               | Brass                                               |
| <b>IHC BT-10</b>                                 |                                                                                                               |           | <b>Polishing Materials</b>                                                             |                                                     |
| K353-0-1                                         | Test Cell                                                                                                     | 6         | 380-150-001                                                                            | Silicone Carbide Paper, 150-grit, Pack of 50 sheets |
| K353-0-2                                         | Condenser                                                                                                     | 6         | 380-240-001                                                                            | Silicone Carbide Paper, 240-grit, Pack of 50 sheets |
| K353-0-3                                         | Air Tube                                                                                                      | 6         | 380-150-000                                                                            | Silicone Carbide Grain, 150-grit, 1 lb package      |
| K353-0-4                                         | Ring Rod                                                                                                      | 6         |                                                                                        |                                                     |

## OXIDATION



K56100 Cigre Bath with K56110 Glassware

### Oxidation Stability of Inhibited Mineral Turbine Oils

### Oxidation Stability of Straight Mineral Oil

### Oxidation Stability of Mineral Insulating Oil

### Oxidation Stability of Inhibited Mineral Insulating Oils

### Oxidation Test For Lubricating Oil

#### Test Method

Oxidation stability is determined by exposing the sample to a measured oxygen flow at elevated temperature in the presence of metal catalysts.

#### Oxidation Stability Apparatus (Cigre Bath)

- Conforms to IP specifications
- Twelve-sample testing capability
- Microprocessor programmable high accuracy temperature control

Constant temperature aluminum block type bath for oxidation stability tests in accordance with the Institute of Petroleum (IP) testing methods. Accommodates twelve sets of oxidation and absorption tubes. Insulated block bath operates efficiently at temperatures of up to 200°C (392°F). Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by an overtemperature control circuit that interrupts power should block temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.* A bank of twelve flowmeters on a movable stand regulates oxygen flow at  $1 \pm 0.1$  L/h to each oil sample per IP specifications. Includes soap bubble flowmeter for checking oxygen flow rate.

#### Specifications

Conforms to the specifications of:  
IP 48, IP 280, IP 306, IP 307, IP 335  
Testing Capacity: Twelve samples  
Temperature Range: 80 to 200°C  
Temperature Uniformity:  $\pm 0.2^\circ\text{C}$   
Air Flow Control:  
Standard Model: 1L/h to each sample  
IP 48 Model: 15L/h to each sample  
Electrical Requirements: **CE**  
115V 60Hz, Single Phase, 12.1A  
220-240V 50/60Hz, Single Phase, 6.3A

#### Included Accessories

Soap Bubble Flowmeter

#### Dimensions

Bath: dia.xh.in.(cm)  
17x22 (43.2x55.9)  
Flowmeter Stand: lwxh.in.(cm)  
24x8x30 1/4 (61x20.3x76.8)  
Net Weight: 186 lbs (84.4kg)



Digital Flowmeter option  
is available for this unit.

#### Shipping Information

Shipping Weight: 245 lbs (111.1kg)  
Dimensions: 16.7 Cu. ft.

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



Software compatible, inquire  
with Koehler Customer Service.

#### Ordering Information

| Catalog No. |                                                                       | Order Qty |
|-------------|-----------------------------------------------------------------------|-----------|
| K56100      | Oxidation Stability Apparatus<br>115V 60Hz                            | 1         |
| K56190      | Oxidation Stability Apparatus<br>220-240V 50/60Hz                     |           |
| K56200      | Oxidation Stability Apparatus<br>115V 60Hz<br>For IP 48 Method.       |           |
| K56290      | Oxidation Stability Apparatus<br>220-240V 50/60Hz<br>For IP 48 Method |           |

#### Accessories

|             |                                                                                                                   |    |
|-------------|-------------------------------------------------------------------------------------------------------------------|----|
| K56110      | Set of Glassware<br>Includes one each oxidation and absorption tube.<br>For IP 48, IP 280, IP 306, IP 307, IP 335 | 12 |
| 250-000-09C | ASTM 9C Thermometer<br>Range: -5 to +110°C<br>(equivalent to IP 15C Thermometer)                                  | 1  |
| 250-000-41C | ASTM 41C Thermometer<br>Range: 98 to 152°C<br>(equivalent to IP 81C Thermometer)                                  |    |

A liquid bath version of this equipment to perform the proposed ASTM test for High Temperature Stability of Distillate Fuels is also available. Please contact Koehler's Customer Service for additional information.

# THERMAL OXIDATION STABILITY OF AUTOMOTIVE GEAR LUBRICANTS

## Test Method

The L-60-1 Performance Test determines the deterioration of gear lubricants under severe thermal oxidation conditions. The sample lubricant is tested for 50 hours in a standardized gear box operating under a predetermined load. An elevated temperature and controlled air flow are maintained throughout the test and a copper catalyst is employed to accelerate the breakdown. At the end of the test period, various lubricant properties are determined by standard testing methods, and the weight loss of the catalyst is measured. The deposits that are formed on the gear box surfaces and the catalyst are examined and reported.

## Ordering Information

|                    |                                                  |
|--------------------|--------------------------------------------------|
| <b>Catalog No.</b> |                                                  |
| <b>K18660</b>      | L-60-1 Performance Test Apparatus, 220-240V 60Hz |
| <b>K18650</b>      | L-60-1 Performance Test Apparatus, 220-240V 50Hz |

## Accessories

|                    |                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>K18661</b>      | Test Kit, for one test. Includes GA34 test gear, GA50 test gear, R-14 test bearing, viton shaft seals (2), O-ring seal, copper test strips (2) |
| <b>380-150-001</b> | Silicone Carbide Paper, 150-grit (pack of 50)                                                                                                  |



## L-60-1 Performance Test Apparatus

- Conforms to ASTM D5704 and STP512A L-60-1 Performance Test specifications. Performs the L-60-1 Thermal Oxidation Stability performance test for API GL-5 gear lubricant service. Consists of a standardized gear box assembly with motor drive system and digital indicating controls for all test functions.

### Gear Case and Drive System

Two spur gears and a test bearing are operated inside a machined stainless steel case with removable window. The drive gear shaft is coupled to a heavy duty ball bearing motor loaded by a 45 ampere alternator. The standard L-60-1 test gear loading value of 128 watts generator output is precisely maintained by a digitally indicated load bank. All gear box components are easily accessible for cleaning.

### Temperature Control

An insulated heating case with high volume blower encloses the gear box. Sample oil temperature is maintained at  $325^{\circ}\text{F} \pm 1^{\circ}\text{F}$  ( $162.8 \pm 0.6^{\circ}\text{C}$ ) by a digital indicating controller with PT-RTD sensor. A built-in microprocessor based recorder produces a test oil temperature chart for reporting purposes. Overtemperature protection is provided by a separate PT-RTD-sensed controller.

### Air Flow Control

A high accuracy mass flow controller with digital indication maintains air flow to the gear box at a constant 1.1L/h. The self correcting controller maintains the setpoint flow rate regardless of fluctuations in air input pressure or temperature. Test cabinet and control cabinet are finished in chemical resistant polyurethane enamel. Test cabinet has a cover for access to the gear box and a removable drive motor cover.

## Specifications

Conforms to the specifications of:

ASTM D5704; STP512A L-60-1 Performance Test (formerly CRC L-60 Test); FTM 791-2504

Controls and Monitors:

Sample Oil Temperature:  $^{\circ}\text{C}/^{\circ}\text{F}$ , digital setpoint and display, user adjustable

Overtemperature Limit Control:  $^{\circ}\text{F}$ , user acceptable

Heating Chamber Air Temperature:  $^{\circ}\text{C}/^{\circ}\text{F}$

Air Flow: L/h, digital setpoint and display, user adjustable

Test Gear Load: Volts DC, Amps. DC, digital display, user adjustable

Sample Oil Temperature Recorder: Programmable microprocessor based strip chart recorder with digital display,  $^{\circ}\text{C}/^{\circ}\text{F}$

Drive Motor: 1725rpm thermally protected ball bearing type

Alternator: 45 ampere output

Electrical Requirements: **CE**

220-240V 60Hz, Single Phase, 15A

220-240V 50Hz, Single Phase, 15A

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

Test Cabinet: 24x24x14½ (61x61x37)

Control Cabinet: 23½x23½x17½ (60x60x44)

Net Weight: 330 lbs (149.7kg)

## Shipping Information

Shipping Weight: 498 Lbs (225.9kg)

Dimensions: 29.2 Cu. ft.

## RUST PREVENTING CHARACTERISTICS



**K30160 Rust Preventing Characteristics Bath**

### Specifications

Conforms to the specifications of:

ASTM D665, D3603, D6158; NACE TM-01-72\*; IP 135; ISO 7120;  
DIN 51355\*\*, DIN 51585; FTM 791-4011, 791-5315\*\*; NF T 60-151

Testing Capacity: Six (6) 400mL sample beakers

Maximum Temperature: 104°C (220°F)

Temperature Control Stability:  $\pm 0.5^{\circ}\text{C}$  ( $\pm 1^{\circ}\text{F}$ )

Drive Motor:  $\frac{1}{2}$ hp induction motor

Bath Medium: 11 gal (41.6L) white technical oil

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 13.0A

220-240V 50 or 60Hz, Single Phase, 6.8A

### Included Accessories

ASTM D665 Models (K30160, K30165, K30166)

Steel Test Specimens (6)

Type 2 Plastic Specimen Holders (6)

Plastic Beaker Covers (6)

ASTM D3603 Models (K30161, K30167, K30168)

Horizontal Disc Test Assembly (6) consisting of:

plastic beaker cover

horizontal test specimen

vertical test specimen

fluorocarbon washer

plastic cap

stainless steel support rods and hardware

### Dimensions

l x w x h, in. (cm)

32 $\frac{1}{2}$  x 14 $\frac{1}{2}$  x 27 (83 x 36 x 69)

Net Weight: 79 lbs (35.8kg)

### Shipping Information

Shipping Weight: 150 lbs (68kg)

Dimensions: 16.2 Cu. ft.

\*\* Accessories for these test methods are available upon request.

 Software compatible, inquire  
with Koehler Customer Service.

## Rust Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water (Standard and Horizontal Disc Methods)

### Test Method

Determines a lubricant's ability to prevent rusting of metal surfaces. Suitable for steam turbine oils, gear oils, hydraulic oils and other types of inhibited mineral oils. A steel test specimen is immersed in a heated mixture of sample oil and water which is stirred continuously during the test. After the test period the specimen is examined for rusting. The standard (ASTM D665) method uses a vertical specimen; the 'horizontal disc method' (ASTM D3603) uses both horizontal and vertical test surfaces.

### Rust Preventing Characteristics Oil Bath

- Conforms to ASTM D665, D3603 and NACE TM-01-72\* specifications

- Accommodates six sample beakers

- Microprocessor programmable high accuracy temperature control

Constant temperature bath with stirrers for rust preventing characteristics tests. Stirs sample-water mixtures at 1000rpm and controls temperature with  $\pm 0.5^{\circ}\text{C}$  ( $\pm 1^{\circ}\text{F}$ ) stability. Immerses test beakers at the proper depth per ASTM specifications.

Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath 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  $^{\circ}\text{C}/^{\circ}\text{F}$  format. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.*

Stainless steel stirrer paddles are driven by a ball bearing type motor through an improved pulley drive-roller bearing arrangement. Paddles can be raised and lowered for placement of sample beakers in the bath. Includes test specimens, holders and beaker covers for ASTM D665 or D3603 testing (see specifications and ordering information). Stainless steel bath includes perforated support shelf for beakers and two-position cover plate that adjusts for either ASTM D665 or D3603 testing. Long-lasting polyester drive belt improves reliability. Drive train components are protected by a removable steel guard. All exterior surfaces have stainless steel or chemical resistant polyurethane enamel finishes.

### Ordering Information

#### Catalog No.

#### Rust Preventing Characteristics Oil Bath For ASTM D665

**K30160** Rust Preventing Characteristics  
Oil Bath, 115V 60Hz

**K30165** Rust Preventing Characteristics  
Oil Bath, 220-240V 50Hz

**K30166** Rust Preventing Characteristics  
Oil Bath, 220-240V 60Hz

#### For ASTM D3603

**K30161** Rust Preventing Characteristics  
Oil Bath, 115V 60Hz

**K30167** Rust Preventing Characteristics  
Oil Bath, 220-240V 50Hz

**K30168** Rust Preventing Characteristics  
Oil Bath, 220-240V 60Hz

\*To order this equipment for the NACE TM-01-72 test please turn to page 98.

## RUST PREVENTING CHARACTERISTICS



**K30800 Horizontal Disk Assembly**



**K30101 Specimen with Holder**



**K30130 Chuck**

| Accessories        |                                                                                                                        |           |
|--------------------|------------------------------------------------------------------------------------------------------------------------|-----------|
| Catalog No.        |                                                                                                                        | Order Qty |
| <b>332-002-006</b> | Test Beaker, 400mL for ASTM D665 & D3603                                                                               | 6         |
| <b>250-000-09F</b> | ASTM 9F Thermometer<br>Range: 20 to 230°F                                                                              | 7         |
| <b>250-000-09C</b> | ASTM 9C Thermometer<br>Range: -5 to +110°C                                                                             |           |
| <b>K30130</b>      | Chuck for polishing test specimens<br>Includes locknut and shaft for mounting on accessory drive motor.                | 1         |
| <b>K30150</b>      | Drive Motor<br>Drives K30130 Chuck. Mounted on base.<br>115V 60Hz                                                      | 1         |
| <b>K30180</b>      | Drive Motor<br>Similar to K30150 but for operation on 220-240V 50Hz                                                    |           |
| <b>380-150-002</b> | Aluminum Oxide Cloth, 150-grit for preliminary grinding of test specimens<br>Pack of 50                                |           |
| <b>380-240-002</b> | Aluminum Oxide Cloth, 240-grit for final polishing of test specimens<br>Pack of 50                                     | 1         |
| <b>K30140</b>      | Auxiliary Stirrer Blade - Attaches to stirrer shaft - for testing heavier than water samples - ASTM D665. Procedure C. |           |

| Test Specimens |                                                                                                                                                                                             |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalog No.    |                                                                                                                                                                                             |
| <b>K30110</b>  | Steel Test Specimen for ASTM D665<br>Machined to ASTM specifications. Without Holder                                                                                                        |
| <b>K30100</b>  | Test Specimen with Type 2 Plastic Holder for ASTM D665                                                                                                                                      |
| <b>K30119</b>  | Test Specimen with Type 1 Plastic Holder for ASTM D665                                                                                                                                      |
| <b>K30101</b>  | Test Specimen with Type 2 PTFE Holder                                                                                                                                                       |
| <b>K30810</b>  | Horizontal Test Specimen for ASTM D3603                                                                                                                                                     |
| <b>K30820</b>  | Vertical Test Specimen for ASTM D3603                                                                                                                                                       |
| <b>K30800</b>  | Horizontal Disc Rust Test Assembly for ASTM D3603. Includes polycarbonate beaker cover, two stainless steel support rods, disc carrier and one each horizontal and vertical test specimens. |

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

## CORROSION OF LEAD BY LUBRICATING OILS

### Test Method

Measures the corrosiveness of lubricating oils to lead in the presence of a copper catalyst. Lead and copper test panels are rotated in the test lubricant under specified test conditions, and the degree of corrosion is determined by the change in weight of the lead panel.

### Lead Corrosion Test Apparatus

- Conforms to FTM 791-5321 specifications
- Six-sample capacity
- Microprocessor programmable high accuracy temperature control

Constant temperature apparatus rotates copper and lead test panels in lubricant samples to determine corrosiveness to lead per FTM specifications. Panels are rotated at 600rpm in samples maintained at 163°C (325°F) and aerated at 0.94L/min. (2.0 Cu. ft./hr.).

Test panel shafts ride on ball bearing spindles driven by a 1/8hp motor. A counterbalanced support bar positions the drive shaft for testing or for mounting and removal of test panels. When the support bar is raised, a safety microswitch automatically stops the drive motor to prevent splashing of hot oil.

Fully insulated bath features double-wall stainless steel construction, with a built-in support rack to suspend test cells vertically at the proper depth. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath 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 format. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.* A 1/2hp stirrer thoroughly circulates the bath medium for temperature uniformity. Redundant overtemperature protection is provided by a built-in backup thermostat. Flowmeters and valves mounted on a convenient manifold provide individual air flow control for each test cell.



Digital Flowmeter option is available for this unit.

### Specifications

Conforms to the specifications of:  
FTM 791-5321

Testing Capacity: 6 lubricant samples  
Maximum Temperature: 199°C (390°F)  
Temperature Control Stability:  $\pm 0.05^\circ\text{C}$  ( $\pm 0.1^\circ\text{F}$ )  
Air Flow Control: 0.94 $\pm$ 0.047L/min.  
(2 $\pm$ 0.1 Cu. ft./hr) six (6) flowmeters mounted on a common manifold  
Electrical Requirements: **CE**  
220-240V 60Hz, Single Phase, 14.5A  
220-240V 50Hz, Single Phase, 14.5A

### Included Accessories

Copper Test Panels (6)  
Lead Test Panels (6)  
Mounting Hardware for Panels

### Dimensions

lxwxh,in.(cm)  
39x25x47 (99x64x119)  
Net Weight: 214 lbs (97kg)

### Shipping Information

Shipping Weight: 330 lbs (150kg)  
Dimensions: 33.5 Cu. ft.

### Ordering Information

| Catalog No. |                                            | Order Qty |
|-------------|--------------------------------------------|-----------|
| K29900      | Lead Corrosion Apparatus,<br>220-240V 60Hz | 1         |
| K29990      | Lead Corrosion Apparatus,<br>220-240V 50Hz |           |

### Accessories

|             |                                            |   |
|-------------|--------------------------------------------|---|
| K29910      | Borosilicate Glass Sample Tube             | 6 |
| 250-000-16F | ASTM 16F Thermometer<br>Range: 85 to 392°F | 1 |
| 250-000-16C | ASTM 16C Thermometer<br>Range: 30 to 200°C |   |
| K29920      | Lead Test Panels                           |   |
| K29930      | Copper Test Panels                         |   |

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

## STABILITY OF LUBRICATING OILS (WORK FACTOR)

### Test Method

Determines the stability of a lubricating oil when subjected to an endurance test in a journal bearing operated under prescribed conditions. After a 100 hour test period, the 'work factor' is computed from measured changes in viscosity, neutralization number and carbon residue.

### Navy Work Factor Machine

• Conforms to FTM 791-3451 specifications  
Complete apparatus for the 'Navy Work Factor' stability test for lubricating oils. Consists of bearing and journal, bearing loading device with calibrated springs, 5hp drive system with variable speed control, oil circulation system, and full instrumentation. Operates the journal bearing at 2000 or 3000rpm under a specified load. Oil system pressure is maintained at a constant 15 psig (103 gauge kPa) throughout the test. Includes digital displays of oil pressure and temperature and a built-in strip chart recorder for hard copy test reports.

### Specifications

Conforms to the specifications of: FTM 791-3451.4  
Electrical Requirements: 220-240V, 3 Phase, 50/60Hz, 20A **CE**

### Dimensions

lxwxh,in.(cm)  
50x40x60 (127x102x152)  
Net Weight: 1378 lbs (625.1kg)

### Shipping Information

Shipping Weight: 1660 lbs (753kg)  
Dimensions: 110 Cu. ft.

### Ordering Information

| Catalog No. |                                                                        |
|-------------|------------------------------------------------------------------------|
| K30000      | Navy Work Factor Machine,<br>220-240V Specify 50 or 60Hz when ordering |
| K30010      | Replacement Test Bearing                                               |

## COPPER CORROSION FROM PETROLEUM PRODUCTS

### Test Method

The Copper Strip Tarnish Test assesses the relative degree of corrosivity of petroleum products, including lubricating oils. A polished copper strip is immersed in 30mL of sample at elevated temperature. After the test period, the strip is examined for evidence of corrosion and a classification number from 1-4 is assigned based on a comparison with the ASTM Copper Strip Corrosion Standards.

### Copper Strip Tarnish Test Apparatus

- Conforms to ASTM D130, D6074, D6158 and related specifications

The complete apparatus for the Copper Strip Tarnish Test for lubricating oils consists of:

- Test Tube Bath
- Copper Strips
- Test Tubes
- ASTM Copper Strip Corrosion Test Standard
- Surface Preparation Accessories

### Test Tube Bath

- Accommodates 17 test tubes
- Temperature range to 190°C (374°F)
- Microprocessor temperature control with digital display and overtemperature protection.

Constant temperature bath immerses 16 test tubes for copper strip tarnish tests of products not requiring a test bomb. Microprocessor temperature control has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an overtemperature control circuit which automatically interrupts power to the unit should bath temperature exceed a programmed cut-off point. Welded stainless steel double-wall construction with built-in support rack. Fully insulated. For complete specifications, please refer to page 90.

### Ordering Information

| Catalog No.        |                                                                                                              | Order Qty |
|--------------------|--------------------------------------------------------------------------------------------------------------|-----------|
| K25330             | Copper Strip Test Tube Bath, 115V 60Hz                                                                       | 1         |
| K25339             | Copper Strip Test Tube Bath, 220-240V 50/60Hz                                                                |           |
| K25312             | Vented Cork                                                                                                  |           |
| <b>Accessories</b> |                                                                                                              |           |
| K25080             | Copper Test Strips<br>12.5x1.5-3.0mmx75mm to ASTM specifications                                             | 17        |
| 332-004-004        | Test Tube, 25x150mm                                                                                          | 17        |
| 332-004-002        | Viewing Test Tube                                                                                            | 17        |
|                    | Protects copper strip during inspection or storage                                                           |           |
| K25100             | ASTM Copper Strip Corrosion Standard                                                                         | 1         |
|                    | Colored reproductions of tarnished strips encased in a plastic plaque                                        |           |
| 380-220-001        | Silicone Carbide Paper, FEPA Grade, 220 grit<br>For polishing of copper strips prior to testing              |           |
|                    | Pack of 50 sheets                                                                                            |           |
| 380-150-003        | Silicone Carbide Grain, FEPA grade, 150 grit<br>For final polishing of copper strips prior to testing        |           |
|                    | 1 lb package                                                                                                 |           |
| K25000             | Polishing Vise                                                                                               | 1         |
|                    | Holds copper strip firmly in place without marring the edges. Stainless steel. mounted on a composition base |           |
| K25090             | Multi-Strip Polishing Vise. Similar to K25000 but capable of holding four strips at a time                   | 1         |
| 250-000-12F        | ASTM 12F Thermometer, Range: -5 to +215°F                                                                    | 1         |
| 250-000-12C        | ASTM 12C Thermometer, Range: -20 to +102°C                                                                   |           |

## BEARING COMPATIBILITY OF TURBINE OILS

### Test Method

Evaluates the in-service stability of turbine lubricants by running a sample-lubricated babbit journal bearing for an extended period at high speed under controlled conditions of load, lubricant flow and temperature. The change in various properties (viscosity, carbon residue, acidity) is measured at the end of the endurance test and the bearing is cleaned and examined for evidence of deposits, corrosion and other changes.

### Bearing Compatibility Tester

- Conforms to FTM 791-3452 specifications
- Digital-indicating controls and built-in temperature recorder

Tests the bearing compatibility (lacquering, deposits, corrosion) and stability of turbine lubricants when subjected to an endurance test. Consists of bearing housing assembly with test bearing and support bearings, hydraulic loading device, oil circulation system with thermostatic and hydrostatic control, and powerful 5hp variable speed drive system. Digital LCD controls monitor oil pressure, oil temperature and spindle rpm, and a built-in strip chart recorder plots oil temperature at three different points—at the bearing housing, in-line, and in the reservoir. Equipped with overtemperature and low pressure cut-off switches and a cartridge oil filter for convenient 'flush run' operation. All components are mounted in a sturdy angle iron frame. A removable steel guard protects drive train components.

**Dimensions** lwxh, in.(cm)  
48x36x54 (122x91x137)  
Net Weight: 1300 lbs (589.7kg)

### Shipping Information

Shipping Weight: 1582 lbs (717.6kg)  
Dimensions: 101.7 Cu. ft.

### Specifications

Conforms to the specifications of: FTM 791-3452

Journal Drive Motor: 5hp variable speed, with digital 0-3500rpm control.

Fan cooled with thermal overload protection.

Lubricant Flow: 3.8L/min. gear pump recirculating 1.9-23L/min.  
of test lubricant to support bearing and test bearing.

Digital oil pressure circulation.

Temperature Control: Sump temperature (0-500°F) with digital indication and recording of temperature at bearing housing, sump and in-line.

Bearing Load: Hydraulic loading device maintaining 1520 kPa (220 psig) on the loading bearing.

Electrical Requirements: **CE**

200-240V 50/60Hz, 3-Phase, 20A

380V 50/60Hz, 3-Phase, 12A

440V 50/60Hz, 3-Phase, 10A

### Ordering Information

| Catalog No.        |                                                       | Order Qty |
|--------------------|-------------------------------------------------------|-----------|
| K29800             | Bearing Compatibility Tester                          | 1         |
|                    | <i>Specify electrical requirements when ordering.</i> |           |
| <b>Accessories</b> |                                                       |           |
| K29801             | Test Bearing                                          |           |

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

# CLOUD POINT AND POUR POINT OF PETROLEUM PRODUCTS



K46100 Refrigerated Bench Model

## Ordering Information

### Catalog No.

#### Cloud and Pour Point Chamber

**K46000** Cloud and Pour Point Chamber

**K46001** Cloud and Pour Point Chamber, with inlet/outlet fittings

#### Refrigerated Models:

**K46100** Cloud and Pour Point Bath, Bench Model, 115V 60Hz

**K46195** Cloud and Pour Point Bath, Bench Model, 220-240V 50Hz

**K46196** Cloud and Pour Point Bath, Bench Model, 220-240V 60Hz

**K46300** Cloud and Pour Point Bath, Floor Model, 115V 60Hz

**K46395** Cloud and Pour Point Bath, Floor Model, 220-240V 50Hz

**K46396** Cloud and Pour Point Bath, Floor Model, 220-240V 60Hz

**K46500** Cloud and Pour Point Bath, Floor Model, 5-Bath, 115V 60Hz

**K46595** Cloud and Pour Point Bath, Floor Model, 5-Bath, 220-240V 50Hz

**K46596** Cloud and Pour Point Bath, Floor Model, 5-Bath, 220-240V 60Hz

## Accessories

|                    |                                                      |
|--------------------|------------------------------------------------------|
| <b>332-004-001</b> | Test Jar                                             |
|                    | Clear, flat bottom jar with sample height graduation |
| <b>250-000-05F</b> | ASTM 5F Thermometer, range: -36 to +120°F            |
| <b>250-000-05C</b> | ASTM 5C Thermometer, range: -38 to +50°C             |
| <b>250-000-06F</b> | ASTM 6F Thermometer, range: -112 to +70°F            |
| <b>250-000-06C</b> | ASTM 6C Thermometer, range: -80 to +20°C             |
| <b>K46120</b>      | Cork Disk                                            |
| <b>K46130</b>      | Foam Sponge Disc                                     |
| <b>AS568-219</b>   | Gasket, for test jar                                 |
| <b>K460-0-8</b>    | Thermometer Holder, for test jar                     |
| <b>K460-1-7B</b>   | Copper Jacket                                        |

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

Custom configurations of this bath are available. Please contact Koehler Customer Service for additional information.

 Software compatible, inquire with Koehler Customer Service.

## Test Method

Cloud point and pour point are indicators of the lowest temperature of utility for petroleum products. The sample is periodically examined while it is being cooled in the cloud and pour point apparatus. The highest temperature at which haziness is observed (cloud point), or the lowest temperature at which movement of the oil is observed (pour point), is reported as the test result.

## Cloud and Pour Point Test Equipment

- Conforms to ASTM D97, D2500 and related specifications
- Compact four-place portable chamber
- Mechanically refrigerated models with factory preset cold baths

**Cloud and Pour Point Chamber**—Immerses four copper test jackets in suitable freezing mixtures at the required depth per ASTM specifications. Available with inlet and outlet connections for circulating refrigerated coolant from an external source. Consists of steel exterior housing with polyurethane enamel finish and all copper interior for corrosion resistance. Removable composition top plate and ½" (13mm) cork insulation around interior aid in cold retention. Supplied with copper jackets, gaskets, disks, and thermometer holders for test jars and cooling bath. Order test jars and thermometers separately.

**Mechanically Refrigerated Baths**—Bench-model and floor-model test units with multiple four-jacket mechanically refrigerated baths, each factory preset at a different temperature for convenient cloud and pour point testing. Bench model has three baths, set at +32, 0 and -27°F (0, -18 and -33°C); floor model available with either four or five baths, set at +32, 0, -27 and -60°F (0, -18, -33 and -51°C) and +32, 0, -27, -60 and -92°F (0, -18, -33, -51, and -69°C) respectively. Each bath has a phenolic top plate with ports for thermometer and four copper test jackets. Synthetic sponge covers over each top plate and gasketed hoods over each bath prevent excessive ice accumulation around the test jackets. Cascade hermetic refrigeration system provides reliable long term service. Bath interior is made of stainless steel, cabinet is constructed of polyester-epoxy finished steel housing. Floor model rides on swivel castors. Supplied with test jackets, gaskets, disks, and thermometer holders for test jars and cooling baths.

## Specifications

Conforms to the specifications of:

ASTM D97, D2500, D5853, D6074, D6158; IP 15, 219;  
ISO 3015, 3016; DIN 51597; FTM 791-201; NF T 60-105

Electrical Requirements: **CE**

Model K46100 Refrigerated Bench Model:

115V 60Hz, Single Phase, 12.2A

220-240V 50/60Hz, Single Phase, 6.9A

Model K46300/K46500 Refrigerated Floor Model:

115V 60Hz, Single Phase, 17.7A

220-240V 50/60Hz, Single Phase, 9.7A

## Dimensions

K46000: dia.xh.in.(cm)

10½x12 (27x30)

K46100: lwxh.in.(cm)

30x28x35 (76x71x89)

K46300/K46500: lwxh.in.(cm)

44x38x4 (112x97x115)

Net Weight:

K46000: 14 lbs (6.3 kg)

K46100: 340 lbs (155 kg)

K46300/K46500: 392 lbs (178 kg)

## Shipping Information

Shipping Weight:

K46000: 18 lbs (8.2 kg)

K46100: 550 lbs (250 kg)

K46300/K46500: 605 lbs (275 kg)

Dimensions:

K46000: 2.6 Cu. ft.

K46100: 14.1 Cu. ft.

K46300/K46500: 60.6 Cu. ft.

# AUTOMATED CLOUD POINT AND POUR POINT OF PETROLEUM PRODUCTS

## Test Method

For Petroleum Products, cloud point and pour point of a petroleum product is an index of the lowest temperature of its utility for certain applications. The specimen is cooled at a specified rate and examined periodically. The highest temperature at which a cloud is first observed at the bottom of the test jar is recorded as the cloud point. The lowest temperature at which movement of the specimen is observed is recorded as the pour point.

## Automatic Cloud Point and Pour Point Analyzer with Integrated Panel PC

- Cloud Point Analyzer conforms to ASTM D2500, D5771, D5772, D5773 and related test methods
- Pour Point Analyzer conforms to ASTM D97, D5853, D5950 and related test methods
- Stand alone system with Integrated Touch Screen Panel PC
- Direct Cooling system eliminates the need for solvent cooling baths
- One-stage cooling system provides temperatures as low as -45°C and a two-stage cooling system down to -80°C
- Cloud Point measured by light pulsed emission on I.R spectrum through a coaxial fiber optic
- Pour Point measured by two PT100 detection probes placed on the surface of the product and a mechanical moving arm bringing the test jar to a horizontal position

**Cloud Point Detection**—The cloud point detection system provides automated sample testing with the accuracy and repeatability in accordance with ASTM D2500, D5771, D5772, D5773 and related international test methods. The sophisticated dynamic measuring system emits a light pulse every 1°C from a coaxial fiber optic cable positioned above the test sample. The light pulse is then reflected off the silver bottom test jar to an optical sensor. The advanced software package analyzes the response of the light pulse. The initial appearance of crystallization is monitored by light scattering, signifying the cloud point of the sample. All clear and transparent oils are readily measured by the detection system, regardless of sample color.

**Pour Point Detection**—The pour point detection system provides automated sample testing with the accuracy and repeatability in accordance with ASTM D97, D5853, D5950 and related international test methods. The automated operation involves removing the sample from the cooling jacket at 3°C intervals and tilting it to a 90° angle as prescribed by the test method until no flow is observed. Contact of the cold sample with the two PT100 detection probes positioned just above the surface liquid level when the test jar is tilted identifies sample flow. The test jar is automatically returned to the cooling jacket and sampled again until no flow is detected for 5 seconds. The pour point result is then reported at 3°C higher than the temperature at which the sample ceased to flow in accordance with the test method.

**Integrated Panel PC and Software Package**—The Automated Cloud and Pour Point Analyzers are complete standalone systems featuring an integrated panel PC with an advanced software package. The 6.4" TFT/LCD touch screen display has a resolution of 640x480 with a 262K color scheme. All analytical parameters are graphed and displayed in real time as well as recorded in Microsoft® Excel compatible file format. The software monitors the operation and performance of all the analyzer components for proper data measurement, including the solenoid valves, cooling system, pressure sensors, and the Platinum resistance PT100 Class A temperature probe.

**Cooling System**—For various user applications, the automated cloud and pour point systems are available with either one-stage cooling for temperatures as low as -45°C or two-stage cooling for temperatures as low as -80°C. The direct cooling system features integrated gas CFC free motors compressors thus eliminating the need for a solvent cooling bath. The direct system is capable



**KLA-3-TS**  
*Automatic Cloud & Pour Point  
Analyzer with Touch Screen*

of rapid cooling, approaching -80°C bath temperatures in approximately 15 minutes, and utilizes less electricity than standard cooling systems. The rapid cooling feature combined with a consistent cooling profile system provides repeatable results with high test reproducibility.

**Multiple Configuration System**—These automated sample cooling and physical property measurement systems can be configured with one, two, three, four and six test positions with one of five possible analytical heads at each position: cloud point, pour point, cloud & pour point, cold filter plugging point and freezing point. Standard and customized multiple configuration systems are readily available.

## Specifications

Conforms to the specifications of:

**KLA-1-TS:** ASTM D2500, D5771, D5772, D5773; DIN 51597; IP 219, IP 444, IP 445, IP 446; ISO 3015

**KLA-2-TS:** ASTM D97, D5853, D5950; IP 15, IP441; ISO 3016

**KLA-3-TS:** ASTM D97, D2500, D5771, D5772, D5773, D5853, D5950; DIN 51597; IP 15, IP 219, IP441, IP 444, IP 445, IP 446; ISO 3015, ISO 3016

Temperature Range:

One-Stage: +60°C to -45°C

Two-Stage: +60°C to -80°C

Resolution: 0.06°C

Accuracy: ±0.1°C

Repeatability / Reproducibility: as per standard test methods or better

Data Storage: < 60,000 analyses

Electrical Requirements: **C** €

115V ± 15% / 60Hz

220V ± 15% / 50 to 60Hz

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

26 x 23¼ x 31½ (66x60x80)

Net Weight: 176.5 lbs (80kg)

## Ordering Information

### Catalog No.

**KLA-1-TS** Auto Cloud Point Analyzer, Touch Screen (One-stage)

**KLA-1-TS/2** Auto Cloud Point Analyzer, Touch Screen (Two-stage)

**KLA-2-TS** Auto Pour Point Analyzer, Touch Screen (One-stage)

**KLA-2-TS/2** Auto Pour Point Analyzer, Touch Screen (Two-stage)

**KLA-3-TS** Auto Cloud & Pour Point Analyzer, Touch Screen (One-stage)

**KLA-3-TS/2** Auto Cloud & Pour Point Analyzer, Touch Screen (Two-stage)

*Please specify voltage requirements when ordering.*

### Accessories

**KLA-PT100-CAL** Calibration Decade Box - PT100 Simulator

**KLA-DB-KIT** Set of Connectors and Cables

*Extended Cooling Range down to -100°C Available Upon Request.*

# DIELECTRIC BREAKDOWN VOLTAGE OF INSULATING OILS

## Test Method

The majority of high-voltage transformers, cables, switchgears, transducers, capacitors, and rectifiers use insulating oils for insulating electrically live parts and to carry off thermal energy. The quality of the insulating oil must be checked at regular intervals to ensure a long equipment service life. The most important requirement of an insulating oil is a high dielectric strength. Determination of the dielectric breakdown voltage of insulating oils provides an early detection method for any reduction in the insulating properties.

## Automatic Portable Dielectric Breakdown Tester

- Conforms to ASTM D877, D1816 and related test specifications
- Output voltage: 75kV
- Features 2.8" ultra bright color display for optimal readability and mobility
- Built-in printer offers direct evaluation and reporting of results
- Internal battery, external 12V power supply
- Automatic Vernier function for electrode gap spacing
- Measurement of Silicone based oils
- Internal temperature measurement of oil sample
- Bluetooth PC Connectivity and USB Flashdrive Capability

## Specifications

Conforms to the specifications of:

ASTM D877, D1816; BS EN 60156; CEI EN 60156; IEC 156; VDE 0370 Pt. 5

Output Voltage: Up to 75kV rms symmetrical

Voltage measurement accuracy: 0 - 75kV  $\pm 1$ kV

Voltage slew rate: 0.5 - 10kV/s

Resolution (displayed): 0.1kV

Power Supply: 85V - 264V, 47Hz - 63Hz, 12V external supply **CE**

Power consumption: 60VA

Internal rechargeable battery: 1 x 12V / 7.2Ah

Switch-off time on flashover: < 5 $\mu$ s

Measurement of oil temperature: 0 - 100°C / 32 - 212°F

Temperature Resolution: 1°C / 1.8°F

Display: 2.8" color (ultra bright)

Selectable Programs: ASTM D1816-04-1mm, ASTM D1816-04-2mm, ASTM D877-02A, ASTM D877-02B, IEC 156/95

Customer-specific programs: Unlimited

PC Software: Included

Printer: Dot Matrix Hard Copy Output

Interface: Bluetooth

USB: USB memory stick

Operating Temperature: -5°C - 45°C (23°F - 113°F)

Storage Temperature: -20°C - 60°C (-4°F)

## Included Accessories

|                   |                |                    |
|-------------------|----------------|--------------------|
| Calibration Sheet | AC Power Cable | Integrated Battery |
| User Manual       | PC Software    | Integrated Printer |



**K16175 Automatic Portable Dielectric Tester**

## Dimensions WxHxD, in.(cm)

16.9x11x9.85 (43x28x25)

Net Weight: 48.5 lbs (22kg)

## Shipping Information

Shipping Weight: 54.5 lbs (24.7kg)

Dimensions: 25x21x19in. (63.5x53.4x48.3cm)

## Ordering Information

### Catalog No.

**K16175** Automatic Dielectric Breakdown Tester, 0-75kVAC, 100-240V 50/60Hz

### Accessories

|                  |                                                     |
|------------------|-----------------------------------------------------|
| <b>K16175-4</b>  | Transport Case                                      |
| <b>K16175-5</b>  | Test Vessel complete with electrodes for ASTM D1816 |
| <b>K16175-6</b>  | Test Vessel complete with electrodes for ASTM D877  |
| <b>K16175-23</b> | IEC156 Test Cell with VDE Electrode                 |
| <b>K16175-24</b> | IEC156 Test Cell with Sphere Electrode              |
| <b>K16175-12</b> | Spacer Gauge, 1mm                                   |
| <b>K16175-13</b> | Spacer Gauge, 2mm                                   |
| <b>K16175-14</b> | Spacer Gauge, 2.5mm                                 |

# COKING TENDENCY OF OIL



K50100 Panel Coker

## Test Method

Determines the tendency of finished oils to form coke when in contact with surfaces at elevated temperatures for short periods. A sample of oil is mechanically splashed against an aluminum test panel at elevated temperature. After a specified test period, the amount of coke deposited on the panel is determined by weight.

## Panel Coking Test Apparatus

- Conforms to FTM 791-3462 specifications
- Suitable as a screening test prior to performing engine tests

Digitally controlled panel coking apparatus for finished lubricating oils, consisting of mechanical splasher, splash chamber and sample oil reservoir. Test panel temperature and oil sump temperature are individually controlled by separate heaters with digital-indicating controllers. Mechanical splasher has a variable speed 0-1800rpm drive motor with digital indicating control. A high accuracy variable area flowmeter permits introduction of a corrosive acidic atmosphere to increase the severity of the test. Equipped with a digital countdown timer. Hinged safety cover has a port for fume removal and a safety interlock switch that interrupts power to the drive motor when the cover is lifted.

## Specifications

Conforms to the specifications of:  
FTM 791-3462  
Maximum Temperature:  
Test Panel: 400°C (752°F)  
Sample Oil: 210°C (410°F)  
Temperature Control: Separate controls for test panel and oil temperature, with digital °C/°F digital setpoint and display  
Splashing Rate: 0-1800rpm, with digital display  
Timer: 0-99.9 hr variable countdown  
Flowmeter Range: 0.2-1.0L/hr  
Oil Reservoir Capacity: 0.35 liter  
Electrical Requirements: **CE**  
115V 60Hz, 8A  
220-240V 50/60Hz, 5A

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

Test Unit: 32x18x21 (81x46x53)  
Control Cabinet:  
18x12x18 (46x30x46)

Net Weight:  
Test Unit: 50 lbs (22.7kg)  
Control Cabinet: 25 lbs (11.3kg)

## Shipping Information

Shipping Weight: 135 lbs (61.2kg)  
Dimensions: 26.7 Cu. ft.



Digital Flowmeter option is available for this unit.



Software compatible, inquire with Koehler Customer Service.

## Ordering Information

| Catalog No.        |                                                                 | Order Qty |
|--------------------|-----------------------------------------------------------------|-----------|
| K50100             | Panel Coking Test Apparatus, 115V 60Hz                          |           |
| K50110             | Panel Coking Test Apparatus, with cyclic timer 115V 60Hz        |           |
| K50119             | Panel Coking Test Apparatus, with cyclic timer 220-240V 50/60Hz |           |
| K50190             | Panel Coking Test Apparatus, 220-240V 50/60Hz                   |           |
| <b>Accessories</b> |                                                                 |           |
| K50101             | Aluminum Test Panel                                             | 1         |
| K50102             | Stainless Steel Test Panel (Type 321)                           | 1         |

# EVAPORATION LOSS OF LUBRICATING OILS BY THE NOACK METHOD



**K44100 Automatic Non-Woods Metal Noack Evaporative Apparatus**

## Included Accessories

Integrated Touch Screen Panel PC  
Integrated Vacuum Pump  
Inlet Filter  
Evaporation Crucible  
Test Ball (10)  
Nozzle Cleaner  
Crucible Holder  
Protective Gloves  
Hook Wrench  
Pliers

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

15.75x17.72x17.72 (40x45x45)  
Net Weight: 48.5 lbs (22 kg)

## Test Method

For determining the evaporation loss of lubricating oils, particularly engine oils. High temperatures can evaporate oil which may contribute to oil consumption in an engine and can lead to a change in the properties of an oil. A measured quantity of sample is placed in an evaporation crucible that is then heated to 245.2°C with a constant flow of air drawn through it for 60 minutes. The loss in mass of the oil is determined.

## Automatic Non-Woods Metal Noack Evaporative Apparatus

- Conforms to ASTM D5800, Procedure B
- 6.5" Integrated Touch Screen Panel PC
- Integrated Vacuum Pump with automatic electronic control system
- Direct sample temperature measurement via PT100 probe
- Equipped with high resistant Kalrez valve, inlet filter to remove product residuals
- USB port for connection to an external printer and/or external PC
- Storage capacity for more than 60,000 analysis
- CE Marked

The Automatic Non-Woods Metal Noack Evaporative Apparatus tests for the evaporation loss tendencies of lubricating oils at temperatures of up to 275°C. The newly designed electrically heated aluminum block allows for testing without the use of hazardous Woods Metal. The Noack tester is equipped with an Electronic regulator allowing for automatic control of temperature and differential pressure. The system is managed by an integrated 6.5" Touch Screen Panel PC by means of the Noack Evaluation Software run by a Windows® based operating system. The Evaluation Software is capable of recording all analytical parameters, allowing for user customizable parameters, methods and result reports as well as printing graphs and test results.

## Ordering Information

### Catalog No.

|               |                                                                    |
|---------------|--------------------------------------------------------------------|
| <b>K44100</b> | Automatic Non-Woods Metal Noack Evaporative Apparatus 115V 60Hz    |
| <b>K44190</b> | Automatic Non-Woods Metal Noack Evaporative Apparatus 220V 50/60Hz |

### Accessories

|                      |                                                                                                                                  |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>K44100-SFW</b>    | Noack Evaluation Software                                                                                                        |
| <b>K44100-1</b>      | Glassware Accessory Set<br>Includes: 2L Glass Bottle (2), Rubber Stopper (4),<br>Glass Delivery Tubes, Silicon Connection Tubing |
| <b>K44100-2</b>      | Stand for Glass Bottles with Inclined Manometer,<br>0-50mm H2O                                                                   |
| <b>K44100-3</b>      | Noack Reference Oil, 1 Liter                                                                                                     |
| <b>KLA-DB-KIT</b>    | Set of Calibration Connectors and Cables                                                                                         |
| <b>KLA-PT100-CAL</b> | Calibration Decade Box – PT100 Simulator                                                                                         |

## Specifications

Conforms to the specifications of:  
ASTM D5800 Procedure B; IP 421; DIN 51581  
Capacity: 1 Sample  
Temperature Range: 225°C to 275°C  
Temperature Resolution: 0.01°C  
Temperature Accuracy: ±0.2°C  
Repeatability/Reproducibility: Meets or Exceeds ASTM D5800  
Ambient Temperature: Max. 35°C  
Relative Humidity: Max 80%  
Heater Power: 420W  
Electrical Requirements: **CE**  
115V 60Hz  
220V 50/60Hz

## 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.

### Foaming Characteristics of Lubricating Oils.....Pages 108-110

ASTM D892; IP 146; DIN 51566; FTM 791-3211, 791-3213

|            |             |
|------------|-------------|
| Air Supply | Toluene     |
| Acetone    | Isopropanol |
| Desiccant  | Cotton      |

### Water Separability of Petroleum Oils and Synthetic Fluids.....Page 111

ASTM D1401; ISO 6614; DIN 51599; FTM 791-3201

|                       |                 |
|-----------------------|-----------------|
| Precipitation Naphtha | Acetone         |
| Nochromix             | Distilled Water |
| Cotton                |                 |

### Demulsibility Characteristics of Lubricating Oils.....Page 112

ASTM D2711 and DIN 51353

|                 |                       |
|-----------------|-----------------------|
| Centrifuge      | Centrifuge Tubes      |
| Distilled Water | 1,1,1-Trichloroethane |

### Oxidation Stability of Steam Turbine Oils and Inhibited Mineral Insulating Oils by Rotating Bomb.....Pages 114-118

ASTM D2112, D2272; IP 229

|                     |                   |
|---------------------|-------------------|
| Liquid Detergent    | Oxygen            |
| Potassium Hydroxide | Petroleum Spirit  |
| Acetone             | Hydrochloric Acid |
| Chloroform          | Isopropanol       |

### Oxidation Stability of Gasoline Automotive Engine Oils by Thin-Film Oxidation Uptake (TFOUT).....Pages 114-118

ASTM D4742

|                     |            |
|---------------------|------------|
| Liquid Detergent    | Acetone    |
| n-Hexane            | Oxygen     |
| Potassium Hydroxide | Air Supply |
| Isopropanol         | Water      |

### Oxidation Stability of Distillate Fuel Oil (Accelerated Method).....Pages 119-122

ASTM D2274

|                  |                 |
|------------------|-----------------|
| Drying Oven      | Filter Assembly |
| Membrane Filters | Beaker, 200mL   |
| Hot Plate        | Isooctane       |
| Oxygen           | Water Supply    |
| Acetone          | Methanol        |
| Toluene          |                 |

### Oxidation Characteristics of Inhibited Mineral Oils.....Pages 119-122

ASTM D943; DIN 51587

|                   |                             |
|-------------------|-----------------------------|
| Desiccant Bags    | Acetone                     |
| Abrasive Cloth    | Glass Syringes, 10 and 50mL |
| Distilled Water   | Flexible Tubing             |
| Detergent         | n-Heptane                   |
| Hydrochloric Acid | Isopropanol                 |
| Oxygen            | Nitrogen                    |
| Gloves            |                             |

### Sludging Tendencies of Inhibited Mineral Oils.....Pages 119-122

ASTM D4310

|                   |                       |
|-------------------|-----------------------|
| Syringe, 50mL     | Flexible Tubing       |
| Acetone           | Detergent             |
| n-Heptane         | Hydrochloric Acid     |
| Chromic Acid      | Oxygen                |
| Filter Holder     | Membrane Filters      |
| Separatory Funnel | Weighing Bottle, 60mL |
| Forceps           | Drying Oven           |
| Nitrogen          | Vacuum Source         |
| Desiccant Bags    | Flushing Tube         |
| Isopropanol       | Rubber Policeman      |

### Oxidation Characteristics of Extreme Pressure Lubricating Oils.....Pages 119-122

ASTM D2893

|                                                        |
|--------------------------------------------------------|
| Drying Tower                                           |
| Chromic Acid or equivalent detergent cleaning solution |
| Air Supply                                             |

### Oxidation Stability of Mineral Insulating Oils .....Page 123

ASTM D2440

|                              |                            |
|------------------------------|----------------------------|
| n-Heptane                    | Oxygen                     |
| Potassium Hydroxide Solution | Toluene                    |
| Isopropyl Alcohol            | Chloroform                 |
| Acid Free Filter Paper       | p-Naphtolbenzein Indicator |

### Oxidation Stability of Inhibited Mineral Turbine Oils .....Page 126

IP 280

|                      |                       |
|----------------------|-----------------------|
| Oxygen               | Alkali Blue Indicator |
| Phenolphthalein      | Heptane               |
| Hydrochloric Acid    | Potassium Hydroxide   |
| Toluene              | Dichloromethane       |
| Ethanol              | Sulfuric Acid         |
| Membrane Filters     | Evaporating Dish      |
| Burette              | Air Oven              |
| Filtration Apparatus | Conical Flask, 500mL  |

### Oxidation Stability of Straight Mineral Oil.....Page 126

IP 306

|                       |                      |
|-----------------------|----------------------|
| Filtering Crucibles   | Porcelain Crucibles  |
| Burette               | Oxygen               |
| Alkali Blue Indicator | Phenolphthalein      |
| n-Heptane             | Hydrochloric Acid    |
| Potassium Hydroxide   | Toluene              |
| Chloroform            | Ethanol              |
| Sulfuric Acid         | Acetone              |
| Membrane Filters      | Forceps              |
| Petri Dishes          | Filtration Apparatus |
| Oven                  | Isopropanol          |

## ADDITIONAL ACCESSORIES (CONTINUED)

### **Oxidation Stability of Mineral Insulating Oil .....Page 126**

IP307

|                       |                     |
|-----------------------|---------------------|
| Filtering Crucibles   | Porcelain Crucibles |
| Burette               | Oxygen              |
| Alkali Blue Indicator | Phenolphthalein     |
| Heptane               | Hydrochloric Acid   |
| Potassium Hydroxide   | Toluene             |
| Chloroform            | Ethanol             |
| Sulfuric Acid         | Acetone             |
| Isopropanol           | Membrane Filters    |
| Forceps               | Petri Dishes        |
| Filtration Apparatus  | Oven                |

### **Oxidation Stability of Inhibited Mineral Insulating Oils .....Page 126**

IP 335

|                          |                          |
|--------------------------|--------------------------|
| Porcelain Crucibles      | Burette                  |
| Oxygen                   | Alkali Blue Indicator    |
| Phenolphthalein Solution | n-Heptane                |
| Hydrochloric Acid        | Potassium Hydroxide      |
| Toluene                  | Chloroform               |
| Ethanol                  | Membrane Filters, 5.0 µm |
| Forceps                  | Petri Dishes             |
| Filtration Apparatus     | Oven                     |
| Sulfuric Acid            | Acetone                  |
| Isopropanol              |                          |

### **Thermal Oxidation Stability of Automotive Gear Lubricants .....Page 127**

ASTM 5704; STP12A L-60-1 Performance Test (formerly CRC L-60 Test);  
FTM 791B Method 2504

|                  |                          |
|------------------|--------------------------|
| Oakite 811       | Pentane                  |
| Stoddard Solvent | Toluene                  |
| Reference Oils   | Air Supply               |
| Absorbent Cotton | Tweezers                 |
| Heptane          | Organic Cleaning Solvent |

### **Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants and Other Highly Refined Oils .....Pages 124-125**

ASTM D4636; FTM 791-5307, FTM 791-5308; IHC BT-10, DIN 51394

|                      |                  |
|----------------------|------------------|
| Air Supply           | Cotton           |
| Analytical Balance   | n-Heptane        |
| Centrifuge and Tubes | Acetone          |
| Microscope           | Nitric Acid      |
| Oven (optional)      | Sodium Hydroxide |
| Forceps              | Sodium Phosphate |
| Sodium Dichromate    | Sulfuric Acid    |
| Brush                | Distilled Water  |
| Nochromix            |                  |

### **Rust Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water (Standard and Horizontal Disc Methods) .....Pages 128-129**

ASTM D665, D3603; NACE TM-01-72; IP 135; ISO 7120; DIN 51355,  
DIN 51585; FTM 791-4011, 791-5315

|                        |                       |
|------------------------|-----------------------|
| Oven                   | Naphtha               |
| Isooctane              | Synthetic Sea Water   |
| Distilled Water        | Precipitation Naphtha |
| Petroleum Spirit 60/80 |                       |

### **Corrosion of Lead by Lubricating Oils .....Page 130**

FTM 791-5321.1

|            |                    |
|------------|--------------------|
| Air Supply | Analytical Balance |
| Forceps    | Petroleum Naphtha  |
| Acetone    | Steel Wool         |
| Cotton     |                    |

### **Bearing Compatibility of Turbine Oils .....Page 131**

FTM 791-3452

Test Equipment for:

- ASTM D445 Kinematic Viscosity (refer to Viscosity Section)
- ASTM D524 Ramsbottom Carbon Residue (refer to Page 53)
- ASTM D974 Total Acid Number

### **Copper Corrosion From Petroleum Products .....Page 131**

ASTM D130

|                   |                         |
|-------------------|-------------------------|
| Filter Paper      | Cotton Wool             |
| Isooctane         | Stainless Steel Forceps |
| Stoddard Solvents |                         |

### **Cloud Point and Pour Point of Petroleum Oils .....Pages 132-133**

ASTM D97, D2500; IP 15, 219; ISO 3015, 3016; DIN 51597; FTM 791-201

|                      |                   |
|----------------------|-------------------|
| Methanol             | Sodium Sulfate    |
| Solid Carbon Dioxide | Petroleum Naphtha |
| Calcium Chloride     | Acetone           |
| Ethanol              | Sodium Chloride   |

### **Coking Tendency of Oil .....Page 135**

FTM 791-3462

|                 |
|-----------------|
| Emery Paper     |
| Petroleum Ether |

### **Evaporation Loss of Lubricating Oils (Noack Test) .....Page 136**

ASTM D5800; DIN 51581; IP 421

|         |         |
|---------|---------|
| Balance | Naphtha |
| Toluene |         |

# TRIBOLOGY

| Test Methods                                                           | Page | Test Methods                                            | Page |
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## FOUR BALL WEAR AND EP



**K93100 Four Ball Tester**

### Shipping Information

Shipping Weight: 1360 lbs (620 kg)

Dimensions: 45 Cu. ft.

*\*Pneumatic option required*

*IP300 or CEC-L-45-A-99 units available.*

*Please contact Koehler Customer Service for additional information.*

### Included Accessories

|                       |                              |
|-----------------------|------------------------------|
| Set of Weights        | Set of Hand Tools            |
| Ball Chucks           | Torque Wrench                |
| Ball Pot              | Electrical Controller        |
| Ball Chuck Remover    | Connecting Cables            |
| Ball Rack             | TriboDATA Software           |
| Ball Clamp Ring       | Calibration and Test Reports |
| Ball Holder Base Disc |                              |

### Ordering Information

| Catalog No.      |                                                    | Order Qty |
|------------------|----------------------------------------------------|-----------|
| <b>K93100</b>    | Four Ball Tester, 220V 60Hz                        | 1         |
| <b>K93100-PN</b> | Four Ball Tester with pneumatic loading, 220V 60Hz |           |
| <b>K93190</b>    | Four Ball Tester, 380V 50Hz                        | 1         |
| <b>K93190-PN</b> | Four Ball Tester with pneumatic loading, 380V 50Hz |           |

### Accessories

|               |                                    |
|---------------|------------------------------------|
| <b>K93105</b> | Test Balls (Pack of 100)           |
| <b>K93111</b> | High Resolution Digital Microscope |

## Tribology (Friction and Wear) Testing of Lubricants Friction and Wear Test Equipment

Koehler Instrument Company is pleased to offer advanced equipment for a variety of friction and wear tests. Several of the standard instruments that we offer are listed here. Please contact us to discuss your requirements for these as well as custom-designed units for tribology analysis methods. Our applications personnel will consult with you on your requirements and work with our design staff to provide solutions for your tribology testing needs.

### Test Method

Determines the Wear Preventative (WP) and Extreme Pressure (EP) characteristics of lubricating oils and greases in sliding steel-on-steel applications. The test consists of rotating a steel ball under load against three stationary steel balls coated with lubricant. Measurements are taken at the rotating speeds, temperatures, and duration as specified by published standards. The load-wear index can be calculated from the weld point in EP tests, and lubricant comparisons can be made based upon scar diameters incurred from wear tests.

### Four Ball Wear and EP Tester

- Conforms to ASTM D2266, D2596, IP 239, and related specifications
- Performs Wear Preventative (WP) and Extreme Pressure (EP) tests
- Displays and records normal load, frictional torque, time, and temperature
- Test speeds and temperatures are electronically controlled
- Data Acquisition Software and Card are included
- Custom configurations are available
- Precise variable loading capability\*

Four Ball Tester performs both Wear Preventative (WP) and Extreme Pressure (EP) analyses for measuring the wear and frictional properties of lubricants under sliding steel-on-steel test conditions. Tests are performed in accordance to the latest ASTM and IP published methods. Normal load on the ball assembly and frictional torque are measured through load cells. Data is processed and stored utilizing TriboDATA, an advanced data acquisition and processing software package. Test results can be plotted and compared, as well as exported to other programs. Wear scars on the steel balls are measured and recorded with a High Resolution Digital Microscope available as recommended accessory for the Four Ball Tester.

### High Resolution Digital Microscope

Koehler's Four Ball Microscope is a versatile device for measuring the wear scar diameter on a steel test ball. This apparatus consists of the "Dinolite" Microscope with "DinoCapture" Software mounted at an angle on an aluminum base. The device is designed to measure the wear scar without removing the test balls from the ball pot allowing for a safer measurement procedure. The wear scar can be viewed through an external PC. The software measures the wear scar using a diameter and line tool. The images can be saved at varied resolutions on a PC.

### Specifications

Conforms to the specifications of:

ASTM D2266, D2596, D2783, D4172, D5183\*, IP 239

Electrical Requirements: **C** **E**

220V, 60Hz, 3 phase

440V, 50Hz, 3 phase

Drive Motor: 1.5 kW

Test Speeds: 1200, 1440, 1760 rpm

Optional Test Speeds (min/max): 1000/3000, 300/3000 rpm

Maximum Axial Load: 10000 N at 3000 rpm or 12000 N at 1800 rpm

Test Duration (min/max): 1/9999 min

Test Ball diameter: 12.7 mm

# TRIBOLOGY DATA ACQUISITION SYSTEM

## TriboDATA Data Acquisition System

- Powerful data acquisition system provides analog to digital conversion and data analysis of test results for many tribology instruments available from Koehler as well as **other tribology instrument manufacturers**
- Real-time display of critical test parameters such as normal load, friction force, temperature, and time

The Koehler TriboDATA System is designed to acquire and process analog data from the various tribology test instrumentation offered from Koehler as well as from **other tribology instrument manufacturers**. The analog-to-digital converter card is comprised of four analog inputs, and the test data is recorded and displayed in real-time. Up to four graphs can be displayed simultaneously. The data can be stored to disk for future reference or exported in an ASCII text format to other software packages. Critical test parameters are also saved with the data. With the TriboDATA hardware and software package, data acquisition of crucial test parameters such as normal load, friction load, temperature, and time can be seamlessly performed to ensure that your test results are consistent and repeatable within prescribed test conditions. As an option, a CCD camera package is available to capture wear scar images and store them on a PC for analysis.

### Computer Requirements

Processor: Pentium or higher  
 Processor Speed: 100 MHz or higher  
 Operating System: Windows®95/98/NT  
 Memory (RAM): 16 Mb  
 Required Disk Space: 10 Mb  
 One Free Expansion ISA Slot

### Included Accessories

Software on CD  
 Acquisition Data Card  
 Connection Cable  
 Instruction Manual



**K93900 TriboDATA Data Acquisition System**

### Ordering Information

| Catalog No. |                                   | Order Qty |
|-------------|-----------------------------------|-----------|
| K93900      | TriboDATA Data Acquisition System | 1         |

## HIGH FREQUENCY RECIPROCATING RIG

### Test Method

A 2-mL test specimen of fuel is placed in the test reservoir and maintained at 25 or 60°C. When the temperature has stabilized, a vibrator arm holding a nonrotating steel ball and loaded with a 200-g mass is lowered until it contacts a test disk completely submerged in the fuel. The ball is caused to rub against the disk with a 1-mm stroke at a frequency of 50 Hz for 75 min. The ball is removed from the vibrator arm and cleaned. The dimensions of the major and minor axes of the wear scar are measured under magnification and recorded.

### High Frequency Reciprocating Rig

The two-station Fuel Lubricity Wear Test Machine incorporates two test positions with heater pads and mounting arrangements for fuel lubricity test specimens. Load is applied manually by means of dead weights directly to the fixed ball specimen carrier by means of a loading yoke. Machine controls are limited to speed control of the drive motor to give the required frequency, temperature control of the specimen bath and test duration. Test data is limited to post test wear scar measurement only and no facilities are provided for friction force measurement.

### Electrical Requirements ☹

115V 60Hz, Single Phase  
 230V 50/60Hz, Single Phase



**K93450 High Frequency Reciprocating Rig (HFRR)**

### Specifications

Test specifications: ASTM D6079; ISO 12156  
 Contact Geometry: Ball on Plate  
 Ball Specimen: 6 or 10 mm diameter  
 Load: 1.95 to 10.00 N ( $\pm 0.01$  N)  
 Stroke: 1 mm ( $\pm 0.02$  mm)  
 Frequency: 2.5 to 50 Hz ( $\pm 1$  Hz)  
 Fluid Volume: 2 mL ( $\pm 0.2$  mL)  
 Test Temperature: 25 or 60°C ( $\pm 2^\circ$ C)  
 Test Duration: 75 min ( $\pm 0.1$  min)  
 Bath Surface Area: 6 cm<sup>2</sup>

### Ordering Information

| Catalog No. |                                                |
|-------------|------------------------------------------------|
| K93450      | High Frequency Reciprocating Rig, 115V 60Hz    |
| K93459      | High Frequency Reciprocating Rig, 230V 50/60Hz |

# PIN-ON-DISC



**K93500 Pin-On-Disc Tester**

## Specifications for Pin-On-Disc with Environmental Chamber & Lubricant Recirculating System

Temperature: 60°C Maximum  
Discharge Rate: 0-1 L/min  
Viscosity Range: 90 SAE Maximum  
Capacity: 3L of Lubricant

## Shipping Information

Shipping Weight: 440 lbs (200 kg)  
Dimensions: 18 Cu. ft.

## Included Accessories

Electrical Controller Unit  
Connecting Cables  
Spare Fuses  
TriboDATA Software  
Set of Weights  
Set of Hand Tools  
Set of Pins  
Calibration and Test Reports

## Electrical Requirements

115V 60Hz  
230V 50/60Hz

## Pin-On-Disc Tester

- Conforms to ASTM G99 standard test method
- Analyzes wear and friction characteristics of sliding contacts (dry or lubricated conditions)
- Tests can be performed on a variety of materials: metals, polymers, composites, ceramics, lubricants, cutting fluids, abrasive slurries, coatings, and heat-treated samples
- TriboDATA software package varies and records pin pressure, pin temperature, sliding speed, and lubrication parameters
- Custom configurations available

The Pin-On-Disc machine is a versatile unit designed to evaluate the wear and friction characteristics on a variety of materials exposed to sliding contacts in dry or lubricated environments. The sliding friction test occurs between a stationary pin stylus and a rotating disk. Normal load, rotational speed, and wear track diameter can be varied. Electronic sensors monitor wear and the tangential force of friction as a function of load, speed, lubrication, or environmental condition. These parameters as well as the acoustic emissions at the contact are measured and displayed graphically utilizing the TriboDATA software package.

## Specifications

Conforms to the specifications of: ASTM G99  
Sliding Speed Range: 0.26-10 m/sec  
Disc Rotation Speed: 100-2000 rpm  
Maximum Normal Load: 200 N  
Frictional Force: 0-200 N  
Wear Measurement Range: 4 mm  
Pin Size: 3-12 mm diagonal/diameter  
Disc Size: 160 mm diameter x 8 mm thick  
Wear Track Diameter: 10-140 mm

## Ordering Information

| Catalog No. |                                | Order Qty |
|-------------|--------------------------------|-----------|
| K93500      | Pin-On-Disc Machine, 115V 60Hz | 1         |
| K93590      | Pin-On-Disc Machine, 230V 50Hz |           |

## Optional Configurations Available

Environmental Chamber  
Lubricant Recirculating System  
Environmental Chamber and  
Lubricant Recirculating System

*High temperature models (up to 700°C) are available. Please contact Koehler Customer Service for additional information.*

## TIMKEN TESTERS

### Timken Mechanical Tester

A steel test cup rotating at 800 RPM is pressed against a steel test block. Sample under test is carried by the test cup into the sliding contact. Test load at the contact is progressively increased, score value and OK value are determined.

### Test Method

This tester is used to measure extreme pressure properties of lubricating grease and lubricating fluids.

### Specifications

Conforms to the specifications of:  
ASTM D 2509 - IP 326 for greases.  
ASTM D 2782 - IP 240 for lubricating fluids.  
Rate of loading : 0.9 to 1.3 Kg/sec.  
Grease feed rate :  $45 \pm 9$  g / min.  
Fluid feeder : 3.8 liter with recirculating pump and heater.  
Motor : 1.5 kW with variable frequency drive.  
Power : 220V 60Hz, 380V 50Hz, 5 KVA max.  $\text{C}\epsilon$

### Included Accessories

- Calibration kit for load and RPM
- Set of tools for operation
- Microscope for scar measurement
- Electronic timer

### Timken Pneumatic Tester

A steel test cup rotating at 800 RPM is pressed against a steel test block. Sample under test is carried by the test cup into the sliding contact. Test load at the contact is progressively increased, score value and OK value are determined.

### Test Method

This tester is used to measure extreme pressure properties of lubricating grease and lubricating fluids.

### Features & Benefits

- Loading is pneumatic. Frictional torque is measured with a torque cell.

### Specifications

Conforms to the specifications of:  
ASTM D 2509 - IP 326 for greases.  
ASTM D 2782 - IP 240 for lubricating fluids.  
Rate of loading : 0.9 to 1.3 Kg/sec.  
Grease feed rate :  $45 \pm 9$  g / min.  
Fluid feeder : 3.8 liter with recirculating pump and heater.  
Motor : 1.5 kW with variable frequency drive.  
Power : 220V 60Hz, 380V 50Hz, 5 KVA max.  $\text{C}\epsilon$

### Included Accessories

- Calibration kit for load and RPM
- Vibration sensor
- Microscope for scar measurement
- Set of tools for operation
- Electronic timer

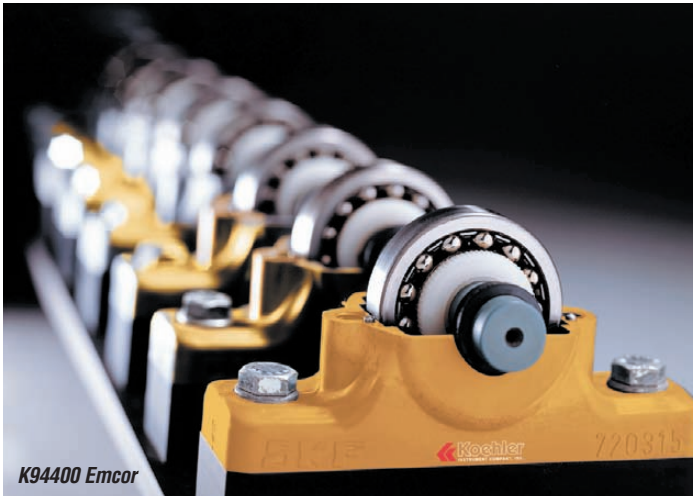


K92000 Timken Tester

### Ordering Information

| Catalog No. |                                                 |
|-------------|-------------------------------------------------|
| K92000      | Timken Tester, 220V 60Hz                        |
| K92000-PN   | Timken Tester with pneumatic loading, 220V 60Hz |
| K92090      | Timken Tester, 380V 50Hz                        |
| K92090-PN   | Timken Tester with pneumatic loading, 380V 50Hz |

## CORROSION INHIBITION PROPERTIES OF GREASES



### Test Method

Measures the ability of a grease to protect a bearing against corrosion in the presence of water. Two sets of grease-coated bearings per station are partially immersed in water and rotated at a speed of 80 rpm in a sequence of running and resting periods. At the end of the test, the raceways of the bearing outer rings are inspected for rust.

### Emcor Grease Testing Machine

- Evaluates the rust preventive properties of greases and oils
- Performs both standing and dynamic testing

The Emcor Grease Testing Machine evaluates the rust preventive properties of greases on bearing components, measuring the ability of a grease to protect a bearing against corrosion in the presence of water. As bearings are normally used in environments exposed to humidity and temperature variations, condensation may form on the bearing thus promoting the onset of rust. Rust is detrimental to proper bearing operation and will compromise the longevity of the bearing. A good quality grease should be designed to protect the bearing from rust and corrosion under these conditions.

The Emcor system features test method versatility, since both greases and oils can be tested as well as variations can be made with regard to the test medium (e.g., brine instead of water). The costs for running these tests are minimal. The two test bearings are the only machined parts that have to be renewed for each test, and the polyamide material for the housing is rigid and strong and rarely ever needs replacement.

| Ordering Information                                                                             |                                         |           |
|--------------------------------------------------------------------------------------------------|-----------------------------------------|-----------|
| Catalog No.                                                                                      |                                         | Order Qty |
| K94400                                                                                           | Emcor Grease Testing Machine, 115V 60Hz | 1         |
| K94490                                                                                           | Emcor Grease Testing Machine, 230V 50Hz |           |
| Accessories                                                                                      |                                         |           |
| K94401                                                                                           | Test Bearing                            | 8         |
| K94402                                                                                           | Mounting Sleeve                         | 8         |
| K94403                                                                                           | Mounting Nut                            | 8         |
| K94408                                                                                           | Mounting Tool                           | 1         |
| K94410                                                                                           | Filling Device for Test Bearings        | 1         |
| K94490-1                                                                                         | Emcor Washout Test Option               | 1         |
| <i>Includes: Peristaltic Pump, Overflow Container, Inlet and Outlet Tubing and Pipe Fittings</i> |                                         |           |

### Specifications

Conforms to the specifications of:  
 ASTM D6138; IP 220; ISO 11007;  
 DIN 51802; NFT 60-135;  
 SIS 155130  
 Electrical Requirements: **CE**  
 115V, 60Hz, 1 phase  
 230V, 50Hz, 1 phase

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

48½x15x11 (123x38x28)  
 Net Weight: 88 lbs (40kg)

### Shipping Information

Shipping Weight: 121 lbs (55 kg)  
 Dimensions: 8 Cu. ft.

## SCRATCH TESTER

### Specifications

Normal load control range: 2 - 20N  
 Normal load accuracy: 1% or 10mN  
 Tangential force measurement range: 2 - 20N  
 Tangential force accuracy: 1% or 10mN  
 Stroke (X): 0.1 - 50mm  
 Speed: 0.1 - 5mm/s  
 Pitch(Y): 0.2 - 50mm  
 Loading Rate: 0 - 20N/s. In steps of 0,2,5,10,15,20N/s  
 Sample Size (LxWxT): 60x60x10mm  
 Operating Temperature: 15 - 40°C. RH: 25 - 85%  
 Storage Temperature: -10 - 40°C, RH: 0 - 90%  
 Electrical Requirements: **CE**  
 115V 60Hz  
 220V 50Hz

### Included Accessories

Control Box                      Diamond Indenter  
 Reference Sample (2)        Data Acquisition Software  
 Tool Kit                          Operating and Instruction Manual

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

11.81x10.83x21.65 (30x27.5x55)  
 Net Weight: 44.1lbs (20kg)

### Scratch Tester

The Scratch Tester is a versatile instrument capable of quantifying scratch resistance, critical load, adhesion and bond strength for a wide range of surfaces. The tester evaluates scratch resistance of a sliding surface in relative motion (X movement) to a stylus. The stylus is pressed against the moving surface with controlled force which is normal to the surface. Tangential force at the contact is measured. The ratio of tangential and normal forces is merely the co-efficient of friction till the threshold of surface damage. Energy required to damage the surface contributes an additional component to the tangential force, which increase this ratio. Force ratio is not the only sign of damage - acoustic emission level also increases corroborating the occurrence of surface damage. Image of the entire scratch may be captured and the view at any given load can be seen to study nature of failure.

| Ordering Information |                                    |
|----------------------|------------------------------------|
| Catalog No.          |                                    |
| K93000               | Scratch Tester, 115V 60Hz          |
| K93090               | Scratch Tester, 220V 50Hz          |
| Accessories          |                                    |
| K93004               | CCD Based Image Acquisition System |
| K93016               | Acoustic Emission Sensor           |

## PIN AND VEE BLOCK TESTER

### Test Method

To evaluate wear preventative and load carrying properties of fluid lubricants, and endurance (wear) life of film lubricants.

### Pin and Vee Block Tester

- Automatic Start of Test at Set Temperature
- Over-Temperature and Over-Torque Protection
- Maintenance of Test Speed within Specified Limits over entire Load Range
- Calibration kit for Load, Torque, and Wear
- High Performance Sensor to cover entire test load range with single load cell with adequate resolution.

The Pin and Vee Block Tester consists of a rotating pin pressed between two stationary steel Vee blocks. Load is applied to the Vee blocks by a ratchet mechanism. Ramping of load during extreme pressure testing is made possible by auto advancement mechanism of ratchet. Pin and Vee blocks are immersed in lubricant fluid under test in heated test cup. Wear, torque and endurance life is evaluated accordingly. The Pin and Vee Block tester comes with data acquisition software. Test torque, load, temperature and wear are measured and recorded. The software permits users to view, compare and report various test results.

### Specifications

Conforms to the Specifications of:

ASTM D2625, D2670, D3233, D5620;  
FTM 791C-3807.1, FTM 791C-3812.1

Test Load: 0 to 4500 lbf

Torque: 0 to 100 in-lb

Speed: 100 to 500 RPM

Temperature: Ambient to 200°C

Duration: 0 to 999.9 minutes

Electrical Requirements: **CE**

230V, 50/60Hz, 2 KVA, 1 Phase



**K95190 Pin and Vee Block Tester**

### Included Accessories

Calibration Kit  
Data Acquisition Software  
Brinell Ball Attachment  
Test Pin (50)  
Vee Block (100)

Measuring Microscope  
Steel Ruler, 6"  
Dust Cover  
Shear Pin (50)

### Ordering Information

**Catalog No.**

**K95190**

Pin and Vee Block Tester, 230V 50/60Hz

## MEASUREMENT OF LUBRICITY OF AVIATION TURBINE FUELS BY THE BALL-ON-CYLINDER LUBRICITY EVALUATOR (BOCLE)

### Test Method

Covers the Assessment of the wear aspects of the boundary lubrication properties of aviation turbine fuels on rubbing steel surfaces.

### Data Acquisition

Test parameters such as speed, test duration, fuel temperature, air temperature and humidity are acquired, displayed and recorded. The acquired data can be viewed in graphs. The data acquisition system provides the users with the facility to super impose up to four test graphs for comparative viewing.

### Specifications

Conforms to the Specifications of: ASTM D5001

Motor Speed: 240 ± 0.5 RPM

Fuel Temperature Control: 25±1.0 max, 0.1°C typical

Flow Rate: 3.8 ± 0.1 L/min

Relative Humidity: 10.0 ± 0.2% indicated

Temperature: 25±1.0 max, 0.1°C typical

Fuel Conditioning: 15 min ± 0.1s

Test Duration: 30 min ± 0.1s

Ambient Temperature: 15 to 22°C

Electrical Requirements: 230V, 50Hz, 2 KVA, 1 Phase, 1.5 KVA Max. **CE**

### ATF Lubricity Test Rig (BOCLE)

The instrument consists of a rotating test ring against which a fixed test ball is pressed with the required force. A fuel bath containing the fuel under test is placed on – movable stage under the test ring. The temperature is controlled and the air is conditioned.

Fuel under test is conditioned by maintaining the fuel temperature at 25°C maintained at 25°C with 10% Relative Humidity is passed through the test area which is enclosed.

After conditioning of the fuel, a test ball of 12.7 mm diameter is pressed against the outer surface of the test ring. The lower part of the test ring is immersed in the test fuel bath.

The test ball is pressed with a force of 10 N against the test ring. The test ring is made to rotate at 240 RPM for a period of 30 minutes after which the test stops.

The wear scar on the test ball is studied and the scar diameters of the wear scar (major and minor axis) are measured.

### Ordering Information

**Catalog No.**

**K94190**

ATF Lubricity Test Rig (BOCLE), 230V 50Hz

## MULTISPECIMEN

### Multispecimen Tester

- Multiple test configuration for wear and friction monitoring in one unit
- Speeds variable to 2000 rpm and loads to 1000 N
- Data acquisition system records speed of rotation, normal load, sample temperature, and frictional torque

Measures and displays a variety of friction and wear characteristics on various geometric test samples with different compositions and forms. Test configurations are easy to change on the instrument: single or multiple, sliding or rolling, point, line or area contacts are available. A wide range of materials including coatings, lubricants, plastics, metals, polymers, ceramics, and composites can be readily analyzed. The test is performed by mounting a test sample into the spindle and rotating it against a stationary counter-face test specimen. The spindle rotation speed, normal load, and interface temperature can be user-adjusted in accordance with published ASTM standards. Specimen holders are designed for standard test configurations; optional custom designed holders for customer specific applications are also available. This unit has a temperature range to 120°C, load to 1000 N and speed up to 2000 rpm. Windows®-based TriboDATA data acquisition software is included, and some of the possible configurations are shown in the table to the right.

#### Specifications

Conforms to the specifications of:

|                               |                                  |
|-------------------------------|----------------------------------|
| ASTM D2266, D3702, D4172      | Non-Rotating Sample              |
| Normal Load: 5-1000 N         | Diameter/Diagonal: up to 80 mm   |
| Frictional Torque Measurement | Pin Sample Diameter: up to 8 mm  |
| Range: 0-10 Nm                | Ball Diameter: 12.7 mm           |
| Shaft Speed: 200-2000 rpm     | Non-rotating Sample Temperature: |
| Wear Measurement: 0-2000 µm   | Ambient to 100°C                 |

| Configurations Table                                 |                           |  |
|------------------------------------------------------|---------------------------|--|
| <b>Ball on flat</b>                                  | 1, 2, 3 balls can be used |  |
| Sliding point contact                                | Dry or lubricated contact |  |
| <b>Cylinder on flat</b>                              | 1 or 2 pins.              |  |
| Sliding line contact                                 | Dry or lubricated         |  |
| <b>Pin on flat</b>                                   | 1, 2 or 3 pins.           |  |
| Sliding area contact                                 | Dry or lubricated         |  |
| <b>Four ball wear</b>                                | ASTM D2266                |  |
| Wear preventive properties of lubricants             | ASTM D4172                |  |
| <b>Thrust washer</b>                                 | ASTM D3702                |  |
| Rotating washer against fixed washer with axial load |                           |  |

| Ordering Information |                                         |                  |
|----------------------|-----------------------------------------|------------------|
| <b>Catalog No.</b>   |                                         | <b>Order Qty</b> |
| <b>K93600</b>        | Multispecimen Tester, 220V 60Hz 3 Phase | 1                |
| <b>K93690</b>        | Multispecimen Tester, 380V 50Hz 3 Phase |                  |

#### Included Accessories

Electrical Controller  
Electrical Cables  
TriboDATA Software  
Set of Hand Tools  
Calibration and Test Reports

#### Electrical Requirements

220V 60Hz 3 Phase  
380V 50Hz 3 Phase

#### Included Adapters

Ball on Flat  
Cylinder on Flat  
Pin on Flat  
Four Ball Wear Preventative  
Thrust Washer

#### Shipping Information

Shipping Weight: 880 lbs (400 kg)  
Dimensions: 32 Cu. ft.

## TRIBOLOGY TEST SPECIMENS AND OTHER TRIBOLOGY EQUIPMENT

### Slurry Abrasion Tester

Measures the slurry abrasive resistance of solid materials as prescribed by ASTM G105 specifications. Performs tests on metals, minerals, polymers, composites, ceramics, coatings, and heat-processed materials. A rectangular test sample is rotated in a slurry cup with the temperature maintained using a water bath. The test speed, temperature, duration, sample size, and slurry composition can be varied. The differential mass of the sample before and after the test is converted to volume loss (abrasion index) for direct comparison of the tested materials.

### Tapping Torque Tester

Evaluates metal working fluids and various machining operations according to ASTM D5619 for the torque requirements of tapping operations in pre-drilled samples. Software package acquires cutting torque and rotational speed and displays them as a function of test duration or angle of tool rotation.

### Air Jet Erosion Tester

Performs air jet erosion test according to ASTM G76 specifications. A test sample is bombarded by a gas containing particulates with a known velocity and concentration of particles. Comparison can be made by varying test sample composition, size, particle velocity, angle of incidence, and temperature.

### Dry Abrasion Tester

Measures index of abrasive resistance to dry sand according to ASTM G65 test specifications. Test specimen is held against a rotating wheel and abraded with a grit of controlled size, composition, and flow with the proper test duration and applied force as prescribed by the ASTM test method. The differential mass of the specimen before and after the test is recorded and converted to volume loss (abrasion index) for direct comparison of tested materials.

### Custom-Built Tribology Test Equipment and Test Specimens

Test specimens are available for all of the tribology instrumentation offered from Koehler. Please inquire with customer service about other custom-built tribology test equipment and test specimens. Custom-designed equipment is readily available for the following tribology test methods:

**Universal Wear (ASTM G77, G99)**

**Vane Pump Wear (ASTM D2882)**

**Shear Stability (ASTM D6278)**

**Slurry Erosion Tester**

**Reichert Tester**

**Grease Life Tester (D3336)**

**Grease Noise Tester**

**V2F Grease Testing Machine**

**ROF Grease Testing Machine (DIN 51806)**

**R2F Grease Testing Machine**



*High Temperature  
Air Jet Erosion  
Tester*

# LUBRICATING GREASES

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*For information on additional test methods for lubricating greases:*

–Please refer to the Penetration Section

–Additional test methods are available upon request

–please call or write for information



# EVAPORATION LOSS OF LUBRICATING GREASES AND OILS



K29500 Evaporation Test Cell with Grease Cup

## Specifications

Conforms to the specifications of:

ASTM D972, D2878; IP 183; FTM 791-351

Capacity: 2 oil or grease samples

Maximum Temperature: 350°F (177°C)

Temperature Control Stability:  $\pm 1^\circ\text{F}$  ( $\pm 0.5^\circ\text{C}$ )

Circulation:  $\frac{1}{2}$ hp stainless steel impeller

Bath Medium: 5.3 gal (20L) high temperature transfer fluid

Electrical Requirements:

115V 60Hz, Single Phase, 8.6A

220-240V 50/60Hz, Single Phase, 4.5A

## Included Accessories

Support Clamps (2)

Thermometer Holder

## Dimensions

33w" x 25½"h (84x65cm)

Maximum width with two evaporation cells inserted

Net Weight: 62 lbs (28.1kg)

## Shipping Information

Shipping Weight: 90 lbs (40.8kg)

Dimensions: 14.2 Cu. ft.

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

## Test Method

Evaluates the potential for evaporation loss of lubricant components in high temperature service. A controlled flow of heated air is passed over the sample for a specified period. Evaporation loss is measured by the change in sample weight during the test. The Evaporation Loss test can also be used for Estimating Apparent Vapor Pressures and Molecular Weights of Lubricating Oils (ASTM D2878). A high temperature version of the Evaporation Loss test is available (See ASTM D2595).

## Evaporation Loss Tester

- Conforms to ASTM D972, D2878 and related specifications
- Two-sample testing capability

**Evaporation Cell**—Suitable for evaporation loss tests on lubricating greases and oils in the temperature range of 210 to 300°F (99 to 149°C). Passes heated air over the sample at the required flow rate. Consists of stainless steel body, cover, eduction tube and hood. Calibrated flowmeter with needle valve maintains 2L/min. air flow at standard temperature and pressure. Supplied with stainless steel grease or oil sample cup. Sample cups are interchangeable. Entire assembly mounts in Evaporation Loss Test Bath.

**Evaporation Loss Test Bath**—Constant temperature oil bath mounts two Evaporation Cells in an upright position at the proper immersion level. Maintains test temperature within  $\pm 1^\circ\text{F}$  ( $\pm 0.5^\circ\text{C}$ ). Microprocessor PID control provides quick temperature stabilization without overshoot and the bath 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  $^\circ\text{C}/^\circ\text{F}$  format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information. Fully insulated, double-wall construction, with stainless steel tank and polyurethane-finished steel exterior.

\*Also available—special bath to accommodate both ASTM D972 and D942 (Oxidation Stability of Greases on page 152) test methods. Please contact Koehler for additional information.

## Ordering Information

| Catalog No. |                                              | Order Qty |
|-------------|----------------------------------------------|-----------|
| K29400      | Evaporation Loss Test Bath, 115V 60Hz        | 1         |
| K29490      | Evaporation Loss Test Bath, 220-240V 50/60Hz |           |
| K29500      | Evaporation Test Cell with Grease Cup        | 2         |
| K29550      | Evaporation Test Cell with Oil Cup           |           |

## Accessories

|             |                                             |
|-------------|---------------------------------------------|
| 250-000-22F | ASTM 22F Thermometer<br>Range: 204 to 218°F |
| 250-000-22C | ASTM 22C Thermometer<br>Range: 95 to 103°C  |
| 250-000-67F | ASTM 67F Thermometer<br>Range: 203 to 311°F |
| 250-000-67C | ASTM 67C Thermometer<br>Range: 95 to 155°C  |
| K29530      | Oil Sample Cup with Hood                    |
| K29540      | Grease Sample Cup with Hood                 |

# EVAPORATION LOSS OF LUBRICATING GREASES OVER WIDE TEMPERATURE RANGE

## Test Method

Similar to the ASTM D972 Evaporation Loss test, extending the temperature range for evaporation loss testing to 600°F (316°C).

## High Temperature Evaporation Loss Tester

- Conforms to ASTM D2595 specifications
- Microprocessor temperature control with digital display and overtemperature cut-off
- Microprocessor programmable high accuracy temperature control

Performs evaporation loss tests on lubricating greases at temperatures of up to 600°F (316°C). Maintains sample temperature within  $\pm 0.3^\circ\text{F}$  while passing heated air over the sample surface at a controlled flow rate. Consists of evaporation cells and aluminum block oven with controls for sample temperature, air temperature and air flow rate. Evaporation cells include grease sample cup, head, eduction tube, cover and thermocouple tube. Aluminum block oven provides efficient response and safe operation at high temperatures. 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 when bath temperature exceeds a programmed cut-off point. Microprocessor PID control provides quick temperature stabilization without overshoot and the bath 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  $^\circ\text{C}/^\circ\text{F}$  format. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.* Separate air preheater controls and flowmeters for each cell permit accurate control of heated air flow to sample surface. Order accessory Digital Thermometer (Cat. No. K29310) to monitor exit air temperature and ASTM 3F or 3C Thermometer for block (sample) temperature. Accessory oil sample cup (Cat. No. K29530) converts evaporation cell for lubricating oil samples.

### Ordering Information

| Catalog No.        |                                                                                                                                                                                                                                                                                                                                                                                       | Order Qty |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>K29300</b>      | High Temperature Evaporation Loss Tester, 220-240V 50/60Hz                                                                                                                                                                                                                                                                                                                            | 1         |
| <b>Accessories</b> |                                                                                                                                                                                                                                                                                                                                                                                       |           |
| <b>K29320</b>      | High Precision Digital Thermometer, 115V 60Hz Microprocessor based digital thermocouple thermometer with ten channel input. Monitors Type K Thermocouples from evaporation cells in K29300 Evaporation Loss Tester. Use together with preheater controls in Model K29300 to maintain air temperature within $\pm 1.1^\circ\text{C}$ ( $\pm 2^\circ\text{F}$ ) per ASTM specifications | 1         |
| <b>K29329</b>      | High Precision Digital Thermometer, 220-240V 50/60Hz                                                                                                                                                                                                                                                                                                                                  |           |
| <b>250-000-03F</b> | ASTM 3F Thermometer<br>Range: 20 to 760°F                                                                                                                                                                                                                                                                                                                                             |           |
| <b>250-000-03C</b> | ASTM 3C Thermometer<br>Range -5 to +400°C                                                                                                                                                                                                                                                                                                                                             |           |
| <b>K29530</b>      | Oil Sample Cup with Hood                                                                                                                                                                                                                                                                                                                                                              |           |
| <b>K29540</b>      | Grease Sample Cup with Hood                                                                                                                                                                                                                                                                                                                                                           |           |

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



K29300 High Temperature Evaporation Loss Tester

## Specifications

Conforms to the specifications of:

ASTM D2595, D2878\*

\*with accessory oil sample cup installed

Capacity: 2 samples

Temperature Range: 200 to 600°F (93 to 316°C)

Sample Temperature Control:

Type: microprocessor digital control

Exit Air Temperature Control: Two 0-500W variable control heaters and type K thermocouples (order K29320/K29329 Digital Thermometer separately)

Air Flow Control: Two externally mounted flowmeters maintaining 2L/min flow at standard temperature and pressure

Electrical Requirements: **CE**

220-240V 50/60Hz, Single Phase, 10.4A

## Included Accessories

Evaporation Cell Assemblies with grease sample cups (2)

Type K Thermocouples (2)

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

25x16x17 (64x41x43)

Net Weight: 175 lbs (79.4kg)

## Shipping Information:

Shipping Weight: 224 lbs (101.6kg)

Dimensions: 10.4 Cu. ft.

# DROPPING POINT OF LUBRICATING GREASE



K19490 Dropping Point Apparatus

## Test Method

Dropping point determinations are used for identification and quality control purposes, and can be an indication of the highest temperature of utility for some applications. The sample is heated at a prescribed rate in a precision machined cup whose sides slope toward an opening at its center. The temperature at which a liquid drop first falls from the cup is the dropping point of the sample.

## Dropping Point Apparatus

- Conforms to ASTM D566, D4950 and related specifications

Performs dropping point determinations on lubricating greases at temperatures of up to 550°F (288°C). Consists of dropping point cup, test cell with accessories and oil bath with stirrer and heater. Test cell is immersed in a 400mL Borosilicate Glass bath for heating at the prescribed rate. A 750W variable stepless control heater and 1/40hp stirrer permit accurate, uniform control of bath temperature rate of rise. Heater assembly includes refractory top plate and reference dial.

## Specifications

Conforms to the specifications of:

ASTM D566, D4950; IP 132; ISO 2176; DIN 51801; FTM 791-1421; NF T 60-102

Maximum Temperature: 550°F (288°C)

Bath Medium: A high temperature heat transfer fluid having a flash point in excess of 400°C is recommended. Silicone fluid (P/N 355-001-002 — page 8) is suitable.

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 6.5A

220-240V 50/60Hz, Single Phase, 3.4A

## Included Accessories

Grease Cup, chromium plated brass

Test Tube with indentations

Cork Ring Guide

Thermometer Corks (2)

Thermometer Depth Gauge

Polished Metal Rod

Connecting Hardware

## Dimensions

5x5x31(13x13x78)

Net Weight: 11 lbs (5.0kg)

## Shipping Information

Shipping Weight: 16 lbs (7.3kg)

Dimensions: 2.8 Cu. ft.

## Ordering Information

| Catalog No. |                                            | Order Qty |
|-------------|--------------------------------------------|-----------|
| K19490      | Dropping Point Apparatus, 115V 60Hz        | 1         |
| K19491      | Dropping Point Apparatus, 220-240V 50/60Hz |           |

## Accessories

|             |                                                    |   |
|-------------|----------------------------------------------------|---|
| 250-000-02F | ASTM 2F Thermometer. Range: 20 to 580°F            | 2 |
| 250-000-02C | ASTM 2C Thermometer. Range: -5 to +300°C           |   |
| K194E7      | Cup Plug Gauge                                     | 1 |
|             | Checks conformity of test cup with specifications. |   |
|             | Per Fig. 1, ASTM D566 and Fig. 1-E7, ASTM D2265    |   |
| K194E6      | Polished Metal Rod                                 |   |
| K194EA      | Grease Cup                                         |   |
| K19492      | Test Tube with indentations                        |   |
| K19493      | Thermometer Cork                                   |   |
| K19499      | Cork Ring Guide                                    |   |

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

# DROPPING POINT OF LUBRICATING GREASE OVER WIDE TEMPERATURE RANGE

## Test Method

The ASTM D2265 dropping point test permits higher temperatures than the ASTM D566 method and uses a different heating procedure: the test cell is inserted in an aluminum block oven maintained at a constant temperature that is higher than the expected dropping point of the sample. The sample temperature then rises to the dropping point without operator control.

## High Temperature Dropping Point Apparatus

- Conforms to ASTM D2265 and D4950 specifications
- Six-sample testing capability
- Microprocessor programmable high accuracy temperature control

Tests dropping points of lubricating greases at temperatures of up to 400°C (752°F). Includes thermostatically controlled aluminum block oven and six complete dropping point assemblies. Six-place oven has large viewing ports with fluorescent backlighting for excellent visibility. Microprocessor PID control provides quick temperature stabilization without overshoot and the bath is protected by an overtemperature control circuit that interrupts power should block temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.* Microprocessor temperature control with digital readout and overtemperature safety cut-off maintains block temperature with ±0.5°C stability. Insulated cabinet has a chemical resistant polyurethane finish.



**K19400 High Temperature Dropping Point Apparatus**

## Ordering Information

| Catalog No.        |                                                                       | Order Qty |
|--------------------|-----------------------------------------------------------------------|-----------|
| K19400             | High Temperature Dropping Point Apparatus, 115V 60Hz                  | 1         |
| K19410             | High Temperature Dropping Point Apparatus, 220-240V 50/60Hz           |           |
| <b>Accessories</b> |                                                                       |           |
| 250-000-03F        | ASTM 3F Thermometer<br>Range: 20 to 760°F                             | 7         |
| 250-000-03C        | ASTM 3C Thermometer<br>Range: -5 to +400°C                            |           |
| K194E7             | Cup Plug Gauge<br>Per Fig. 1, ASTM D566 and<br>Fig. 1-E-7, ASTM D2265 | 1         |
| K194EA             | Grease Cup                                                            |           |
| K194EB             | Test Tube, 13x100mm                                                   |           |
| K194EC             | Cup Support                                                           |           |
| K194E1             | Thermometer Clamp                                                     |           |
| K194E2             | Upper Bushing                                                         |           |
| K194E3             | Lower Bushing                                                         |           |
| K194E4             | Bushing Support Ring                                                  |           |
| K194E5             | Thermometer Depth Gauge                                               |           |
| K194E6             | Polished Metal Rod                                                    |           |

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

## Specifications

Conforms to the specifications of:  
ASTM D2265, ASTM D4950  
Maximum Temperature: 400°C (752°F)  
Control Stability: ±0.5°C (±1°F)  
Electrical Requirements: **CE**  
115V 60Hz, Single Phase, 6.5A  
220-240V 50/60Hz, Single Phase, 3.4A

## Included Accessories:

Dropping Point Assemblies (6) consisting of: test tube, grease cup, thermometer clamp, upper and lower bushings and bushing support ring  
Thermometer Depth Gauge  
Polished Metal Rod  
Cup Support

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

11½x9x14 (29x23x36)  
Net Weight: 24½ lbs (11.1kg)

## Shipping Information

Shipping Weight: 31 lbs (14.1kg)  
Dimensions: 2.6 Cu. ft.

**Please inquire about our Automated Dropping Point Test Equipment by contacting Koehler's Customer Service.**

## OXIDATION STABILITY OF LUBRICATING GREASES BY THE OXYGEN BOMB METHOD



K10901 Oxidation Bath with  
K11000 Oxidation Bombs

### Test Method

The sample is oxidized in a bomb initially charged with oxygen at 110psi (758kPa) and maintained at elevated temperature for a specified aging period. The pressure drop inside the bomb is measured by means of a gauge or transducer.

### Oxidation Stability Test Apparatus

- Conforms to ASTM D942 and related specifications
- Four sample testing capability
- Available Oxidata® Pressure Measurement System

Consists of Oxidation Bombs, Sample Dishes, Pressure Measuring and Recording Equipment and Oxidation Bath.

**Oxidation Bomb**—Stainless steel bomb consists of body, lid with stem and needle valve, and dish holder per ASTM specifications. Bomb interior surfaces and inside of stem have a high polish to facilitate cleaning. Safely withstands a working pressure of 180psi (1241kPa) at 99°C (210°F). Includes PTFE gasket seals (3) and cap screws with wrench. PTFE-fluorocarbon seals are available (see Accessories).

**Pressure Measurement and Recording Equipment**—Select mechanical pressure gauges or, for greater convenience and accuracy in test reporting, the Oxidata® Pressure Management System designed expressly for ASTM oxidation tests.

Pressure gauge measures pressure inside Oxidation Bomb with accuracy of better than 0.5psi (3.45kPa) in accordance with ASTM specifications. Range: 0-160psi (0-1100kPa), graduated in 1psi intervals. Cleaned for oxygen service.

**Oxidata® Pressure Measurement System**—A complete electronic measurement system based on powerful Oxidata® software for Windows® and Windows 95® environments. Electronically measures and reports pressure versus time and accuracy of better than 0.5psi (3.45kPa) in the range of 0-200psi (0-1378kPa) for four channels in graphical tabular format. Included RTD attachment permits measurement and reporting of bath temperature. Includes transducers, data acquisition card, multiplexer, Oxidata® software, RTD probe assembly and connecting cables and hardware. Refer to page 115 for complete specifications on Oxidata® software.

**Oxidation Bath**—Constant temperature oil bath holds bombs at the proper depth for determining oxidation stability of lubricating greases. 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 format. *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 welded stainless steel bath interior has a bomb support rack and overflow standpipe/drain to maintain proper working depth. Steel exterior has a corrosion-resistant polyurethane enamel finish.

*Also available—Special baths to accommodate two test methods:*

- ASTM D942 and D525 (Oxidation Stability of Gasoline—Induction Method on pages 81-82)
- ASTM D942 and D972 (Evaporation Loss of Lubricating Greases and Oils on page 149)
- Higher temperature models are available.

*Please contact Koehler's Customer Service for additional information.*

# OXIDATION STABILITY OF LUBRICATING GREASES BY THE OXYGEN BOMB METHOD



*Oxidata® Pressure Measurement System*

## Specifications

Conforms to the specifications of:

ASTM D942; IP 142; DIN 51808; FTM 791-3453

Oxidation Bath:

Capacity: four (4) oxidation bombs

Temperature Range: ambient to 275°F (135°C)

Bath Medium: 12.5 gal (47.3L) white technical oil

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 13.0A

220-240V 50/60Hz, Single Phase, 6.8A

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

Interior: 16x14 (41x36)

Overall: 19½x28½ (50x72)

## Shipping Information (with electronic pressure measurement system)

Shipping Weight:

Bath: 75 lbs (34.0kg)

Electronic Pressure Measurement System: 48 lbs (21.8kg)

Dimensions:

Bath: 16.7 Cu. ft.

Electronic Pressure Measurement System: 7.8 Cu. ft.

## Ordering Information

| Catalog No.                                                                   |                                                                                                                                                                                                                                                                                     | Order Qty |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Oxidation Bomb</b>                                                         |                                                                                                                                                                                                                                                                                     |           |
| <b>K11000</b>                                                                 | Oxidation Bomb                                                                                                                                                                                                                                                                      | 4         |
| <b>Pressure Measurement and Recording Equipment</b>                           |                                                                                                                                                                                                                                                                                     |           |
| <i>Select either Pressure Gauges or Oxidata® Pressure Measurement System*</i> |                                                                                                                                                                                                                                                                                     |           |
| <b>311-160-003</b>                                                            | Pressure Gauge                                                                                                                                                                                                                                                                      | 4         |
| <b>K11005</b>                                                                 | 4-Unit Electronic Pressure Measurement for Lubricating Grease Oxidation Tests, 115V 60Hz                                                                                                                                                                                            |           |
| <b>K11095</b>                                                                 | 4-Unit Electronic Pressure Measurement for Lubricating Grease Oxidation Tests, 220-240V 50/60Hz                                                                                                                                                                                     |           |
| <b>Oxidation Bath</b>                                                         |                                                                                                                                                                                                                                                                                     |           |
| <b>K10901</b>                                                                 | Oxidation Bath, 115V 60Hz                                                                                                                                                                                                                                                           | 1         |
| <b>K10991</b>                                                                 | Oxidation Bath, 220-240V 50/60Hz                                                                                                                                                                                                                                                    |           |
| <b>Accessories</b>                                                            |                                                                                                                                                                                                                                                                                     |           |
| <b>K11040</b>                                                                 | Borosilicate Glass Dish                                                                                                                                                                                                                                                             | 20        |
| <b>250-000-22F</b>                                                            | ASTM 22F Thermometer. Range: 204 to 218°F                                                                                                                                                                                                                                           |           |
| <b>250-000-22C</b>                                                            | ASTM 22C Thermometer. Range: 95 to 103°C                                                                                                                                                                                                                                            | 1         |
| <b>355-001-001</b>                                                            | White Technical Bath Oil, 1 Gallon container                                                                                                                                                                                                                                        | 13        |
| <b>355-001-003</b>                                                            | White Technical Bath Oil, 5 Gallon container                                                                                                                                                                                                                                        | 3         |
| See page 8 for specifications                                                 |                                                                                                                                                                                                                                                                                     |           |
| <b>K10504-0-1</b>                                                             | Transducer Assembly                                                                                                                                                                                                                                                                 |           |
| <b>K10551</b>                                                                 | Pressure Line. For pressurizing Oxidation Bomb. 6 ft (1.83m) long, with quick release coupling for needle valve on bomb and threaded fitting for oxygen tank                                                                                                                        | 1         |
| <b>K10556</b>                                                                 | Oxygen Manifold Pressure Relief System. Connects to oxygen source to prevent overcharging of bomb. Equipped with relief valve to vent at 125psi and 300 series stainless steel 150psi burst disk assembly. Constructed from 300 series stainless steel. Cleaned for oxygen service. |           |
| <b>K11029</b>                                                                 | PTFE-fluorocarbon Gasket                                                                                                                                                                                                                                                            |           |

*\*This ordering information is for installation to Koehler grease oxidation test equipment. For other makes of equipment, a few items of basic hardware may also be required—please contact your Koehler representative for assistance.*



*K11000 Oxidation Bomb*

# CORROSION PREVENTIVE PROPERTIES OF LUBRICATING GREASES

## Corrosion Preventive Properties of Lubricating Greases

### Corrosion Preventive Properties of Lubricating Greases in Presence of Dilute Synthetic Sea Water Environments

#### Test Method

Determines the corrosion preventive properties of greases when distributed in a tapered roller bearing stored under wet conditions.

#### Corrosion Preventive Properties Apparatus

- Conforms to ASTM D1743 and D4950 specifications

Distributes a lubricating grease sample in a roller bearing by running the bearing under light thrust load. Corrosion preventive capability is determined on a pass/fail basis by the presence of rust spots (1mm or larger) on the bearing race after a 60 second run-in period followed by prolonged exposure to water at constant temperature. Consists of variable speed motor, 1750rpm run-in stand, bearing holder assemblies, spindle/thrust loading device, mechanical grease packer pliers and test bearings.

#### Specifications

Conforms to the specifications of: ASTM D1743, D4950, Draft Method, D5969  
Drive Motor: 1750rpm

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 2.0A

220-240V 50/60Hz, Single Phase, 1.0A

#### Included Accessories

Bearing Holder Assemblies (3): Consisting of:

- 1kg weight
- upper and lower plastic collars for cone
- plastic collar for cup
- plastic jar with screw cap
- metal screw

Spindle/Thrust Loading Device

Mechanical Grease Packer

Pliers

Test Bearings (3) (cone and roller assemblies)

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

10x15x20 (25.4x38.1x50.8)

Net Weight: 27 lbs (12.2kg)

#### Shipping Information

Shipping Weight: 36 lbs (16.3kg)

Dimensions: 5 Cu. ft.



#### Corrosion Preventive Properties Apparatus (Alternate Method)

- Conforms to ASTM D1743-73 specifications

Determines corrosion preventive properties of lubricating greases in accordance with original ASTM D1743-73 specifications, now incorporated as Appendix #2 in the current ASTM D1743 method. Offers a suitable alternative to the new method for laboratories needing a quicker screening test method. Consists of drive motor on base with driving cone hub, thrust loading device, mechanical grease packer, test bearings (3), bearing supports (3) and containers with lids (3).

#### Specifications

Conforms to the specifications of: ASTM D1743-73, FTM 791-4012

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 5.2A

220-240V 50/60Hz, Single Phase, 2.6A

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

7x12x9 3/4 (18x30x25)

Net Weight: 27 lbs (12.3kg)

#### Shipping Information

Shipping Weight: 36 lbs (16.3kg)

Dimensions: 5 Cu. ft.

| Ordering Information |                                                             |
|----------------------|-------------------------------------------------------------|
| <b>Catalog No.</b>   |                                                             |
| <b>K17980</b>        | Corrosion Preventive Properties Apparatus, 115V 60Hz        |
| <b>K17989</b>        | Corrosion Preventive Properties Apparatus, 220-240V 50/60Hz |
| <b>Accessories</b>   |                                                             |
| <b>K17981</b>        | Bearing Holder Assembly                                     |
| <b>K17981-0-2</b>    | Upper Flange                                                |
| <b>K17981-0-3</b>    | Lower Flange                                                |
| <b>K17982</b>        | Mechanical Grease Packer                                    |
| <b>K17983</b>        | Pliers                                                      |
| <b>K17984</b>        | Plastic Jar                                                 |
| <b>289-004-002</b>   | Test Bearing                                                |

| Ordering Information                  |                                                                                |
|---------------------------------------|--------------------------------------------------------------------------------|
| <b>Catalog No.</b>                    |                                                                                |
| <b>K17970</b>                         | Corrosion Preventive Properties Apparatus (Alternate Method), 115V 60Hz        |
| <b>K17979</b>                         | Corrosion Preventive Properties Apparatus (Alternate Method), 220-240V 50/60Hz |
| <b>Accessories (Alternate Method)</b> |                                                                                |
| <b>K17900</b>                         | Thrust Loading Device and Mechanical Grease Packer                             |
| <b>K17910</b>                         | Test Bearing                                                                   |
| <b>K17920</b>                         | Bearing Supports                                                               |
| <b>K17930</b>                         | Container with Lid                                                             |

# COPPER CORROSION FROM LUBRICATING GREASE

## Test Method

Measures the tendency of lubricating grease to corrode copper under static conditions. A polished copper strip is immersed in a sample of grease at elevated temperature for a specified period. The strip is examined for corrosion and a classification number from 1-4 is assigned based on a comparison with the ASTM Copper Strip Corrosion Standards.

## Copper Strip Tarnish Test Apparatus

- Conforms to ASTM D4048 specifications

| Ordering Information |                                                                                                                                                                                                                                                                                                                                                                                       |           |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Catalog No.          |                                                                                                                                                                                                                                                                                                                                                                                       | Order Qty |
| K25330               | Test Tube Bath, 115V 60Hz<br>Constant temperature bath with microprocessor temperature control. Control features °C/°F switchable digital setpoint and display and overtemperature cut-off protection. Temperature range from ambient to 190°C (374°F) with ±1°C (±2°F) stability. Welded stainless steel inner wall and powder coated steel outer wall construction, fully insulated | 1         |
| K25339               | Test Tube Bath, 220-240V 50/60Hz                                                                                                                                                                                                                                                                                                                                                      |           |
| K25308               | Test Jar Rack<br>Inserts in K25330/K25339 baths to hold sixteen 332-004-001 Test Jars                                                                                                                                                                                                                                                                                                 | 1         |
| 332-004-001          | Test Jar                                                                                                                                                                                                                                                                                                                                                                              | 16        |
| K25080               | Copper Test Strip<br>Conforming to ASTM specifications                                                                                                                                                                                                                                                                                                                                | 16        |
| 380-150-001          | Silicone Carbide Paper, 150 grit<br>For polishing of test strips<br>Pack of 50 sheets                                                                                                                                                                                                                                                                                                 | 1         |
| 380-240-001          | Silicone Carbide Paper 240 Grit<br>For final polishing of test strips<br>Pack of 50 sheets                                                                                                                                                                                                                                                                                            | 1         |
| 380-150-000          | Silicone Carbide Grain, 150 Grit<br>For final polishing of test strips. 1 lb package                                                                                                                                                                                                                                                                                                  | 1         |
| K25000               | Polishing Vise<br>Holds copper strip firmly in place without marring the edges. Stainless steel, mounted on a composition base                                                                                                                                                                                                                                                        | 1         |
| K25100               | ASTM Copper Corrosion Standards<br>Colored reproductions of tarnished strips encased in plastic                                                                                                                                                                                                                                                                                       | 1         |
| 332-004-002          | Viewing Test Tube<br>Protects copper strip during inspection or storage                                                                                                                                                                                                                                                                                                               | 16        |
| 250-000-130F         | ASTM 130F Thermometer<br>Range: 20 to 220°F                                                                                                                                                                                                                                                                                                                                           | 1         |
| 250-000-130C         | ASTM 130C Thermometer<br>Range: -7 to +105°C                                                                                                                                                                                                                                                                                                                                          | 1         |
| K460-0-8             | Vented Cork                                                                                                                                                                                                                                                                                                                                                                           | 16        |

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



*K25339 Constant Temperature Bath with 332-004-001 Test Jars*

## Specifications:

Conforms to the specifications of:  
 ASTM D4048, FTM 791-5309  
 Test Tube Bath Capacity: 16 test jars  
 Maximum Temperature: 190°C (374°F)  
 Temperature Control Stability: ±1°C (±2°F)  
 Bath Medium: 5 gal (18.9L) water or high temperature heat transfer fluid  
 Electrical Requirements: **CE**  
 115V 60Hz, Single Phase, 7.5A  
 220-240V 50/60Hz, Single Phase, 4A

## Dimensions

lxwxh,in.(cm)  
 15½x12½x14 (39x32x36)  
 Net Weight: 27 lbs (12.2kg)

## Shipping Information

Shipping Weight: 40 lbs (18.1kg)  
 Dimensions: 7.8 Cu. ft.

# ROLL STABILITY OF LUBRICATING GREASE



**K18320 Double-Unit Roll Stability Tester**

## Specifications

Conforms to the specifications of:

ASTM D1831, MIL-G-10924SA

Maximum Temperature: 200°F (93°C)

Temperature Control Stability:  $\pm 2^\circ\text{F}$  ( $\pm 1^\circ\text{C}$ )

Electrical Requirements (Single and double unit models):  $\text{C}\epsilon$

115V 60Hz, Single Phase, 10.5A

220-240V 50Hz, Single Phase, 5.5A

220-240V 60Hz, Single Phase, 5.5A

## Included Accessories

Test Cylinders with threaded end caps and O-ring seals

Test Rollers, steel, 5kg

## Dimensions lwxhxh,in.(cm)

Single-Unit: 16½x18½x15 (42x47x38)

Double-Unit: 16½x18½x15 (42x47x38)

Four-Unit: 25x18½x15 (64x47x38)

Net Weight:

Single-Unit: 98 lbs (44.4kg)

Double-Unit: 116 lbs (52.6kg)

Four-Unit: 187 lbs (84.8kg)

## Shipping Information

Shipping Weight:

Single-Unit: 142 lbs (64.4kg)

Double-Unit: 175 lbs (79.4kg)

Four-Unit: 270 lbs (122.5kg)

Dimensions:

Single-Unit: 7.7 Cu. ft.

Double-Unit: 9.8 Cu. ft.

Four-Unit: 16.6 Cu. ft.

## Test Method

Provides an indication of shear stability of lubricating greases by testing the change in worked penetrations after two hours in the roll stability tester.

## Roll Stability Tester

- Conforms to ASTM D1831 and related specifications
- Single, double and four-unit models
- Microprocessor programmable high accuracy temperature control
- High Temperature model

Roll stability apparatus for shear stability tests on lubricating greases. Rotates steel test cylinders at 10 or 165rpm in a thermostatically controlled environment at temperatures of up to 200°F (93.3°C). Drive system is powered by a rugged ratio motor, and interchangeable drive chain sprockets are easily accessible for converting unit to either operating speed. Microprocessor PID control provides quick temperature stabilization without overshoot and is protected by an overtemperature control circuit that interrupts power should temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.* A balanced cast aluminum fan and 1200W heater provide efficient, uniform heat distribution. A dial thermometer in the hinged cover displays chamber temperature. Heaters and drive chain mechanism are shielded for operator safety. Insulated steel cabinet and base are finished with a durable polyurethane enamel finish.

**High Temperature Model**—A high temperature model is also available that expands the temperature range to 320°F (160°C). Tests can be conducted using the high temperature model unit for time/temperature specifications beyond those listed in existing D1831.

## Ordering Information

### Catalog No.

### Roll Stability Tester

|               |                                                 |
|---------------|-------------------------------------------------|
| <b>K18300</b> | Single-Unit Model, 115V 60Hz                    |
| <b>K18305</b> | Single-Unit Model, 220-240V 50Hz                |
| <b>K18306</b> | Single-Unit Model, 220-240V 60Hz                |
| <b>K18320</b> | Double-Unit Model, 115V 60Hz                    |
| <b>K18325</b> | Double-Unit Model, 220-240V 50Hz                |
| <b>K18326</b> | Double-Unit Model, 220-240V 60Hz                |
| <b>K18340</b> | Four-Unit Model, 115V 60Hz                      |
| <b>K18341</b> | High Temperature Four-Unit Model, 115V 60Hz     |
| <b>K18345</b> | Four-Unit Model, 220-240V 50Hz                  |
| <b>K18346</b> | Four-Unit Model, 220-240V 60Hz                  |
| <b>K18347</b> | High Temperature Four-Unit Model, 220/240V 50Hz |
| <b>K18348</b> | High Temperature Four-Unit Model, 220/240V 60Hz |

### Accessories

|                  |                                                                     |
|------------------|---------------------------------------------------------------------|
| <b>K183-0-1A</b> | Test Cylinder, plated steel with threaded end caps and O-ring seals |
| <b>K183-0-4</b>  | Steel Cylinder Roller                                               |

# APPARENT VISCOSITY OF LUBRICATING GREASES

## Test Method

Apparent viscosity is used to evaluate pumpability and handling characteristics of greases and is also suitable for analysis of adhesives, sealants and other semi-solid products. The sample is forced through a capillary by means of a gear pump-driven hydraulic system and the resulting pressure in the system is measured. Apparent viscosity is then calculated from the flow rate and pressure. Eight different capillaries and two pump speeds are used to determine the apparent viscosity at sixteen shear rates.

## Pressure Viscometers

- Conforming to ASTM D1092 and related specifications
- Mechanically refrigerated low temperature model

**Low Temperature Pressure Viscometer**—Consists of power, hydraulic and grease systems with refrigerated test chamber. Hydraulic system includes constant displacement gear-driven metering pump, hydraulic oil reservoir with 50-mesh screen, stainless steel tubing, high pressure valve and fittings. Drive motor has interchangeable 40 and 64 tooth gears for two-speed operation. Four interchangeable gauges of 0-60, 0-100, 0-600 and 0-5000psi ranges monitor system pressure.

Supplied with three precision machined grease assemblies, each including piston, caps and thermocouple; set of eight (ASTM Nos. 1-8) stainless steel capillaries; and wrenches for gauge installation and removal. The refrigerated test chamber holds three cylinders at a time for sample preparation. Operating range is from ambient to  $-65^{\circ}\text{F}$  ( $-53.8^{\circ}\text{C}$ ), with stability of  $\pm 0.5^{\circ}\text{F}$  ( $\pm 0.3^{\circ}\text{C}$ ). The refrigeration system uses hermetically sealed, self-lubricating compressors in cascaded configuration to provide efficient cool-down and trouble-free long term operation.

Floor-mounted cabinet is constructed of polished stainless steel with a welded reinforced frame.

**Pressure Viscometer**—Complete apparent viscometer meeting ASTM D1092 specifications. Includes power, hydraulic and grease systems and standard accessories as supplied with the Low Temperature Pressure Viscometer but without refrigerated test chamber or stainless steel cabinet. Mounted on a sturdy base having locating feet for permanent benchtop placement.

## Specifications

Conforms to the specifications of:

ASTM D1092

Operating Range: performs apparent viscosity determinations at sixteen different shear rates

Low Temperature Pressure Viscometer:

Temperature Range: ambient to  $-65^{\circ}\text{F}$  ( $-54^{\circ}\text{C}$ )

*Optional  $-100^{\circ}\text{F}$  cooling range available on special order\**

Temperature Control Precision:  $\pm 0.5^{\circ}\text{F}$  ( $\pm 0.3^{\circ}\text{C}$ ) throughout the operating range

Test Chamber Medium: denatured alcohol

Electrical Requirements: **C** **E**

115V 60Hz

220-240V 50Hz

220-240V 60Hz

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

## Ordering Information

### Catalog No.

#### Low Temperature Pressure Viscometer

|               |                                                    |
|---------------|----------------------------------------------------|
| <b>K22690</b> | Low Temperature Pressure Viscometer, 115V 60Hz     |
| <b>K22695</b> | Low Temperature Pressure Viscometer, 220-240V 50Hz |
| <b>K22696</b> | Low Temperature Pressure Viscometer, 220-240 60Hz  |

*\*Please call or write for ordering Information on extended ( $-100^{\circ}\text{F}$ ) cooling range.*

### Pressure Viscometer

|               |                                    |
|---------------|------------------------------------|
| <b>K22600</b> | Pressure Viscometer, 115V 60Hz     |
| <b>K22615</b> | Pressure Viscometer, 220-240V 50Hz |
| <b>K22610</b> | Pressure Viscometer, 220-240V 60Hz |

### Accessories

|                    |                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------|
| <b>K22690-0-27</b> | Grease Cylinder Assembly for Low Temperature Pressure Viscometer (K22690 Series)<br>— Includes piston and caps |
| <b>K226-0-16</b>   | Grease Cylinder Assembly for Pressure Viscometer - (K22600 Series)<br>— Includes piston and caps               |
| <b>K226-0-22</b>   | Capillary Set. Nos. 1-8                                                                                        |
| <b>250-000-74F</b> | ASTM 74F Thermometer<br>Range $-67.5$ to $-62.5^{\circ}\text{F}$                                               |
| <b>250-000-74C</b> | ASTM 74C Thermometer<br>Range: $-55.4$ to $-52.6^{\circ}\text{C}$                                              |

## Included Accessories

Stainless Steel Grease Cylinder

Assemblies (3)

Thermocouples (3)

Set of Stainless Steel Capillaries (Nos. 1-8)

Interchangeable Pressure Gauges (4)

Interchangeable Pump Drive Gears, 40 and 64-tooth

Set of Wrenches (3)

## Dimensions lxwxh,in.(cm)

Low Temperature Pressure Viscometer:  $43\frac{1}{2} \times 30\frac{3}{4} \times 66\frac{1}{4}$  (110x78x168)

Net Weight: 640 lbs (290.3kg)

Pressure Viscometer:  $30 \times 12 \times 36$  (76x30x91)

Net Weight: 121 lbs (54.9kg)

## Shipping Information

Low Temperature Pressure Viscometer:

Shipping Weight: 900 lbs (408.2kg)

Dimensions: 89.8 Cu. ft.

Pressure Viscometer:

Shipping Weight: 186 lbs (84.4kg)

Dimensions: 14.8 Cu. ft.

## GREASE MOBILITY



K22680 Grease Mobility Tester

### Specifications

Conforms to the specifications of:

U.S. Steel Method; ASTM Draft Method

Minimum Temperature:  $-30^{\circ}\text{F}$  ( $-34.4^{\circ}\text{C}$ )

Control Stability:  $\pm 2^{\circ}\text{F}$  ( $\pm 1^{\circ}\text{C}$ )

### Included Accessories

Grease Cylinder (pressure viscometer) with modified No.1, 40:1 capillary

Sample Collector Turntable

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 6A

220-240V 50 or 60Hz, Single Phase, 3A

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

Cooling Chamber: 12x12x30 (30.5x30.5x76)

Refrigeration Unit: 15x12x12 (38x30x30)

Net Weight: 114 lbs (51.7kg)

### Shipping Information

Shipping Weight: 188 lbs (85.3kg)

Dimensions: 18.4 Cu. ft.

### Test Method

Determines the resistance of lubricating grease to flow under prescribed conditions. Mobility is measured in grams per second by pumping the sample through a standardized SOD pressure viscometer at controlled temperature and pressure.

### Grease Mobility Tester

- U.S. Steel Method; ASTM Draft Method
- Test temperatures as low as  $-30^{\circ}\text{F}$  ( $-34.4^{\circ}\text{C}$ )

Performs grease mobility tests at low temperatures to predict pumpability characteristics. Determines the suitability of greases for applications in centralized or bulk systems where pumps, valves or pipes are used to distribute or transfer grease. Consists of pressure viscometer, cooling bath and refrigeration system. The stainless steel pressure viscometer is fitted with a modified No.1, 40:1 ratio capillary. After the sample is loaded in the pressure viscometer, the assembly is installed in the cooling bath and allowed to reach the test temperature. Mechanically refrigerated cooling bath can attain test temperatures as low as  $-30^{\circ}\text{F}$  ( $-34.4^{\circ}\text{C}$ ) with stability of  $\pm 2^{\circ}\text{F}$  ( $\pm 1^{\circ}\text{C}$ ). With the sample at the test temperature, the flow of grease is started under the selected pressure on a nitrogen tank regulator. Flow per second is determined by collecting the grease for a specified period. Includes sample collector turntable.

### Ordering Information

#### Catalog No.

|               |                                             |
|---------------|---------------------------------------------|
| <b>K22680</b> | Grease Mobility Apparatus,<br>115V 60Hz     |
| <b>K22685</b> | Grease Mobility Apparatus,<br>220-240V 50Hz |
| <b>K22686</b> | Grease Mobility Apparatus,<br>220-240V 60Hz |

#### Accessories

|                    |                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------|
| <b>K22680-0-22</b> | Grease Cylinder with plunger and fittings                                                              |
| <b>K22680-0-16</b> | Capillary                                                                                              |
| <b>250-100-001</b> | Thermometer dial type<br>Range: $-100$ to $+100^{\circ}\text{F}$ with $2^{\circ}\text{F}$ subdivisions |

# LOW-TEMPERATURE TORQUE OF LUBRICATING GREASE

## Low-Temperature Torque of Ball Bearing Grease

### Low-Temperature Torque of Grease-Lubricated Wheel Bearings

#### Test Method

Significant for the design and specification of greases for low temperature service, the low temperature torque test measures the extent to which a grease sample retards rotation of a bearing assembly at the test temperature.

#### Low Temperature Torque Apparatus

- Digital torque indication for two samples
- Choice of test rig combinations
- Mechanically refrigerated, with standard -65°F (-54°C) operating range
- Optional cooling range to -100°F (-73°C)
- Conforms to ASTM D1478, D4693 and D4950 specifications
- Data acquisition software available

Refrigerated two unit apparatus for ASTM low temperature torque tests on lubricating greases. Includes an insulated, thermostatically controlled air chamber with test rigs, drive shafts and externally mounted gear motors. Rotates drive shafts at 1rpm while electronic load cell-strain gauge indicators measure the torque required to restrain the test rigs. Digital LED displays indicate torque for each drive unit and cold chamber temperature. On ASTM D4693 models, spindle temperature is also indicated for each drive unit. Includes drive shaft overtorque protection—when drive shaft torque exceeds a preset value, the drive motors automatically shut down to prevent breakage of shaft insulators. Standard cooling range of -65°F (-54°C) meets ASTM requirements for D1478 and D4693 test methods. Optional -100°F (-73°C) range is available for special testing requirements.

**ASTM D1478 Model for Ball Bearing Greases**—Equipped with two test cages and two 6204 ball bearings per ASTM D1478 specifications.

**ASTM D4693 Model for Automotive Wheel Bearing Greases**—Equipped with two spring loaded spindle-bearings-hub assemblies, bearing packer assembly and bearing installation and removal tools.

**Combined ASTM D1478-D4693 Model**—Equipped with one test cage and one 6204 ball bearing for ASTM D1478 testing and one spindle-bearings-hub assembly with bearing packer and tools for ASTM D4693 testing.

**Data acquisition software**—Data acquisition software facilitates running both ASTM D1478 and D4693 tests. Graph of torque versus time details starting torque, running torque and time elapsed. Includes software, data acquisition board and cable.

#### Specifications

Conforms to the specifications of:

ASTM D1478, D4693, D4950; FTM 791-334

Cooling Range:

Standard: -65°F (-54°C)

Optional: -100°F (-73°C)

Temperature Uniformity: ±1°F (±0.5°C)

Refrigeration: air cooled mechanical cascade hermetic system

Cabinet: floor-mount, polished stainless steel exterior, rides on swivel casters



K18860 Low Temperature Torque Apparatus

#### Ordering Information

| Catalog No. | Test Method               | Cooling Range | Electrical Requirements C € |
|-------------|---------------------------|---------------|-----------------------------|
| K18852      | ASTM D1478                | -65°F(-54°C)  | 220-240V 50Hz               |
| K18862      |                           |               | 220-240V 60Hz               |
| K18853      |                           | -100°F(-73°C) | 220-240V 50Hz               |
| K18863      |                           |               | 220-240V 60Hz               |
| K18850      | ASTM D4693                | -65°F(-54°C)  | 220-240V 50Hz               |
| K18860      |                           |               | 220-240V 60Hz               |
| K18851      |                           | -100°F(-73°C) | 220-240V 50Hz               |
| K18861      |                           |               | 220-240V 60Hz               |
| K18854      | Combined ASTM D1478-D4693 | -65°F(-54°C)  | 220-240V 50Hz               |
| K18864      |                           |               | 220-240V 60Hz               |
| K18855      |                           | -100°F(-73°C) | 220-240V 50Hz               |
| K18865      |                           |               | 220-240V 60Hz               |

#### Accessories

|             |                                                                                |   |
|-------------|--------------------------------------------------------------------------------|---|
| K18871      | Data Acquisition Package.                                                      | 1 |
| 289-001-006 | Test Bearing, 6204, for ASTM D1478                                             | 1 |
| 308-230-009 | Chart Recorder, 115V/230V                                                      | 1 |
| K18860-0-24 | Inboard Test Bearing, for ASTM D4693, LM-67010-LM-67048 tapered roller bearing | 1 |
| K18860-0-16 | Outboard Test Bearing for ASTM D4693, LM-11910-LM-11949 tapered roller bearing | 1 |

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

48½x34x45½ (123x86x116)

Net Weight: 600 lbs (272.2kg)

#### Shipping Information

Shipping Weight: 697 lbs (316.1kg)

Dimensions: 6.4 Cu. ft.

# LEAKAGE TENDENCIES OF AUTOMOTIVE WHEEL BEARING GREASES

## Test Method

Evaluates the tendency of automotive wheel bearing grease to separate oil and/or grease under prescribed laboratory conditions. The test is performed at elevated temperature in a modified automotive spindle-hub assembly rotated at 660rpm. Any leakage of oil or grease during the test period is collected and weighed. See also “ASTM D4290 Accelerated Leakage Tendencies Method” (Page 161).

## Leakage Tendencies Tester

- Conforms to ASTM D1263 and FTM 791-3454 specifications
- Microprocessor programmable high accuracy temperature control

Consists of a modified front wheel hub and spindle assembly with drive motor and constant temperature air cabinet. Rotates hub at 660rpm while maintaining spindle temperature at a constant 220°F (104°C) or other specified temperature. Oil that has separated from the sample grease during the test period is collected in the hub cap and in a leakage collector that installs on the spindle. The hub is rotated by a durable ½hp motor through a V-belt drive. 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 format. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.* Cabinet is insulated on all sides and has a hinged cover for easy access to the hub-spindle assembly. Thermometer ports in the spindle and the cabinet allow for precise setting and monitoring of test temperature. Housed in a heavy-gauge steel exterior with polyurethane enamel finish.

## Specifications

Conforms to the specifications of:  
ASTM D1263; FTM 791-3454  
Maximum Temperature: 250°F (121°C)  
Electrical Requirements: **CE**  
115V 60Hz, Single Phase, 13.0A  
220-240V 50Hz, Single Phase, 7A  
220-240V 60Hz, Single Phase, 7A

## Included Accessories

Large (Inner) Bearing (1)  
Small (Outer) Bearing (1)

## Dimensions

l x w x h, in. (cm)  
20½ x 18 x 15 (52 x 46 x 38)  
Net Weight: 95 lbs (43.1kg)

## Shipping Information

Shipping Weight: 145 lbs (65.8kg)  
Dimensions: 8.3 Cu. ft.

*High temperature models to 205°C available. Contact your Koehler representative for information.*

| Ordering Information             |                                            |           |
|----------------------------------|--------------------------------------------|-----------|
| Catalog No.                      |                                            | Order Qty |
| <b>Leakage Tendencies Tester</b> |                                            |           |
| K18700                           | Leakage Tendencies Tester, 115V 60Hz       | 1         |
| K18795                           | Leakage Tendencies Tester, 220-240V 50Hz   |           |
| K18790                           | Leakage Tendencies Tester, 220-240V 60Hz   |           |
| <b>Accessories</b>               |                                            |           |
| K18723                           | Torque Wrench                              | 1         |
| 250-000-07F                      | ASTM 7F Thermometer<br>Range: 30 to +580°F | 2         |
| 250-000-07C                      | ASTM 7C Thermometer<br>Range: -2 to +300°C |           |
| 289-004-004                      | Large (Inner) Bearing                      |           |
| 289-004-003                      | Small (Outer) Bearing                      |           |

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

# LIFE PERFORMANCE AND ACCELERATED LEAKAGE TENDENCIES

## Life Performance of Automotive Wheel Bearing Grease Leakage Tendencies of Automotive Wheel Bearing Grease Under Accelerated Conditions

### Test Method

Evaluates the high temperature stability of automotive wheel bearing greases in a modified automotive front wheel hub-spindle-bearings assembly. The ASTM D3527 Life Performance test employs severe conditions—25 lbf (111N) thrust load, 1000rpm, 160°C spindle temperature—to induce grease deterioration and failure. The test continues in a 20/4 hour on/off cycle until grease breakdown causes measured drive motor torque to increase past an established end point. The number of hours to failure is the test result. The ASTM D4290 Accelerated Leakage Tendencies procedure employs similar test conditions for a 20 hour period, after which leakage of grease and oil is measured and the bearings are washed and examined for deposits of gum and varnish.

### High Temperature Wheel Bearing Grease Tester

- Conforms to ASTM D3527, D4290 and D4950 specifications
- Fully automatic operation
- Digital monitoring of all test functions

Performs life performance and accelerated leakage tendencies tests on lubricating greases in accordance with ASTM test specifications. Consists of a modified front wheel hub-spindle-bearings assembly housed in a constant temperature oven and coupled to a 1/2hp variable-speed drive motor. Controls test functions automatically and provides continuous digital display of motor torque, rpm, chamber temperature, spindle temperature, time cycle and elapsed time. Test parameters outside of ASTM specifications can be selected by the operator for in-house testing. Automatically terminates test and displays elapsed on-cycle hours when grease deterioration causes drive motor torque to increase to the calibrated end point. A built-in thirty second time delay circuit prevents erroneous test terminations due to momentary surges in motor torque at the beginning of the on-cycle. Insulated constant temperature oven is equipped with a 1200W heater and balanced 1/20 hp circulation fan for efficient heat distribution. Sliding access doors and a movable platform that swings the drive motor out of the way provide easy access to the spindle assembly. Modified steel spindle and hub assembly conforms to all critical 1971 Chevy II dimensions and is fitted with thermocouple, bearing thrust loading device and anodized aluminum grease collector. All controls and monitors are housed in a separate cabinet.

#### Ordering Information

| Catalog No.                        |                                                               | Order Qty |
|------------------------------------|---------------------------------------------------------------|-----------|
| <b>Wheel Bearing Grease Tester</b> |                                                               | <b>1</b>  |
| <b>K18500</b>                      | High Temperature Wheel Bearing Grease Tester, 115V 60Hz       |           |
| <b>K18595</b>                      | High Temperature Wheel Bearing Grease Tester, 220-240V 50Hz   |           |
| <b>K18590</b>                      | High Temperature Wheel Bearing Grease Tester, 220-240V 60Hz   |           |
| <b>Accessories</b>                 |                                                               |           |
| <b>250-000-42C</b>                 | ASTM 42C Thermometer Range: 95 to 255°C                       | <b>1</b>  |
| <b>289-004-001</b>                 | Inboard Bearing Set<br>Includes LM67048 Cone and LM67010 Cup  |           |
| <b>289-004-002</b>                 | Outboard Bearing Set<br>Includes LM11949 Cone and LM11910 Cup |           |



### Specifications

Conforms to the specifications of:

ASTM D3527, D4290, D4950

Digital controls and displays:

Timer: on/off cycle and real time

Chamber Temperature: °C

Spindle Temperature: °C

Motor rpm: 0-1725rpm

Motor Torque: current draw

Elapsed Time: 9999.9 hr.

Maximum Temperature: 177°C (350°F)

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 13A

220-240V 50Hz, Single Phase, 7A

220-240V 60Hz, Single Phase, 7A

### Included Accessories

Thermocouples (2)

Thermometer holder

Bearings (1set)

Grease Packer Assembly

Bearing Installation/Removal Tools:

bearing installer, small and large

bearing cup removers, bearing cup installer,

bearing puller and spindle wrenches (pins)

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

Test Unit: 16x20x15 1/4 (41x51x40)

Control Unit: 16x14x16 (41x36x41)

Net Weight: 145 lbs (65.8kg)

### Shipping Information

Shipping Weight: 230 lbs (104.3kg)

Dimensions: 14.8 Cu. ft.

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

# WATER WASHOUT CHARACTERISTICS OF LUBRICATING GREASES

## Test Method

A grease sample is packed in a ball bearing and subjected to a steady water stream under controlled test conditions. The percentage of grease washed out in a one hour period is determined by weight.

## Water Washout Tester

- Conforms to ASTM D1264, D4950 and related specifications

Rotates a lubricated ASTM ball bearing at 600rpm in a modified bearing/housing assembly while impinging the bearing with a jet of water at the specified flow rate and temperature. The tared bearing and bearing shields are weighed before installation in the bearing housing and again after testing and drying to determine the amount of sample loss. Consists of reservoir, bearing housing, circulation system and drive motor. Reservoir is equipped with cartridge heater, thermoregulator and thermometer port for accurate temperature control at 100°F and 175°F (38°C and 79°C) per ASTM specifications. Circulation system includes constant velocity carbon bearing gear pump, valves and flowmeter directing a controlled water flow to a capillary (1mm) spray nozzle aimed at the bearing housing. Rugged ½hp drive motor rotates test bearing at 600rpm while driving the circulation pump. A two-pulley system permits independent pump operation to circulate water while heating it to test temperature. Mounted on a finished steel base with locating feet for permanent benchtop placement.

## Specifications

Conforms to the specifications of:

ASTM D1264, D4950; IP 215; FTM 791-3252

Drive Motor: ½hp 1725rpm

Temperature Control: ±1°F (±0.5°C) sensitivity

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 10.1A

220-240V 50Hz, Single Phase, 5.1A

220-240V 60Hz, Single Phase, 5.1A

## Included Accessories

Ball Bearing (2)

Drive Train Guard

Acrylic Reservoir Cover

Outer Bearing Shield

Inner Bearing Shield

Test Bearing

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

18x12x18¾ (46x30x48)

Net Weight: 67 lbs (30.4kg)

## Shipping Information

Shipping Weight: 102 lbs (46.3kg)

Dimensions: 6.7 Cu. ft.

| Ordering Information        |                                            |           |
|-----------------------------|--------------------------------------------|-----------|
| Catalog No.                 |                                            | Order Qty |
| <b>Water Washout Tester</b> |                                            | <b>1</b>  |
| <b>K19200</b>               | Water Washout Tester,<br>115V 60Hz         |           |
| <b>K19295</b>               | Water Washout Tester,<br>220-240V 50Hz     |           |
| <b>K19290</b>               | Water Washout Tester,<br>220-240V 60Hz     |           |
| <b>Accessories</b>          |                                            |           |
| <b>289-001-006</b>          | Test Bearing                               | <b>3</b>  |
| <b>K192-1-4</b>             | Outer Bearing Shield                       | <b>3</b>  |
| <b>K192-1-6</b>             | Inner Bearing Shield                       | <b>3</b>  |
| <b>250-000-15F</b>          | ASTM 15F Thermometer<br>Range: 30 to 180°F | <b>1</b>  |
| <b>250-000-15C</b>          | ASTM 15C Thermometer<br>Range: -2 to +80°C |           |

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

# RESISTANCE OF LUBRICATING GREASE TO WATER SPRAY

## Test Method

Evaluates the ability of a lubricating grease to adhere to a metal surface when subjected to a direct water spray under controlled conditions. The percentage of grease sprayed off a stainless steel test panel after a specified period is determined by weight.

## Water Spray Apparatus

- Conforms to ASTM D4049 specifications
- Improved spray chamber design

Complete Water Spray Apparatus meeting ASTM specifications, including spray chamber, delivery system and constant temperature reservoir. Sprays water at the specified rate and temperature on a test panel coated with sample grease. To test for water spray resistance, fill reservoir with 8L of tap water and set thermostat at test temperature. Circulate the water through the system to attain temperature equilibrium and insert the coated test panel in the spray chamber. Adjust water spray to 40psi (276kPa) and continue for 5 minutes. Water spray system includes ½hp positive displacement pump; spray nozzle with snubber fitting; 0-60psi pressure gauge; bypass valve; shut-off and drain valves; and flexible high pressure water lines. Hinged acrylic spray chamber cover is recessed into the chamber housing to insure watertight operation. Two thermometer wells permit separate monitoring of reservoir and water spray temperatures. Standardized grease application fixture coats test panel with the required thickness of sample grease. Uses tap water; does not require water hook-up.



K18200 Water Spray Off Tester

## Ordering Information

| Catalog No.                  |                                            | Order Qty |
|------------------------------|--------------------------------------------|-----------|
| <b>Water Spray Apparatus</b> |                                            | 1         |
| <b>K18200</b>                | Water Spray Apparatus,<br>115V 60Hz        |           |
| <b>K18295</b>                | Water Spray Apparatus,<br>220-240V 50Hz    |           |
| <b>K18290</b>                | Water Spray Apparatus,<br>220-240V 60Hz    |           |
| <b>Accessories</b>           |                                            |           |
| <b>250-000-37C</b>           | ASTM 37C Thermometer<br>Range: -2 to +52°C | 1         |
| <b>K18210</b>                | Stainless Steel Test Panel                 |           |
| <b>K18220</b>                | Grease Application Fixture                 |           |

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

## Specifications

Conforms to the specifications of:  
ASTM D4049

Circulation System:

Drive Motor: ½hp, 1725rpm

Pump: rotary gear positive displacement type

Pressure Gauge: 0-60psi

Temperature Control Stability: ±1°F (±0.5°C)

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 13.3A

220-240V 50Hz, Single Phase, 6.8A

220-240V 60Hz, Single Phase, 6.8A

## Included Accessories

Stainless Steel Test Panel

Grease Application Fixture

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

29x18x33½ (74x46x85)

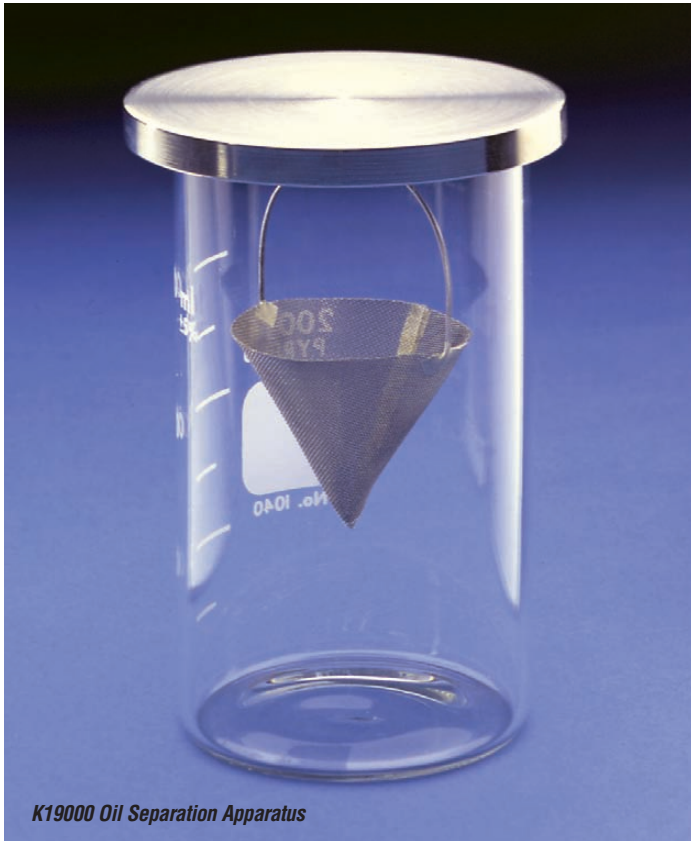
Net Weight: 110 lbs (49.9kg)

## Shipping Information

Shipping Weight: 180 lbs (81.6kg)

Dimensions: 14.2 Cu. ft.

## OIL SEPARATION FROM LUBRICATING GREASE



### Test Method

Determines the tendency of oil and lubricating grease to separate at elevated temperature.

### Oil Separation Apparatus

- Conforms to ASTM D6184 and FTM 791-321 specifications

Consists of 60 mesh nickel gauze cone with wire handle, tall form 200mL beaker and cover with hook. Place sample in wire gauze cone and determine weight loss after heating at test temperature for specified time period. Withstands test temperatures of up to 900°F (482°C).

### Shipping Information

Net Weight: ½ lb (0.2kg)

Shipping Weight: 1 lb (0.45kg)

### Included Accessories

Beaker, 200mL

Cover and Hook Assembly

Cone Assembly

### Ordering Information

#### Catalog No.

K19000

Oil Separation Apparatus

#### Accessories

332-002-008

Beaker, 200mL

K190-0-1C

Cover and Hook Assembly

K190-0-5

Cone Assembly

## OIL SEPARATION ON STORAGE OF GREASE

### Test Method

Provides a measure of the stability of lubricating grease towards oil separation during storage.

### Oil Separation Apparatus

- Conforms to IP 121 and DIN 51817 specifications

Consists of stainless steel separation cup with cone of 240 mesh woven wire cloth, 100g metal weight and oil cup. Oil separation is determined by placing the sample on the wire mesh cone and loading it with the 100g metal weight. The percentage of sample weight lost is calculated after a storage period of 42 hours.

### Shipping Information

Net Weight: ¾ lb (.34kg)

Shipping Weight: 1 lb (.45kg)

### Ordering Information

#### Catalog No.

K19050

Oil Separation Apparatus



# OIL SEPARATION FROM LUBRICATING GREASE DURING STORAGE

## Test Method

Determines the tendency of lubricating grease to separate oil during storage in a 35 lb pail. The sample is placed on a sieve inside a special test cell and subjected to 0.25psi (1.72kPa) air pressure at constant temperature. Any oil that bleeds from the grease during a 24 hour period is collected in the cell and weighed.

## Oil Separation Apparatus

- Conforms to ASTM D1742 and related specifications
- Four sample capability
- Controls temperature and air pressure

Consists of pressure bleeding test cells with air pressure regulation system and constant temperature air cabinet.

**Pressure Bleeding Test Cell**—Type A test cell includes cup assembly with funnel and positioning seat for beaker; cover with air inlet fitting; and 200-mesh stainless steel sieve strainer with brass support ring. Bayonet type connection and o-ring seal provide tight closure between cover and base. Cup, funnel and base are constructed of chrome plated spun copper. Order test beaker separately.

**Constant Temperature Air Cabinet**—Provides a constant temperature environment and regulated air pressure per ASTM specifications. Consists of an insulated airtight cabinet with pressure system to accommodate four pressure bleeding test cells. Equipped with electric heater, solid state controller, cooling coil and circulating fan for efficient temperature control at 77°F (25°C). Pressure system includes air inlet pressure regulator with gauge, cartesian manostat, manifold with control valves for four test cells, output gauge, manostat and gas washing bottle. Built-in pressure relief valve protects against pressure surge. Cabinet is constructed of double-wall stainless steel with full insulation. Order thermometer and pressure bleeding test cell separately.

## Specifications

Conforms to the specifications of:

ASTM D1742, FTM 791-322

Capacity: four samples

Controller Sensitivity  $\pm 1^\circ\text{F}$  ( $\pm 0.5^\circ\text{C}$ )

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 3A

220-240V 50/60Hz, Single Phase, 1.5A

## Dimensions

Interior: 19"x19"x21" (50x50x55)

Overall: 47"x23"x31" (119x60x79)

\*includes external pressure system components

Net Weight: 121 lbs (54.9kg)

## Shipping Information

Shipping Weight: 224 lbs (101.6kg)

Dimensions: 27.8 Cu. ft.



K18910  
Constant Temperature  
Air Cabinet with K18900 Cell

## Ordering Information

| Catalog No. |                                                    | Order Qty |
|-------------|----------------------------------------------------|-----------|
| K18910      | Constant Temperature Air Cabinet, 115V 60Hz        | 1         |
| K18919      | Constant Temperature Air Cabinet, 220-240V 50/60Hz | 1         |
| K18900      | Pressure Bleeding Test Cell                        | 4         |

## Accessories

|             |                                                           |   |
|-------------|-----------------------------------------------------------|---|
| 332-002-009 | Test Beaker, 20mL                                         | 4 |
| 250-000-57F | ASTM 57F Thermometer. Range: $-4$ to $+122^\circ\text{F}$ | 1 |
| 250-000-57C | ASTM 57C Thermometer. Range: $-20$ to $+50^\circ\text{C}$ | 1 |

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



K18900 Pressure Bleeding Test Cell

## ESTIMATION OF DELETERIOUS PARTICLES IN LUBRICATING GREASE



**K19300 Deleterious Particles Determination Apparatus**

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

### Test Method

Detects and estimates deleterious particle contamination in lubricating greases and other semi-solids and heavy liquids. Grease fillers can be tested for abrasive contaminants by first mixing them into petrolatum or grease known to be free of deleterious particles.

### Deleterious Particles Determination Apparatus

- Conforms to ASTM D1404 specifications

Complete apparatus per Figure 1 and 2 of ASTM D1404. Rotates plastic plate 30° against stationary plate while applying 200psi pressure. Includes body, test plate holders, loading screw, calibrated spring with scale for applying test load and removable cap assembly with milled slot and handle for rotating test plates. Constructed of stainless steel. Order plastic test plates separately.

#### Ordering Information

| Catalog No.        |                                                                                              | Order Qty |
|--------------------|----------------------------------------------------------------------------------------------|-----------|
| K19300             | Deleterious Particles Determination Apparatus                                                | 1         |
| <b>Accessories</b> |                                                                                              |           |
| K19310             | Plastic Test Plate. For use in Model K19300. Highly polished. Two (2) required for each test | 20        |

## OIL AND GREASE IN WATER AND WASTEWATER BY INFRARED (IR)

### Test Method

For the determination of oil and grease and nonpolar material in water and wastewater by an infrared (IR) determination of dimer/trimer of chlorotrifluoroethylene (S-316) extractable substances from an acidified sample. Included in this estimation of oil and grease are any other compounds soluble in the solvent.

### Infrared Analyzer

- Analyze produced water on offshore oil rigs
- Monitor effluents from refineries or wastewater treatment and industrial plants
- Measurement of fats, oil and grease (FOG) discharges
- Determine efficiency of oil/water separation systems
- Conduct soil studies at remediation sites or around underground storage tanks
- Measurement of residual oil on pre-cleaned metal components
- Determine purity level of reclaimed solvents or virtually any on-site testing of water and soil requiring measurement of TOG and/or TPH concentration levels

Recommended for measuring total oil and grease (TOG) and total petroleum hydrocarbon (TPH) levels in water and soils, as well as fats, oil and grease (FOG) in water using the traditional EPA methods 413.2 and 418.1 with Freon-113 or ASTM Method D7066-04 with S-316, also compatible with other infrared transparent solvents such as hydrocarbon-free spectroscopic grade perchloroethylene, AK-225 or other infrared transparent solvent as the extracting solvent. The IR analyzer is ideal for on-site analysis to meet new European regulations. Since there is no evaporation step in the analysis the light end volatile components are retained for measurement.

**Dimensions** wxdxh,in.(cm)  
6.5 x 6.5 x 5 (16.5x16.5x12.7)  
Net Weight: 4.5 lb (2.0 kg)

#### Included Accessories

Power Supply  
Instruction Manual

### Specifications

Conforms to the specifications of:

ASTM D7066; EPA Methods 413.2 and 418.1

Type: Fixed filter infrared filterometer

Display: 4 digit, 7-segment red LED, 5/8 in. character height

Measurement Range:

For Water: 2 – 1000 ppm (using a 10:1 extraction ratio)

For Soil: 3 – 5000 ppm (using a 1:2 extraction ratio)

Usable Solvents for Extraction Process:

Freon, perchloroethylene, S-316, AK-225 or other infrared transparent solvent

Analysis Time: 10-15 minutes, including extraction process

Operating Temperature Range: 40°F (4°C) to 110°F (45°C)

User Selected Calibration: Zero balance adjustment. Up to 20 point curve fitting calibration

Repeatability: ± 1ppm

Electrical Requirements: **CE**

Voltage – 12VDC, +2% max.

Power – 7.5 watts max., 5 watts typical

Input – Switchcraft 760 plug or equivalent, center positive

Suggested Power Sources:

Wall Supply; AC/DC converter type (supplied as standard)

12 volt auto battery adapter connector (optional)

Portable 12 volt battery pack (optional)

#### Ordering Information

| Catalog No.        |                                     |
|--------------------|-------------------------------------|
| K25552             | Infrared Analyzer, 12 VDC           |
| <b>Accessories</b> |                                     |
| K25551-1           | 10mm Quartz Cuvette Cells, Set of 4 |
| K25551-2           | Car Adapter Cable                   |
| K25551-3           | IR Sample Plate, pk 5               |
| K25501             | External 12V Battery Pack           |
| K25502             | Carrying Case                       |
| K25507             | Dust Cover                          |
| K25509             | Serial Printer                      |

## LINCOLN VENTMETER

### Test Method

The K95400 Lincoln Ventmeter evaluates the ventability of grease, which is useful in determining by consistency what type of greases can be used in a centralized automatic lubrication system. Furthermore, the size or diameter of the supply line in an automatic lubrication system can be accurately determined for a particular type of grease. Pressurizing lubricant grease in 25 feet coil tube to 1800 psi with a grease gun, opening the venting valve and reading the pressure on the gage after 30 seconds will provide the supply line size and maximum supply line information for the tested grease by referring the supplied grease ventmeter reading to supply line reference charts after measuring of the grease ventability.

### Lincoln Ventmeter

Lincoln Ventmeter, as a simulation device of a centralized lubrication system, consists of 25 feet coil tube with valve 1 at the pressure gage end and valve 2 at the end where a level grease gun is connected. Build up pressure with the grease gun attached when valve 1 closed. Open instantly valve 2 when pressure gage reading stabilizes at 1800 psi. Read the pressure gage after venting for 30 seconds. Repeat test three times and take an average reading to determine supply line pipe size and maximum length of supply line.

**Test under Different Temperature** – The test could be done under any temperature as application required. The standard test recommend three temperature: 0°F, 30°F and 75°F. When testing under temperature other than the ambient, the ventmeter filled with grease should be put in temperature chamber for at least 4 hours. The same test steps should be used for different temperature conditions.

### Specifications

Model:

K95400

Electrical Requirements:

None

**Dimensions** l x w x h

Overall: 15"x6"x5"

### Shipping Information

Shipping Weight: 12 lbs

Dimensions: 16"x10"x6"



K95400 Lincoln Ventmeter

### Ordering Information

| Catalog No.        |                   | Order Qty |
|--------------------|-------------------|-----------|
| K95400             | Lincoln Ventmeter | 1         |
| <b>Accessories</b> |                   |           |
| K95400-1           | Cleaning Kit      | 1         |

## 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.

### **Evaporation Loss of Lubricating Greases and Oils .....Page 148**

ASTM D972, D2878, IP 183, FTM 791-351

Laboratory Balance • m-Terphenyl • Air Supply

### **Evaporation Loss of Lubricating Grease Over Wide Temperature Range .....Page 149**

ASTM D2595, D2878

Laboratory Balance • m-Terphenyl • Air Supply • Cleaning Solvent

### **Dropping Point of Lubricating Greases .....Page 150**

ASTM D566, D4950, IP 132, ISO 2176, DIN 51801, FTM 791-1421

Spatula • Mineral Spirits

### **Dropping Point of Lubricating Grease Over Wide Temperature Range .....Page 151**

ASTM D2265, D4950

Mineral Spirits

### **Oxidation Stability of Lubricating Greases by the Oxygen Bomb Method .....Pages 152-153**

ASTM D942, IP 142, DIN 51808, FTM 791-3453

Oxygen • Forceps • n-Heptane • Oven • Sulfuric Acid  
Distilled Water • Chromic Acid • Soap Powder

### **Corrosion Preventive Properties of Lubricating Greases .....Page 154**

ASTM D1743

Syringe, 100mL • Stoddard Solvent • Laboratory Oven  
Isopropanol • Distilled Water • Ammonium Hydroxide

### **Copper Corrosion From Lubricating Grease by the Copper Strip Tarnish Test .....Page 155**

ASTM D4048, FTM 791-5309

Steel Forceps • Cotton Wool • Oven  
Isooctane • Acetone

### **Roll Stability of Lubricating Grease .....Page 156**

ASTM D1831, MIL-G-10924SA

Spatula

### **Apparent Viscosity of Lubricating Greases .....Page 157**

ASTM D1092

Hydraulic Oil • Nitrogen • Flexible Tubing • Alcohol  
Balance • Kerosene

### **Grease Mobility .....Page 158**

U.S. Steel Method

Nitrogen • Laboratory Balance

### **Low Temperature Torque of Ball Bearing Greases .....Page 159**

ASTM D1478, D4693, D4950, FTM 791-334

Stoddard Solvent • Oven • n-Heptane  
Spatula • Desiccant

### **Low Temperature Torque of Grease-Lubricated Wheel Bearings .....Page 159**

ASTM D4693, D4950

Laboratory Oven • 1,1,1-Trichloroethane • Mercury  
Ethylene Glycol • Ultrasonic Cleaner

### **Leakage Tendencies of Automotive Wheel Bearing Greases .....Page 160**

ASTM D1263, FTM 791-3454

Laboratory Balance • Spatula • n-Heptane

### **Life Performance and Accelerated Leakage Tendencies Tests for Automotive Wheel Bearing Greases .....Page 161**

ASTM D3527, D4290, D4950

Laboratory Balance • SAE Low Engine Oil • n-Heptane  
Steel Wool • Penetone ECS • Oven • Stoddard Solvent • Isopropanol

### **Water Washout Characteristics of Lubricating Greases .....Page 162**

ASTM D1264, D4950, IP 215, FTM 791-3252

Distilled Water • Stoddard Solvent • n-Heptane

### **Resistance of Lubricating Grease to Water Spray .....Page 163**

ASTM D4049

Stoddard Solvent • n-Heptane

### **Oil Separation From Lubricating Grease .....Page 164**

ASTM D6184; FTM 791-321

Laboratory Oven • Laboratory Balance

### **Oil Separation On Storage of Grease .....Page 164**

IP 121

Laboratory Oven • Laboratory Balance

### **Oil Separation From Lubricating Grease During Storage .....Page 165**

ASTM D1742, FTM 791-322

Air Supply • Mineral Spirits

# BITUMENS AND WAXES

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# DUCTILITY AND ELASTIC RECOVERY OF BITUMINOUS MATERIALS



**K80060 Constant Temperature Ductility Machine with Circulator**

## Included Accessories

### Standard Model:

Standard Mold (3)  
Base Plate

### Constant Temperature Model:

Circulation Bath  
Remote Temp. Probe, 10 ft. length  
Connection Tubing  
Standard Mold (3)  
Base Plate  
Lexan Cover

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

### Standard Model:

86½ x 19 x 16 (219.1 x 48.3 x 40.6)  
Net Weight: 200 lbs (91.7kg)

### Circulation Bath:

15½ x 8½ x 22½ (219.1 x 48.3 x 40.6)  
Net Weight: 50 lbs (22.7 kg)

### Constant Temperature Model:

86½ x 19 x 16 (219.1 x 48.3 x 40.6)  
Net Weight: 217 lbs (98.5 kg)

## Electrical Requirements ☺☺

115V 60Hz  
220-240V 50Hz  
220-240V 60Hz

## Shipping Information

### Standard Model:

Shipping Weight: 350 lbs (159kg)  
Dimensions: 92¾ x 25¼ x 23¼" (235.6 x 64.1 x 59.1cm)

### Constant Temperature Model:

Shipping Weight: 368 lbs (167kg)  
Dimensions: 92¾ x 25¼ x 23¼" (235.6 x 64.1 x 59.1cm)

### Circulation Bath:

Shipping Weight: 74 lbs (34kg)  
Dimensions: 22 x 10½ x 26½" (55.9 x 26.7 x 67.3 cm)

*For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 180 through 187.*

## Test Method

Determines the ductility of a bituminous material by measuring the distance in which a sample will elongate before breaking when two ends of a briquet specimen of the test material are pulled apart at a specified speed and temperature. Elastic Recovery is determined by pulling the briquet specimen to a specified distance at a specified speed and temperature. The briquet is then cut and the distance in which it takes for the two halves to reconnect is used to determine the elastic recovery of the test sample.

## Semi-Automatic Ductility Testing Machine

- Conforms to ASTM D113, D6084 and related specifications
- Standard and Constant Temperature Models available
- Capable of testing up to 3 samples simultaneously
- 6" LCD Touch Screen Control Panel
- Pre-programmed with Ductility, Recovery, and Custom test methods
- Maximum travel length of 150 cm
- Variable traction speed from 0.25 to 7.0 cm/min
- Constant Temperature model equipped with Lexan Cover for enhanced temperature stability

Semi-Automatic Ductility Testing Machine designed explicitly for testing the ductility and elastic recovery of bituminous materials. Features a 6" LCD touch screen control panel. This integrated touch screen allows the user to choose between the ductility or recovery test methods. The custom menu allows for the input of desired speed and time parameters. During testing, the distance traveled by the specimen is displayed and a simple touch of the screen can record the distance traveled upon breakage of the briquet. A motor jogging feature permits locking of the sample carriage without additional movement after briquet sample is loaded into the machine.

## Specifications

Conforms to the specifications of:

ASTM D113, D5892, D6084, P226; IP 32, 516; DIN 52013, EN 13398; NF T 66-006; AASHTO T 51, T 301; JIS K2207; ANS A37.11; Federal Specification SS-R-406C; USDA Method 5 (BUL 12-16)

Capacity: 3 molds with samples

Maximum Travel Length: 150 cm

Standard Traction Speed: 5 cm/min

Variable Traction Speed: 0.25 to 7.0 cm/min

Timer: 1-999 min

## Ordering Information

### Catalog No.

|               |                                                                              |
|---------------|------------------------------------------------------------------------------|
| <b>K80050</b> | Semi-Automatic Standard Ductility Testing Machine, 115V/220-240V 50/60Hz     |
| <b>K80060</b> | Semi-Automatic Constant Temperature Ductility Testing Machine, 115V 60Hz     |
| <b>K80068</b> | Semi-Automatic Constant Temperature Ductility Testing Machine, 220-240V 60Hz |
| <b>K80069</b> | Semi-Automatic Constant Temperature Ductility Testing Machine, 220-240V 50Hz |

## Accessories

|                    |                                         |
|--------------------|-----------------------------------------|
| <b>K80012</b>      | Standard Mold                           |
| <b>K80041</b>      | Recovery Mold                           |
| <b>K80013</b>      | Base Plate                              |
| <b>250-000-63F</b> | ASTM 63F Thermometer, Range: 18 to 89°F |
| <b>250-000-63C</b> | ASTM 63C Thermometer, Range: -8 to 32°C |
| <b>K80050-SFW</b>  | Semi-Automatic Ductility Software       |

# AUTOMATIC SOFTENING POINT OF BITUMEN (RING AND BALL APPARATUS)

## Test Method

Determines the Softening Point of Bitumen in the range from 30 to 157°C (86 to 315°F) using the ring and ball apparatus immersed in distilled water (30 to 80°C), USP glycerine (above 80 to 157°C), or ethylene glycol (30 to 110°C).

## Automatic Softening Point Apparatus

- Conforms to ASTM D36 and related test specifications
- Optical detectors for automatic measurement of softening point
- Data Storage: 200 Results
- Quick access to calibration parameters
- Auto diagnostic
- Four programmable preset test methods available
- Controllable heating rate and stirring speeds
- Preheating cycle
- Cooling by fan at the end of the test
- Waterproof heating element

## Specifications

Conforms to the specifications of:

ASTM D36; AFNOR T66-008; EN 1427; ISO 4625; NF EN 1427; IP 58; DIN 52011

## Included Accessories

Printer  
Glass Beaker (2)  
Shouldered Rings (10)  
Load Balls (10)  
Craddle  
Pt 100 Probe  
Detection Cable  
Stirrer  
RS232C Output

## Electrical Requirements

115V 60Hz  
230V 50Hz



*K87800 Auto Softening Point Apparatus*

## Dimensions wxdxh,in.(cm)

Adapter: 10¼x21x20 (26x53.5x50)

## Shipping Information

Shipping Weight: 44 lbs (20 kg)

## Ordering Information

| Catalog No.   |                                                |
|---------------|------------------------------------------------|
| <b>K87800</b> | Automatic Softening Point Apparatus, 115V 60Hz |
| <b>K87890</b> | Automatic Softening Point Apparatus, 230V 50Hz |

## Accessories

|                  |                              |
|------------------|------------------------------|
| <b>K87800-1</b>  | Glass Beaker                 |
| <b>K87800-2</b>  | Straight Rings, Pack of 10   |
| <b>K87800-3</b>  | Shouldered Rings, Pack of 10 |
| <b>K87800-4</b>  | Conical Rings, Pack of 10    |
| <b>K87800-5</b>  | Detection Lamp               |
| <b>K87800-6</b>  | Ring & Ball Cradle           |
| <b>K87800-7</b>  | PT 100 Probe                 |
| <b>K87800-8</b>  | Heating Element, 1000W       |
| <b>K87800-9</b>  | Roll of Printer Paper        |
| <b>K87800-10</b> | Load Ball, Pack of 10        |

## SOFTENING POINT OF BITUMEN (RING-AND-BALL APPARATUS)

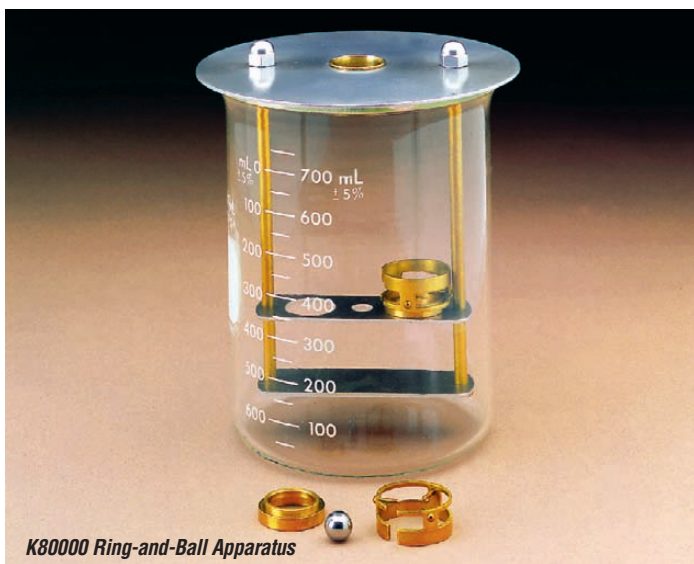
### Test Method

The sample is cast in shouldered rings and heated at a controlled rate under the weight of a steel ball. The softening point is the temperature at which the bitumen disks soften and sag downward a specified distance.

### Softening Point Apparatus

- Conforms to ASTM D36 and related specifications

Consists of 800mL beaker, 2 standard balls, shouldered rings, ball centering guides, ring holder, bottom plate and beaker cover with support rods. Order thermometer and heater separately.



### Ordering Information

| Catalog No.        |                                                                                                                                                                                                                                                 | Order Qty |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| K80000             | Softening Point Apparatus                                                                                                                                                                                                                       | 1         |
| <b>Accessories</b> |                                                                                                                                                                                                                                                 |           |
| K42000             | Powertrol Heater<br>1000W heater with variable stepless control and porcelain refractory top plate with positioning well for beaker. Enclosed in a stainless steel housing with cooling vents, Shipping Weight: 8 lbs, 14 oz (3.6kg). 115V 60Hz |           |
| K42090             | Powertrol Heater, 220-240V 50/60Hz                                                                                                                                                                                                              | 1         |
| 250-000-15F        | ASTM 15F Thermometer<br>Range: 30 to 180°F                                                                                                                                                                                                      | 1         |
| 250-000-15C        | ASTM 15C Thermometer<br>Range: -2 to +80°C                                                                                                                                                                                                      | 1         |
| 250-000-16F        | ASTM 16F Thermometer<br>Range: 85 to 392°F                                                                                                                                                                                                      |           |
| 250-000-16C        | ASTM 16C Thermometer<br>Range: 30 to 200°C                                                                                                                                                                                                      |           |
| K80001             | Ring. Brass, shouldered ring conforming to ASTM specifications. Pack of 10                                                                                                                                                                      |           |
| K80002             | Ball. Hardened steel, conforming to ASTM specifications. Pack of 10                                                                                                                                                                             |           |
| K80003             | Ball-Centering Guide                                                                                                                                                                                                                            |           |

### Specifications

Conforms to the specifications of:  
ASTM D36, E28; AASHTO T53;  
IP 58, 198; NF T 66-008

### Shipping Information

Shipping Weight: 4 lbs (1.8kg)

## BREAKING POINT OF BITUMEN, FRAASS METHOD

### Test Method

Determines the breaking point of solid and semi-solid bitumens. A thin steel plaque is coated with the sample and flexed in a bending apparatus at descending temperatures until cracks appear in the sample coating.

### Breaking Point Apparatus

- Conforms to IP 80 specifications

Consists of two concentric borosilicate glass tubes with movable steel plate holders. A cone-and-peg mechanism moves the inner tube up and down relative to the outer tube, which varies the distance between the plate holders, causing the stainless steel test plate to be flexed. The inner tube accommodates a test thermometer. Supplied with 12 spring stainless steel plaques.

### Ordering Information

| Catalog No. |                                                                                 | Order Qty |
|-------------|---------------------------------------------------------------------------------|-----------|
| K28300      | Bending Apparatus                                                               | 1         |
| K28310      | Cooling Apparatus<br>Consists of test tubes, cylinder, bungs and thistle tunnel | 1         |
| K28320      | Electric Hotplate, 115V 50/60Hz                                                 | 1         |
| K28321      | Electric Hotplate, 220-240V 50/60Hz                                             |           |
| 250-000-33C | ASTM 33C Thermometer. Range: -38 to + 42°C                                      | 1         |

### Shipping Information

Shipping Weight: 20 lbs (9.1kg)

Dimensions: 2.5 Cu. ft.

# ACCELERATED AGING OF ASPHALT BINDER USING A PRESSURIZED AGING VESSEL (PAV)

## Test Method

For accelerated aging (oxidation) of asphalt binders by means of pressurized air and elevated temperature. This is intended to simulate the type of changes which occur in asphalt binders during in-service oxidative aging but may not accurately simulate the relative rates of aging. It is intended for use with residue from Test Method D2872 (RTFOT) which is designed to simulate plant aging.

## Pressure Aging Vessel (PAV)

The Pressure Aging Vessel (PAV) is used to simulate in service oxidative aging of asphalt binder according to procedures developed by the Strategic Highway Research Program (SHRP). The K88100 is fully compliant with the most recent ASTM and AASHTO standards for these tests. The complete PAV system consists of an ASME-code stainless steel pressure vessel in a stainless steel cabinet with encased band heaters, a precision sample holder for simultaneous testing of ten specimens, a set of ten TFOT specimen trays, a pressure controller, temperature controller, pressure and temperature measurement devices, temperature recorder, and a specimen loading and unloading tool.

The K88100 PAV takes the hassle out of running and documenting asphalt binder aging operations. Three easy, non-complicated steps produce accurate and reliable results. Just press the "heat" button, inset specimens when prompted and press the "Age" button and let the PAV do the rest. Custom status screens guide the user step-by-step through the entire process. Each display screen (preheat start-up, preheat ready, aging heat up, aging pressurized, and aging complete) is simple and direct, with detailed process and status information. The final output screen, when the test is complete, shows the current vessel pressure, as well as minimum and maximum temperatures achieved during the test procedure. Process data (temperature and pressure) is continually stored at regular intervals in the programmable logic controller (PLC) that controls and monitors the process.

The K88100 features a compact, bench top design with integral pressure vessel. Its rotating vessel lid with rounded support block provides easy opening and closing. A built-in timer accumulates and records out-of-range time (out of range time for the PAV is typically less than 10 minutes during a 20-hour test). Minimum and maximum temperature data is recorded and is displayed at the end of each test.

## Specifications

Conforms to the specifications of:  
ASTM D6521; AASHTO R28  
Operating Pressure:  $2.10 \pm 0.05$  MPa (304 psi)  
Temperature Range: 90°C to 110°C (194°F to 230°F)  
Temperature Control Resolution:  $\pm 0.1^\circ\text{C}$   
Test Temperature Uniformity:  $\pm 0.5^\circ\text{C}$   
Time to Set point: 3 hours from ambient  
Return to Set point: 120 min. after preheating and lading of specimens  
Pressure Vessel: ASME code section VIII, division 1; 1992 A 93  
Maximum Pressure: 325 psi (2.24 MPa) at 120°C (250°F)  
Pressure Safety Release: 325 psi (2.24 MPa)

## Ordering Information

| Catalog No. |                                     |
|-------------|-------------------------------------|
| K88100      | Pressure Aging Vessel, 230V 50/60Hz |

### Accessories

|          |                             |
|----------|-----------------------------|
| K88100-1 | UPS Battery Backup System   |
| K88100-2 | PAV Verification Kit        |
| K88100-3 | PAV O-Ring                  |
| K88100-4 | CGA Adapter                 |
| K88100-5 | High Pressure Hose          |
| K88100-6 | Specimen Pans Set (Pk / 10) |

# LOSS ON HEATING OF OIL AND ASPHALTIC COMPOUNDS

## Effect of Heat and Air on Asphaltic Materials (Thin Film Oven Test)

### Test Method

Determines the effect on asphaltic materials of heating in an oven under prescribed conditions. The results are reported in terms of change in sample mass and/or changes in selected properties such as viscosity, penetration and ductility as evidenced by test data taken before and after the oven cycle.

### Asphalt Oven

Dual purpose oven for loss of heat test and thin film test for bitumen and asphaltic materials. Interior chamber of stainless steel and stored powder painter steel exterior. Double glazed window in door for viewing test chamber.

Side mounted controls comprise microprocessor digital control, independent overheat thermostat, main switch and indicator lamps. Two rotating platforms supplied to perform both the tests.

### Specifications

Conforms to the specifications of:

ASTM D6, D1754; Specification E145, Type 1B; AASHTO T47, T179, BS2000

Temperature Range: to 356°F (180°C)

Pre-set at 163°C ± 1°C

Electrical Requirements: **CE**

110V 60Hz

220V 50Hz

### Dimensions

Internal Chamber Dimension 38cm(H) x 52cm(W) x 46cm(D)

External Dimension 57cm(H) x 87cm(W) x 63cm(D)

(External Dimension does not include motor or handle)

Net Weight: 44kg



*K45850 Loss on Heat / Thin Film Oven*

### Ordering Information

| Catalog No.        |                                                         | Order Qty |
|--------------------|---------------------------------------------------------|-----------|
| <b>K45850</b>      | Loss on Heat/Thin Film Oven for D6, D1754<br>110V, 60Hz | 1         |
| <b>K45859</b>      | Loss on Heat/Thin Film Oven for D6, D1754<br>220V, 50Hz |           |
| <b>Accessories</b> |                                                         |           |
| <b>388-001-003</b> | Sample Container for ASTM D6                            | 9         |
| <b>K17000</b>      | Thin Film Oven Pan, aluminum for D1754                  | 4         |
| <b>K17090</b>      | Thin Film Oven Pan, stainless steel for D1754           | 4         |

# EFFECT OF HEAT AND AIR ON A MOVING FILM OF ASPHALT

## Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin Film Oven Test)

### Test Method

Determines the effect of heat and air on a moving film of asphalt to serve as an indicator of approximate change in properties during conventional hot-mixing. The results are reported in terms of the changes in selected properties such as viscosity, penetration and ductility brought about by the RTFO test, as evidenced by test data taken before and after the 75 minute oven cycle.

### Rolling Thin Film Oven

- Conforms to the specifications of ASTM D2872

Double-walled electrically heated convection oven for rolling thin film oven tests on asphalts. Incorporates all required features per ASTM specifications, including: door with double-pane viewing window; symmetrical top and bottom vents; air plenum; squirrel cage-type 1725rpm fan; digital indicating thermostat to control oven temperature at  $163^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ ; vertical circular carriage to mechanically rotate the samples at  $15 \pm 0.2\text{rpm}$ ; air jets to blow heated air into each sample bottle at its lowest point of travel; and a calibrated flowmeter to control air flow at 4000mL/min. An overtemperature cut-off circuit disconnects power to the unit in the event of control failure.

### Specifications

Conforms to the specifications of: ASTM D2872; AASHTO T240

### Included Accessories

Glass Sample Container (8)  
ASTM 13C Thermometer

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

40x36x26 (101.6x91.44x66.04)  
Net Weight: 310 lbs (141kg)

### Shipping Information

Shipping Weight: 380 lbs (173kg)  
Dimensions: 7.96 Cu. ft.

### Electrical Requirements ☹☹

220-240V 60Hz  
220-240V 50Hz



K88000 Rolling Thin Film Oven

### Ordering Information

| Catalog No.        |                                             | Order Qty |
|--------------------|---------------------------------------------|-----------|
| K88000             | Rolling Thin Film Oven, 220-240V 60Hz       | 1         |
| K88001             | Rolling Thin Film Oven, 220-240V 50Hz       |           |
| <b>Accessories</b> |                                             |           |
| K88000-1           | Glass Sample Container                      | 8         |
| K88000-2           | Cooling Rack                                |           |
| 250-000-13C        | ASTM 13C Thermometer<br>Range: 155 to 170°C | 1         |

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

## FLOAT TEST FOR BITUMINOUS MATERIALS

### Test Method

Provides a measure of the consistency of bituminous materials, including asphalts and tar products.

### Float Test Apparatus

- Conforms to ASTM D139, AASHTO T50 and ANS A37.2 specifications
- Consists of aluminum float and three brass collars for determining the consistency of bituminous materials and tar products.

### Shipping Information

Shipping Weight: 3 lbs (1.4kg)



**K30500 Float Test Apparatus**

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

| Ordering Information |                                            |           |
|----------------------|--------------------------------------------|-----------|
| Catalog No.          |                                            | Order Qty |
| K30500               | Float Test Apparatus                       | 1         |
| Accessories          |                                            |           |
| K30510               | Float, only                                |           |
| K30520               | Collar, only                               |           |
| 250-000-15F          | ASTM 15F Thermometer<br>Range: 30 to 180°F | 1         |
| 250-000-15C          | ASTM 15C Thermometer<br>Range: -2 to +80°C |           |

## RESIDUE & OIL DISTILLATE IN EMULSIFIED ASPHALTS BY DISTILLATION

### Test Method

Determines residue and oil distillate in emulsified asphalt for research, quality control and specification acceptance purposes.

### Residue and Oil Distillate Determination Apparatus

- Conforms to ASTM D244 and AASHTO T59 specifications
- Consists of an aluminum alloy still with lid and clamp assembly, ring burner, connection apparatus, graduate cylinder and thermometers.

### Shipping Information

K31900: Shipping Weight: 7 lbs (3.2kg)

Dimensions: 1.3 Cu. ft.

K31956: Shipping Weight: 18 lbs (8.2kg)

Dimensions: 2.8 Cu. ft.



**K31900 Metal Still**

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

| Ordering Information |                                                                                                               |           |
|----------------------|---------------------------------------------------------------------------------------------------------------|-----------|
| Catalog No.          |                                                                                                               | Order Qty |
| K31900               | Aluminum Alloy Still                                                                                          | 1         |
| Accessories          |                                                                                                               |           |
| K31910               | Ring Burner, 5" (12.7cm) dia                                                                                  | 1         |
| K31956               | Connection Apparatus<br>Includes Borosilicate Glass condenser with metal jacket, tin shield, clamps and stand | 1         |
| 332-002-003          | Graduated Cylinder, 100mL                                                                                     | 1         |
| 250-000-07F          | ASTM 7F Thermometer<br>Range: 30 to 580°F                                                                     | 2         |
| 250-000-07C          | ASTM 7C Thermometer<br>Range: -2 to +300°C                                                                    |           |

# BLOCKING AND PICKING POINTS OF PETROLEUM WAX

## Test Method

Blocking point and picking point are indicators of the temperature above which surface film injury will occur when waxed surfaces come in contact with one another as on a roll of wax paper. Paper test specimens are coated with the wax sample, folded with the waxed surfaces together, and heated on a metal blocking plate having a measured temperature gradient. After a specified period, the specimens are removed and unfolded, and the points at which film disruption occurred are noted together with their corresponding temperatures.

## Blocking and Picking Points Apparatus

- Conforms to ASTM D1465 and TAPPI T652 specifications
- Choice of Type A or Type B Blocking Plates

Applies wax samples to paper test specimens and creates a temperature gradient for determining blocking point and picking point temperatures.

**Wax Coating Device**—Coats paper with wax samples per ASTM specifications. Consists of an insulated electrically heated hot wax bath and a cooling water bath with doctor rods and paper roller. Variable auto transformer and 200W heater situated underneath the hot wax bath heat sample to a temperature above the melting point. Doctor rods connect to an external hot water supply to maintain proper temperature. Cooling bath has water inlet/outlet fittings, and each bath has a built-in paper guide.

**Blocking Plates**—Choice of Type A or Type B plates per ASTM specifications. Type A Aluminum Blocking Plate uses a strip heater and cooling coil on opposite ends of the block to create a temperature gradient. Six thermocouples along the length of the block input to accessory Digital Thermometer. Accommodates eight rows of paper test specimens. Type B Aluminum Blocking Plate uses two thermostatically controlled baths to establish a temperature gradient, with the ends of the plate extending into the baths. Cold bath has a cooling coil and 100W immersion heater; hot bath has a 300W immersion heater. Thermoregulators and motor stirrers provide uniform temperature control in each bath. Ten thermocouples along the length of the block input to accessory Digital Thermometer. Accommodates six rows of test specimens.

**Digital Thermometer**—Ten-channel microprocessor based digital thermocouple thermometer with large LED display. Ten-position front panel rotary selector switch. Mounted in a heavy duty bench case.

## Specifications

Conforms to the specifications of: ASTM D1465; TAPPI T652

Electrical Requirements: **CE**

Wax Coating Device: 115V 60Hz, Single Phase, 1.7A  
220-240V 50/60Hz, Single Phase, .9A

Type A Blocking Plate: 115V 60Hz, Single Phase, 2.1A  
220-240V 50/60Hz, Single Phase, 1.1A or

Type B Blocking Plate: 115V 60Hz, Single Phase, 3.4A  
220-240V 50/60Hz, Single Phase, 1.8A

## Included Accessories

Type A Blocking Plate:

Steel weights, 1x1x30" (8)

Sponge rubber pads (8)

IC thermocouples (6) or

Type B Blocking Plate:

Steel weights, 1x1x6" (24)

Sponge rubber pads (8)

IC thermocouples (10)

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

Wax Coating Device: 19x8x12 (48x20x30)

Type A Blocking Plate: 38x12x2 (97x30x5)

Type B Blocking Plate: 19x8x12 (48x20x30)

## Shipping Information

Shipping Weight:

Wax Coating Device: 44 lbs (20kg)

Type A Blocking Plate: 164 lbs (74.4kg)

Type B Blocking Plate: 183 lbs (83.0kg)

Dimensions:

Wax Coating Device: 5.3 Cu. ft.

Type A Blocking Plate: 4.1 Cu. ft.

Type B Blocking Plate: 12.3 Cu. ft.

## Ordering Information

| Catalog No.                                                                                                                               | Order Qty |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Wax Coating Device</b>                                                                                                                 | 1         |
| <b>K17100</b> Wax Coating Device, 115V 60Hz                                                                                               |           |
| <b>K17190</b> Wax Coating Device, 220-240V 50/60Hz                                                                                        |           |
| <b>Blocking Plates</b>                                                                                                                    | 1         |
| <b>K17200</b> Type A Blocking Plate, 115V 60Hz                                                                                            |           |
| <b>K17290</b> Type A Blocking Plate, 220-240V 50/60Hz                                                                                     |           |
| <b>K17300</b> Type B Blocking Plate.<br>115V 60Hz                                                                                         |           |
| <b>K17390</b> Type B Blocking Plate.<br>220-240V 50/60Hz                                                                                  |           |
| <b>Digital Thermometer</b>                                                                                                                | 1         |
| <b>K29310</b> Digital Thermometer, 115V 60Hz                                                                                              |           |
| <b>K29319</b> Digital Thermometer, 220-240V 50/60Hz                                                                                       |           |
| <b>K17110</b> Test Paper, Cereal glassine, 30 lb basic weight.<br>3½" (8.9cm) wide x 6" (15.25cm) dia. roll<br>on a 3" (7.6cm) dia. core. | 1         |
| <b>Thermometers</b>                                                                                                                       | 2         |
| Use with Type B Blocking Plate only.                                                                                                      |           |
| <b>250-000-09F</b> ASTM 9F Thermometer<br>Range: 20 to 230°F                                                                              |           |
| <b>250-000-09C</b> ASTM 9C Thermometer<br>Range: -5 to +110°C                                                                             |           |

## MELTING POINT OF PETROLEUM WAX (COOLING CURVE)



### Test Method

Periodic temperature measurements are taken of a sample of molten wax as it is cooled in an air bath. When the wax solidifies, a plateau in the cooling curve occurs, indicating the melting point (cooling curve) of the sample.

### Wax Melting Point Apparatus

- Conforms to ASTM D87 and related specifications

Cools molten wax samples in accordance with ASTM and related specifications. Consists of nickel-plated air and water bath assembly with removable cover. Supports test tube in a vertical position in the air bath.

### Specifications

Conforms to the specifications of:

ASTM D87; IP 55; ISO 3841; DIN 51570; FTM 791-1402; NF T 60-114

### Included Accessories

Test Tube, Thermometer Holders (2)

**Dimensions** dia.xh,in.(cm) 5½x7 (14x18)

Net Weight 4 lbs (1.8kg)

### Shipping Information

Shipping Weight: 6 lbs (2.7kg)

Dimensions: 0.7 Cu. ft.

*K17500 Wax Melting Point Apparatus*

### Ordering Information

| Catalog No.        |                                          | Order Qty |
|--------------------|------------------------------------------|-----------|
| K17500             | Wax Melting Point Apparatus              | 1         |
| <b>Accessories</b> |                                          |           |
| 250-000-14F        | ASTM 14F Thermometer Range: 100 to 180°F | 2         |
| 250-000-14C        | ASTM 14C Thermometer Range: 38 to 82°C   |           |
| K175-0-8           | Test Tube, 25x100mm                      |           |

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

# OIL CONTENT AND SOLVENT EXTRACTABLES IN PETROLEUM WAXES

## Oil Content of Petroleum Waxes

### Solvent Extractables in Petroleum Waxes

#### Test Method

Oil content or solvent extractables in wax can affect key properties such as strength, hardness, melting point, etc. The sample is dissolved in methyl-ethyl ketone or a 50-50 mixture of methyl-ethyl ketone and toluene, cooled to precipitate the wax, and filtered. The oil content or solvent extractables content of the filtrate is then determined by evaporating the solvent and weighing the residue.

#### Oil-Solvent Extractables Content Apparatus

- Conforms to ASTM D721, D3235 and related specifications

Determines oil content or solvent extractables content in petroleum waxes in accordance with ASTM specifications. Includes Filter Stick Assembly; Cooling Bath; Air Pressure Regulator; and Evaporation Cabinet.

**Filter Stick and Assembly**—Filters petroleum wax samples per ASTM specifications. Consists of 10mm diameter sintered glass filter stick with air pressure inlet tube and delivery nozzle, and a 25x170mm test tube. Inserts in Cooling Bath.

**Cooling Bath**—Accommodates three (3) 25x170mm test tubes for cooling samples and filter stick assemblies. Insulated stainless steel tank with finished steel exterior. Removable composition top plate has thermometer port, filling port and three 25.4mm (1") test tube ports. Fill tank with suitable cooling mixture.

**Air Pressure Regulator**—Controls air flow to the filter stick assembly at the required rate. Mercury bubbler-type, with 250mL glass cylinder, T-tube and rubber stopper.

**Evaporation Cabinet**—Thermostatically heated cabinet evaporates solvent from filtrate per specifications. Accommodates four weighing bottles. Delivers air stream vertically downward into bottles through glass jets. Manifold assembly is adjustable for positioning of jets at the correct height above the sample surface. Controls temperature at  $35 \pm 1^\circ\text{C}$  ( $95 \pm 2^\circ\text{F}$ ). Finished steel cabinet with composition front plate and hinged glass door.

#### Specifications

Conforms to the specifications of:

ASTM D721, D3235; IP 158; ISO 2908;

DIN 51571, 51572; FTM 791-5431

Electrical Requirements: **CE**

115V 60Hz, Single Phase, 0.8A

220-240V 50/60Hz, Single Phase, 0.4A

#### Included Accessories

Weighing Bottles, 15mL (4)

Filter Stick Assembly (K17630)

Air Pressure Regulator (K17640)

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

Cooling Bath: 8x6x9 (20x15x23)

Evaporation Cabinet: 9x5x16 (23x13x41)

Net Weight:

Cooling Bath: 6 lbs (2.7kg)

Evaporation Cabinet: 7 lbs (3.2kg)

#### Shipping Information

Shipping Weight: 24 lbs (10.9kg)

Dimensions: 5 Cu. ft.

#### Ordering Information

| Catalog No.        |                                                                            | Order Qty |
|--------------------|----------------------------------------------------------------------------|-----------|
| <b>K17600</b>      | Oil-Solvent Extractables Content Apparatus, 115V 60Hz                      | 1         |
| <b>K17690</b>      | Oil-Solvent Extractables Content Apparatus, 220-240V 50/60Hz               |           |
| <b>Accessories</b> |                                                                            |           |
| <b>K17605</b>      | Mechanically Refrigerated Cooling Bath, 115V 60Hz, Ambient to -35°C        |           |
| <b>K17695</b>      | Mechanically Refrigerated Cooling Bath, 220-240V 50/60Hz, Ambient to -35°C |           |
| <b>332-004-009</b> | Test Tube, 25x170mm                                                        | 4         |
| <b>250-000-71F</b> | ASTM 71 F Thermometer<br>Range: -35 to +70°F                               | 1         |

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

## 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.

### **Ductility of Bituminous Materials .....Page 170**

ASTM D113, D-4; AASHTO T51; ANS A37.11; Federal Specification SS-R-406C; USDA Method 51 (BUL 12-16); IP 32; DIN 52013

|                                     |                                        |
|-------------------------------------|----------------------------------------|
| Glycerin                            | Dextrin, Talc or Kaolin                |
| No. 50 300 µm Sieve                 | Spatula                                |
| 150mL Beaker, Griffin Low-form      | 30mL Beaker, Griffin Low-form          |
| Carbon Disulfide                    | Drying Oven                            |
| Celite Analytical Filter Aid (CAFA) | Watch Glasses                          |
| Evaporating Dish                    | Desiccator                             |
| Analytical Balance                  | Filtering Flask, with Crucible Adapter |
| Suction Pump                        | Bunsen Burner or Muffle Furnace        |
| Filtering Crucible, Porcelain       |                                        |

### **Softening Point of Bitumen (Ring-and-Ball Apparatus) .....Page 171-172**

ASTM D36, E28; AASHTO T53; IP 58, IP 198

Distilled Water  
Ethylene Glycol  
Silicone Oil or Grease  
Dextrin or Talc  
Spatula

### **Breaking Point of Bitumen .....Page 173**

IP 80  
Acetone  
Solid Carbon Dioxide

### **Effect of Heat and Air on Asphaltic Materials .....Page 174**

ASTM D1754  
Laboratory Oven with Rotating Shelf  
Analytical Balance

### **Float Test for Bituminous Materials .....Page 176**

ASTM D139; AASHTO T50 and ANS A37.2  
Spatula

### **Residue and Oil Distillate in Emulsified Asphalts by Distillation .....Page 176**

ASTM D244 and AASHTO T59

No. 50 300 µm Sieve  
No. 20 850 µm Sieve  
Condenser  
Xylol

### **Blocking and Picking Points of Petroleum Wax .....Page 177**

ASTM D1465; TAPPI T652

Trimming Board  
Analytical Balance  
Paper Cereal Glassine

### **Melting Point of Petroleum Wax (Cooling Curve) .....Page 178**

ASTM D87; TAPPI T630M-61; IP 55; ISO 3841; DIN 51570; FTM 791-1402

Heating Device

### **Oil Content of Petroleum Waxes Solvent Extractables in Petroleum Waxes .....Page 179**

ASTM D721, D3235; TAPPI T636; IP 158; ISO 2908, DIN 51571, 51572; FTM 791-5431

Dropper Pipet, 15mL  
Transfer Pipet, 15mL  
Analytical Balance  
Wire Stirrer  
Methyl Ethyl Ketone  
Toluene  
Anhydrous Calcium Sulfate  
Air Supply  
Drying Oven  
Kerosene  
Cotton

# CERTIFIED PETROLEUM STANDARDS

## Test Methods

## Page

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| Certified Petroleum Standards Listing..... | 182 |
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Koehler offers laboratory reference standards for our full line of testing equipment. Each test standard comes with original certification listing the ASTM test method, the name and ISO status of each testing laboratory, and the average test result and standard deviation. Please inquire with Koehler's Customer Service Department about further information as well as ordering these reference standards for your testing needs.



# CERTIFIED PETROLEUM REFERENCE STANDARDS

## Certified Petroleum Reference Standards

- Manufactured and certified for ASTM and related test procedures
- NIST traceable standards developed utilizing ASTM Round Robin trials
- Custom standards available

Koehler offers an extensive range of certified petroleum reference materials meeting the analytical requirements for ASTM, ISO, EPA, and related test methods, and are traceable to National Institute of Standards and Technology.

Complete certification is provided with each standard. Refer to the list below for the reference standard that you require or contact us to discuss your needs for a special standard. Detailed datasheets and quotations for standards listed below or for specially prepared standards are readily available from Koehler by contacting our Customer Service Department. We will respond to you promptly upon receiving your request.

### Certified Standards for Petroleum Test Methods

|       |                                                             |
|-------|-------------------------------------------------------------|
| --    | PIANO, PONA, PNA by GC                                      |
| --    | O-PONA Method by GC                                         |
| --    | Simulated Distillation (Sim Dis) by GC                      |
| D56   | Flash Point by Tag Closed Cup                               |
| D86   | Synthetic Distillation Standard                             |
| D92   | Flash Point by Cleveland Open Cup                           |
| D93   | Flash Point by Pensky-Martens Closed Cup                    |
| D97   | Pour Point                                                  |
| D323  | Reid Vapor Pressure of Petroleum Products                   |
| D445  | Kinematic Viscosity ( <i>please refer to pages 18-19</i> )  |
| D611  | Aniline Point                                               |
| D613  | Cetane Number of Diesel Fuel Oil                            |
| D1015 | Freezing Point                                              |
| D1319 | Olefin Analysis by FIA                                      |
| D1744 | Water in Liquid Petroleum Products                          |
| D2162 | Calibration of Master Viscometers & Viscosity Oil Standards |
| D2386 | Freezing Point                                              |
| D2500 | Cloud Point                                                 |
| D2699 | RON of Spark-Ignition Engine Fuel                           |
| D2700 | MON of Spark-Ignition Engine Fuel                           |
| D2789 | Hydrocarbon Analysis in Gasoline by GC/MS                   |
| D2887 | Boiling Range by GC                                         |
| D3230 | Salts in Crude Oil                                          |
| D3231 | Phosphorus in Gasoline                                      |
| D3237 | Lead in Gasoline by AA                                      |
| D3242 | Acidity in Aviation Turbine Fuel                            |
| D3340 | Li and Na in Lubricating Greases by Flame Photometer        |
| D3524 | Diesel Fuel Analysis by GC                                  |
| D3605 | Trace Metal in Gas Turbine Fuel by AA                       |
| D3606 | Aromatics in Gasoline by GC                                 |
| D3610 | Total Cobalt Analysis by Potentiometric Titration           |
| D3710 | Boiling Range by GC                                         |
| D3798 | p-Xylene Analysis by GC                                     |
| D3831 | Manganese in Gasoline by AA                                 |
| D4052 | Density, Relative, and API Gravity of Liquids               |
| D4053 | Benzene in Motor and Aviation Gasoline                      |
| D4059 | PCB Analysis by GC                                          |
| D4110 | Ion Chromatography                                          |
| D4291 | Ethylene Glycol by GC                                       |
| D4327 | Ion Chromatography                                          |
| D4377 | Water in Liquid Petroleum Products                          |
| D4420 | Aromatics in Gasoline by GC                                 |
| D4628 | Wear Metals in Lube Oil                                     |
| D4629 | Nitrogen by Chemiluminescence                               |
| D4815 | Oxygenates in Gasoline by GC                                |
| D4927 | Wear Metals and Additives by WD-XRF                         |
| D4928 | Water in Liquid Petroleum Products                          |
| D4929 | Chlorine in Crude Oil by Microcoulometry                    |
| D4951 | Wear Metals and Additives by ICP                            |
| D4953 | Vapor Pressure of Gasoline                                  |
| D5056 | Trace Metals in Petroleum Coke by AA                        |
| D5059 | Lead in Gasoline by X-Ray Spectroscopy                      |
| D5134 | Petroleum Naphthas through n-Nonane Analysis by GC          |

### Certified Standards for Petroleum Test Methods (cont'd)

|       |                                                        |
|-------|--------------------------------------------------------|
| D5184 | Al and Si by ICP                                       |
| D5186 | Aromatics by SFC                                       |
| D5188 | Vapor-Liquid Ratio Temperature                         |
| D5191 | Vapor Pressure Standards                               |
| D5307 | Boiling Range Distribution by GC                       |
| D5441 | MTBE Analysis by GC                                    |
| D5442 | Petroleum Waxes by GC                                  |
| D5443 | PNA Analysis by Multidimensional GC                    |
| D5480 | Oil Volatility by GC                                   |
| D5482 | Vapor Pressure Standards                               |
| D5501 | Ethanol Analysis by GC                                 |
| D5580 | Aromatics by GC                                        |
| D5599 | Oxygenates by OFID                                     |
| D5600 | Trace Metals by ICP                                    |
| D5622 | Oxygenates by Reductive Pyrolysis                      |
| D5623 | Sulfur Compounds by Sulfur Selective Detection         |
| D5708 | Trace Metals by ICP                                    |
| D5762 | Nitrogen by Chemiluminescence                          |
| D5769 | Aromatics by GC/MS                                     |
| D5771 | Cloud Point (Stepped Cooling Method)                   |
| D5772 | Cloud Point (Linear Cooling Rate)                      |
| D5773 | Cloud Point (Constant Cooling Rate)                    |
| D5863 | Trace Metals by AA                                     |
| D5901 | Freezing Point (Auto Optical Method)                   |
| D5949 | Pour Point (Auto Pressure Pulsing Method)              |
| D5950 | Pour Point (Auto Tilt Method)                          |
| D5972 | Freezing Point                                         |
| D5985 | Pour Point (Rotational Method)                         |
| D5986 | Oxygenates and Aromatics by GC/FTIR                    |
| D6160 | PCBs by GC                                             |
| D6258 | Solvent Red 164 Dye Concentration in Diesel Fuels      |
| D6277 | Benzene in Spark Ignition Fuels                        |
| D6293 | Oxygenates in Engine Fuels by GC                       |
| D6296 | Total Olefins in Spark Ignition Engine Fuels by GC     |
| D6304 | Water in Liquid Petroleum Products                     |
| D6352 | Boiling Range Distribution of Petroleum                |
| D6371 | Cold Filter Plugging Point of Diesel and Heating Fuels |
| D6378 | Vapor Pressure                                         |
| D6379 | Aromatic Hydrocarbon by HPLC                           |
| D6417 | Engine Oil by GC                                       |
| D6443 | Metals in Oil                                          |
| D6481 | Lube Oils by ED-XRF                                    |
| D6550 | Olefin Content of Gasoline by SFC                      |
| IP170 | Flash Point by Abel Closed Cup                         |

### Sulfur Standards

|       |                                                      |
|-------|------------------------------------------------------|
| D2622 | Sulfur by WD-XRF                                     |
| D3120 | Sulfur by Oxidative Microcoulometry                  |
| D3246 | Sulfur in Petroleum Gas by Oxidative Microcoulometry |
| D4294 | Sulfur by ED-XRF                                     |
| D5453 | Sulfur by Ultraviolet Fluorescence                   |
| D6334 | Sulfur in Gasoline by Wavelength                     |
| D6445 | Sulfur in Gasoline by ED-XRF                         |

# ASTM THERMOMETERS, TEST SPECIMENS AND GLASSWARE

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## ASTM THERMOMETERS

Koehler is pleased to offer our customers calibrated thermometers in addition to the wide range of ASTM thermometers available. Thermometers are calibrated to ASTM E-1 requirements in accordance with Method E-77 and are NIST traceable. Calibrated thermometers come with an ISO/IEC 17025 and ANSI/NCSL Z-540-1 Report of Calibration. When ordering, please indicate by catalog number the thermometer(s) which meet your testing requirements.

| Catalog Number | ASTM Designation | IP Reference | Name                                                                                                  | Range         |
|----------------|------------------|--------------|-------------------------------------------------------------------------------------------------------|---------------|
| 250-000-01C    | 1C               | —            | Partial Immersion                                                                                     | –20 to +150°C |
| 250-004-01C    | 1C               | —            | 1C CERTIFIED @ ASTM specified test points of –20, 0, +50, 100, 150°C                                  |               |
| 250-000-01F    | 1F               | —            | Partial Immersion                                                                                     | 0 to 302°F    |
| 250-004-01F    | 1F               | —            | 1F CERTIFIED @ ASTM specified test points of 0, 32, 122, 212, 302°F                                   |               |
| 250-000-02C    | 2C               | 62C          | Partial Immersion                                                                                     | –5 to +300°C  |
| 250-004-02C    | 2C               | 62C          | 2C CERTIFIED @ ASTM specified test points of 0, 75, 150, 225, 300°C                                   |               |
| 250-000-02F    | 2F               | 62F          | Partial Immersion                                                                                     | 20 to 580°F   |
| 250-004-02F    | 2F               | 62F          | 2F CERTIFIED @ ASTM specified test points of 32, 150, 300, 450, 580°F                                 |               |
| 250-000-03C    | 3C               | 73C          | Partial Immersion                                                                                     | –5 to +400°C  |
| 250-004-03C    | 3C               | 73C          | 3C CERTIFIED @ ASTM specified test points of 0, 100, 200, 300, 370°C                                  |               |
| 250-000-03F    | 3F               | 73F          | Partial Immersion                                                                                     | 20 to 760°F   |
| 250-004-03F    | 3F               | 73F          | 3F CERTIFIED @ ASTM specified test points of 32, 200, 370, 540, 700°F                                 |               |
| 250-000-04C    | 4C               | —            | Acid Heat                                                                                             | –1 to +105°C  |
| 250-004-04C    | 4C               | —            | 4C CERTIFIED @ ASTM specified test points of 0, 50, 100°C                                             |               |
| 250-000-04F    | 4F               | —            | Acid Heat                                                                                             | 30 to 220°F   |
| 250-004-04F    | 4F               | —            | 4F CERTIFIED @ ASTM specified test points of 32, 122, 212°F                                           |               |
| 250-000-05C    | 5C               | 1C           | Cloud & Pour, High                                                                                    | –38 to +50°C  |
| 250-004-05C    | 5C               | 1C           | 5C CERTIFIED @ ASTM specified test points of –35, 0, +50°C                                            |               |
| 250-000-05F    | 5F               | 1F           | Cloud & Pour, High                                                                                    | –36 to +120°F |
| 250-004-05F    | 5F               | 1F           | 5F CERTIFIED @ ASTM specified test points of –30, +32, 120°F                                          |               |
| 250-000-06C    | 6C               | 2C           | Cloud & Pour, Low                                                                                     | –80 to +20°C  |
| 250-004-06C    | 6C               | 2C           | 6C CERTIFIED @ ASTM specified test points of –70, –35, 0, +20°C                                       |               |
| 250-000-06F    | 6F               | 2F           | Cloud & Pour, Low                                                                                     | –112 to +70°F |
| 250-004-06F    | 6F               | 2F           | 6F CERTIFIED @ ASTM specified test points of –94, –30, +32, 70°F                                      |               |
| 250-000-07C    | 7C               | 5C           | Distillation, Low                                                                                     | –2 to +300°C  |
| 250-004-07C    | 7C               | 5C           | 7C CERTIFIED @ ASTM specified test points of 0, 50, 100, 150, 200, 250, 300°C                         |               |
| 250-000-07F    | 7F               | —            | Distillation, Low                                                                                     | 30 to 580°F   |
| 250-004-07F    | 7F               | —            | 7F CERTIFIED @ ASTM specified test points of 32, 100, 200, 300, 400, 500, 570°F                       |               |
| 250-000-08C    | 8C               | 6C           | Distillation, High                                                                                    | –2 to +400°C  |
| 250-004-08C    | 8C               | 6C           | 8C CERTIFIED @ ASTM specified test points of 0, 100, 200, 300, 370°C                                  |               |
| 250-000-08F    | 8F               | —            | Distillation, High                                                                                    | 30 to 760°F   |
| 250-004-08F    | 8F               | —            | 8F CERTIFIED @ ASTM specified test points of 32, 200, 370, 540, 700°F                                 |               |
| 250-000-09C    | 9C               | 15C          | Pensky-Martens, Low                                                                                   | –5 to +110°C  |
| 250-004-09C    | 9C               | 15C          | 9C CERTIFIED @ ASTM specified test points of 0, 35, 70, 105°C                                         |               |
| 250-000-09F    | 9F               | 15F          | Pensky-Martens, Low                                                                                   | 20 to 230°F   |
| 250-004-09F    | 9F               | 15F          | 9F CERTIFIED @ ASTM specified test points of 32, 100, 160, 220°F                                      |               |
| 250-000-10C    | 10C              | 16C          | Pensky-Martens, High                                                                                  | 90 to 370°C   |
| 250-004-10C    | 10C              | 16C          | 10C CERTIFIED @ ASTM specified test points of 100, 200, 300, 370°C                                    |               |
| 250-000-10F    | 10F              | 16F          | Pensky-Martens, High                                                                                  | 200 to 700°F  |
| 250-004-10F    | 10F              | 16F          | 10F CERTIFIED @ ASTM specified test points of 212, 390, 570, 700°F                                    |               |
| 250-000-11C    | 11C              | 28C          | Open Flash                                                                                            | –6 to +400°C  |
| 250-004-11C    | 11C              | 28C          | 11C CERTIFIED @ ASTM specified test points of 0, 100, 200, 300, 370°C                                 |               |
| 250-000-11F    | 11F              | 28F          | Open Flash                                                                                            | 20 to 760°F   |
| 250-004-11F    | 11F              | 28F          | 11F CERTIFIED @ ASTM specified test points of 32, 200, 370, 540, 700°F                                |               |
| 250-000-12C    | 12C              | 64C          | Gravity (Density)                                                                                     | –20 to +102°C |
| 250-004-12C    | 12C              | 64C          | 12C CERTIFIED @ ASTM specified test points of –20, –10, 0, +10, 20, 30, 40, 50, 60, 70, 80, 90, 100°C |               |
| 250-000-12F    | 12F              | 64F          | Gravity (Density)                                                                                     | –5 to +215°F  |
| 250-004-12F    | 12F              | 64F          | 12F CERTIFIED @ ASTM specified test points of –5, 15, 32, 60, 85, 110, 135, 160, 185, 210°F           |               |

*Koehler now offers mercury-free, liquid-in-glass thermometers that have the performance of mercury. Please contact Koehler Customer Service for availability of non-mercury type thermometer of interest. Please note, not all ASTM thermometers are available as non-mercury type.*

## ASTM THERMOMETERS

| Catalog Number | ASTM Designation | IP Reference | Name                                                                             | Range           |
|----------------|------------------|--------------|----------------------------------------------------------------------------------|-----------------|
| 250-000-13C    | 13C              | 47C          | Loss on Heat                                                                     | 155 to 170°C    |
| 250-004-13C    | 13C              | 47C          | 13C CERTIFIED @ ASTM specified test points of 155, 163, 170°C                    |                 |
| 250-000-14C    | 14C              | 17C          | Paraffin Wax Melting Point                                                       | 38 to 82°C      |
| 250-004-14C    | 14C              | 17C          | 14C CERTIFIED @ ASTM specified test points of 40, 50, 60, 70, 80°C               |                 |
| 250-000-14F    | 14F              | 17F          | Paraffin Wax Melting Point                                                       | 100 to 180°F    |
| 250-004-14F    | 14F              | 17F          | 14F CERTIFIED @ ASTM specified test points of 100, 120, 140, 160, 180°F          |                 |
| 250-000-15C    | 15C              | 60C          | Softening Point, Low                                                             | -2 to +80°C     |
| 250-004-15C    | 15C              | 60C          | 15C CERTIFIED @ ASTM specified test points of 0, 20, 40, 60, 80°C                |                 |
| 250-000-15F    | 15F              | —            | Softening Point, Low                                                             | 30 to 180°F     |
| 250-004-15F    | 15F              | —            | 15F CERTIFIED @ ASTM specified test points of 32, 70, 100, 140, 180°F            |                 |
| 250-000-16C    | 16C              | 61C          | Softening Point, High                                                            | 30 to 200°C     |
| 250-004-16C    | 16C              | 61C          | 16C CERTIFIED @ ASTM specified test points of 30, 60, 90, 120, 150, 180, 200°C   |                 |
| 250-000-16F    | 16F              | —            | Softening Point, High                                                            | 85 to 392°F     |
| 250-004-16F    | 16F              | —            | 16F CERTIFIED @ ASTM specified test points of 90, 140, 190, 240, 290, 340, 390°F |                 |
| 250-000-17C    | 17C              | —            | Saybolt Viscosity                                                                | 19 to 27°C      |
| 250-004-17C    | 17C              | —            | 17C CERTIFIED @ ASTM specified test points of 21, 25°C                           |                 |
| 250-000-17F    | 17F              | —            | Saybolt Viscosity                                                                | 66 to 80°F      |
| 250-004-17F    | 17F              | —            | 17F CERTIFIED @ ASTM specified test points of 70, 77°F                           |                 |
| 250-000-18C    | 18C              | 23C          | Saybolt Viscosity & Reid Vapor                                                   | 34 to 42°C      |
| 250-004-18C    | 18C              | 23C          | 18C CERTIFIED @ ASTM specified test points of 38, 41°C                           |                 |
| 250-000-18F    | 18F              | 23F          | Saybolt Viscosity & Reid Vapor                                                   | 94 to 108°F     |
| 250-004-18F    | 18F              | 23F          | 18F CERTIFIED @ ASTM specified test points of 100, 107°F                         |                 |
| 250-000-19C    | 19C              | —            | Saybolt Viscosity                                                                | 49 to 57°C      |
| 250-004-19C    | 19C              | —            | 19C CERTIFIED @ ASTM specified test points of 50, 54°C                           |                 |
| 250-000-19F    | 19F              | —            | Saybolt Viscosity                                                                | 120 to 134°F    |
| 250-004-19F    | 19F              | —            | 19F CERTIFIED @ ASTM specified test points of 122, 130°F                         |                 |
| 250-000-20C    | 20C              | —            | Saybolt Viscosity                                                                | 57 to 65°C      |
| 250-004-20C    | 20C              | —            | 20C CERTIFIED @ ASTM specified test points of 60, 64°C                           |                 |
| 250-000-20F    | 20F              | —            | Saybolt Viscosity                                                                | 134 to 148°F    |
| 250-004-20F    | 20F              | —            | 20F CERTIFIED @ ASTM specified test points of 140, 147°F                         |                 |
| 250-000-21C    | 21C              | —            | Saybolt Viscosity                                                                | 79 to 87°C      |
| 250-004-21C    | 21C              | —            | 21C CERTIFIED @ ASTM specified test points of 82, 86°C                           |                 |
| 250-000-21F    | 21F              | —            | Saybolt Viscosity                                                                | 174 to 188°F    |
| 250-004-21F    | 21F              | —            | 21F CERTIFIED @ ASTM specified test points of 180, 187°F                         |                 |
| 250-000-22C    | 22C              | 24C          | Saybolt Viscosity & Oxidation Stability                                          | 95 to 103°C     |
| 250-004-22C    | 22C              | 24C          | 22C CERTIFIED @ ASTM specified test points of 99, 102°C                          |                 |
| 250-000-22F    | 22F              | 24F          | Saybolt Viscosity & Oxidation Stability                                          | 204 to 218°F    |
| 250-004-22F    | 22F              | 24F          | 22F CERTIFIED @ ASTM specified test points of 210, 212°F                         |                 |
| 250-000-23C    | 23C              | —            | Viscosity Engler                                                                 | 18 to 28°C      |
| 250-004-23C    | 23C              | —            | 23C CERTIFIED @ ASTM specified test points of 20, 25°C                           |                 |
| 250-000-24C    | 24C              | —            | Viscosity Engler                                                                 | 39 to 54°C      |
| 250-004-24C    | 24C              | —            | 24C CERTIFIED @ ASTM specified test points of 40, 50°C                           |                 |
| 250-000-25C    | 25C              | —            | Viscosity Engler                                                                 | 95 to 105°C     |
| 250-004-25C    | 25C              | —            | 25C CERTIFIED @ ASTM specified test points of 95, 100°C                          |                 |
| 250-000-26C    | 26C              | —            | Stability Test of Soluble Nitro-Cellulose                                        | 130 to 140°C    |
| 250-004-26C    | 26C              | —            | 26C CERTIFIED @ ASTM specified test points of 130, 135, 140°C                    |                 |
| 250-000-27C    | 27C              | —            | Turpentine Distillation                                                          | 147 to 182°C    |
| 250-004-27C    | 27C              | —            | 27C CERTIFIED @ ASTM specified test points of 155, 165, 175°C                    |                 |
| 250-000-28C    | 28C              | 31C          | Kinematic Viscosity @ 37.8C                                                      | 36.6 to 39.4°C  |
| 250-004-28C    | 28C              | 31C          | 28C CERTIFIED @ ASTM specified test points of 0, 37.8, 39°C                      |                 |
| 250-000-28F    | 28F              | —            | Kinematic Viscosity @ 100F                                                       | 97.5 to 102.5°F |
| 250-004-28F    | 28F              | —            | 28F CERTIFIED @ ASTM specified test points of 32, 100, 102°F                     |                 |

## ASTM THERMOMETERS

| Catalog Number | ASTM Designation | IP Reference | Name                                                                    | Range             |
|----------------|------------------|--------------|-------------------------------------------------------------------------|-------------------|
| 250-000-29C    | 29C              | 34C          | Kinematic Viscosity @ 54.4C                                             | 52.6 to 55.4°C    |
| 250-004-29C    | 29C              | 34C          | 29C CERTIFIED @ ASTM specified test points of 0, 54.4, 55°C             |                   |
| 250-000-29F    | 29F              | —            | Kinematic Viscosity @ 130F                                              | 127.5 to 132.5°F  |
| 250-004-29F    | 29F              | —            | 29F CERTIFIED @ ASTM specified test points of 32, 130, 132°F            |                   |
| 250-000-30F    | 30F              | 32F          | Kinematic Viscosity @ 210F                                              | 207.5 to 212.5°F  |
| 250-004-30F    | 30F              | 32F          | 30F CERTIFIED @ ASTM specified test points of 32, 210, 212°F            |                   |
| 250-000-31F    | 31F              | —            | Reid Vapor                                                              | –30 to +120°F     |
| 250-004-31F    | 31F              | —            | 31F CERTIFIED @ ASTM specified test points of –20, +32, 100°F           |                   |
| 250-000-33C    | 33C              | 20C          | Aniline Point                                                           | –38 to +42°C      |
| 250-004-33C    | 33C              | 20C          | 33C CERTIFIED @ ASTM specified test points of –35, –20, 0, +20, 40°C    |                   |
| 250-000-33F    | 33F              | —            | Aniline Point                                                           | –36.5 to +107.5°F |
| 250-004-33F    | 33F              | —            | 33F CERTIFIED @ ASTM specified test points of –31, –4, +32, 68, 104°F   |                   |
| 250-000-34C    | 34C              | 21C          | Aniline Point                                                           | 25 to 105°C       |
| 250-004-34C    | 34C              | 21C          | 34C CERTIFIED @ ASTM specified test points of 25, 45, 65, 85, 100°C     |                   |
| 250-000-34F    | 34F              | —            | Aniline Point                                                           | 77 to 221°F       |
| 250-004-34F    | 34F              | —            | 34F CERTIFIED @ ASTM specified test points of 77, 113, 149, 185, 212°F  |                   |
| 250-000-35C    | 35C              | 59C          | Aniline Point                                                           | 90 to 170°C       |
| 250-004-35C    | 35C              | 59C          | 35C CERTIFIED @ ASTM specified test points of 100, 120, 140, 160, 170°C |                   |
| 250-000-35F    | 35F              | —            | Aniline Point                                                           | 194 to 338°F      |
| 250-004-35F    | 35F              | —            | 35F CERTIFIED @ ASTM specified test points of 212, 250, 285, 320, 338°F |                   |
| 250-000-36C    | 36C              | —            | Titer Test                                                              | –2 to +68°C       |
| 250-004-36C    | 36C              | —            | 36C CERTIFIED @ ASTM specified test points of 0, 15, 30, 45, 65°C       |                   |
| 250-000-37C    | 37C              | 77C          | Solvents Distillation                                                   | –2 to +52°C       |
| 250-004-37C    | 37C              | 77C          | 37C CERTIFIED @ ASTM specified test points of 0, 15, 30, 50°C           |                   |
| 250-000-38C    | 38C              | 78C          | Solvents Distillation                                                   | 24 to 78°C        |
| 250-004-38C    | 38C              | 78C          | 38C CERTIFIED @ ASTM specified test points of 25, 40, 55, 75°C          |                   |
| 250-000-39C    | 39C              | 79C          | Solvents Distillation                                                   | 48 to 102°C       |
| 250-004-39C    | 39C              | 79C          | 39C CERTIFIED @ ASTM specified test points of 50, 65, 80, 100°C         |                   |
| 250-000-40C    | 40C              | 80C          | Solvents Distillation                                                   | 72 to 126°C       |
| 250-004-40C    | 40C              | 80C          | 40C CERTIFIED @ ASTM specified test points of 75, 90, 105, 125°C        |                   |
| 250-000-41C    | 41C              | 81C          | Solvents Distillation                                                   | 98 to 152°C       |
| 250-004-41C    | 41C              | 81C          | 41C CERTIFIED @ ASTM specified test points of 100, 115, 130, 150°C      |                   |
| 250-000-42C    | 42C              | 82C          | Solvents Distillation                                                   | 95 to 255°C       |
| 250-004-42C    | 42C              | 82C          | 42C CERTIFIED @ ASTM specified test points of 100, 150, 200, 250°C      |                   |
| 250-000-43C    | 43C              | 65C          | Kinematic Viscosity                                                     | –51.6 to –34°C    |
| 250-004-43C    | 43C              | 65C          | 43C CERTIFIED @ ASTM specified test points of –50, –45, –40, –35, 0°C   |                   |
| 250-000-43F    | 43F              | 65F          | Kinematic Viscosity                                                     | –61 to –29°F      |
| 250-004-43F    | 43F              | 65F          | 43F CERTIFIED @ ASTM specified test points of –60, –50, –40, –30, +32°F |                   |
| 250-000-44C    | 44C              | 29C          | Kinematic Viscosity @ 20C                                               | 18.5 to 21.5°C    |
| 250-004-44C    | 44C              | 29C          | 44C CERTIFIED @ ASTM specified test points of 0, 20, 21°C               |                   |
| 250-000-44F    | 44F              | 29F          | Kinematic Viscosity @ 68F                                               | 66.5 to 71.5°F    |
| 250-004-44F    | 44F              | 29F          | 44F CERTIFIED @ ASTM specified test points of 32, 68, 70°F              |                   |
| 250-000-45C    | 45C              | 30C          | Kinematic Viscosity @ 25C                                               | 23.6 to 26.4°C    |
| 250-004-45C    | 45C              | 30C          | 45C CERTIFIED @ ASTM specified test points of 0, 25, 26°C               |                   |
| 250-000-45F    | 45F              | 30F          | Kinematic Viscosity @ 77F                                               | 74.5 to 79.5°F    |
| 250-004-45F    | 45F              | 30F          | 45F CERTIFIED @ ASTM specified test points of 32, 77, 79°F              |                   |
| 250-000-46C    | 46C              | 66C          | Kinematic Viscosity @ 50C                                               | 48.6 to 51.4°C    |
| 250-004-46C    | 46C              | 66C          | 46C CERTIFIED @ ASTM specified test points of 0, 50, 51°C               |                   |
| 250-000-46F    | 46F              | 66F          | Kinematic Viscosity @ 122F                                              | 119.5 to 124.5°F  |
| 250-004-46F    | 46F              | 66F          | 46F CERTIFIED @ ASTM specified test points of 32, 122, 124°F            |                   |

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## ASTM THERMOMETERS

| Catalog Number | ASTM Designation | IP Reference | Name                                                                                       | Range            |
|----------------|------------------|--------------|--------------------------------------------------------------------------------------------|------------------|
| 250-000-47C    | 47C              | 35C          | Kinematic Viscosity @ 60C                                                                  | 58.6 to 61.4°C   |
| 250-004-47C    | 47C              | 35C          | 47C CERTIFIED @ ASTM specified test points of 0, 60, 61°C                                  |                  |
| 250-000-47F    | 47F              | 35F          | Kinematic Viscosity @ 140F                                                                 | 137.5 to 142.5°F |
| 250-004-47F    | 47F              | 35F          | 47F CERTIFIED @ ASTM specified test points of 32, 140, 142°F                               |                  |
| 250-000-48C    | 48C              | 90C          | Kinematic Viscosity @ 82.2C                                                                | 80.6 to 83.4°C   |
| 250-004-48C    | 48C              | 90C          | 48C CERTIFIED @ ASTM specified test points of 0, 82.2, 83°C                                |                  |
| 250-000-48F    | 48F              | 90F          | Kinematic Viscosity @ 180F                                                                 | 177.5 to 182.5°F |
| 250-004-48F    | 48F              | 90F          | 48F CERTIFIED @ ASTM specified test points of 32, 180, 182°F                               |                  |
| 250-000-49C    | 49C              | —            | Stormer Viscosity                                                                          | 20 to 70°C       |
| 250-004-49C    | 49C              | —            | 49C CERTIFIED @ ASTM specified test points of 20, 35, 50, 70°C                             |                  |
| 250-000-50F    | 50F              | —            | Gas Calorimeter Inlet                                                                      | 54 to 101°F      |
| 250-004-50F    | 50F              | —            | 50F CERTIFIED @ ASTM specified test points of 55, 60, 65, 70, 75, 80, 85, 90, 95, 100°F    |                  |
| 250-000-51F    | 51F              | —            | Gas Calorimeter Outlet                                                                     | 69 to 116°F      |
| 250-004-51F    | 51F              | —            | 51F CERTIFIED @ ASTM specified test points of 70, 75, 80, 85, 90, 95, 100, 105, 110, 115°F |                  |
| 250-000-52C    | 52C              | —            | Butadiene Boiling Point                                                                    | -10 to +5°C      |
| 250-004-52C    | 52C              | —            | 52C CERTIFIED @ ASTM specified test points of -10, 0, +5°C                                 |                  |
| 250-000-53C    | 53C              | —            | Benzene Freezing Pt                                                                        | -0.6 to +10.4°C  |
| 250-004-53C    | 53C              | —            | 53C CERTIFIED @ ASTM specified test points of 0, 5, 10°C                                   |                  |
| 250-000-54C    | 54C              | 18C          | Congealing Point                                                                           | 20 to 100.6°C    |
| 250-004-54C    | 54C              | 18C          | 54C CERTIFIED @ ASTM specified test points of 20, 50, 75, 100°C                            |                  |
| 250-000-54F    | 54F              | 18F          | Congealing Point                                                                           | 68 to 213°F      |
| 250-004-54F    | 54F              | 18F          | 54F CERTIFIED @ ASTM specified test points of 70, 120, 170, 210°F                          |                  |
| 250-000-56C    | 56C              | —            | Bomb Calorimeter                                                                           | 19 to 35°C       |
| 250-004-56C    | 56C              | —            | 56C CERTIFIED @ ASTM specified test points of 19, 21, 23, 25, 27, 29, 31°C                 |                  |
| 250-000-56F    | 56F              | —            | Bomb Calorimeter                                                                           | 66 to 95°F       |
| 250-004-56F    | 56F              | —            | 56F CERTIFIED @ ASTM specified test points of 66, 70, 74, 78, 82, 88, 92, 95°F             |                  |
| 250-000-57C    | 57C              | —            | Tag Closed Tester Low Range                                                                | -20 to +50°C     |
| 250-004-57C    | 57C              | —            | 57C CERTIFIED @ ASTM specified test points of -20, 0, 25, +50°C                            |                  |
| 250-000-57F    | 57F              | —            | Tag Closed Tester Low Range                                                                | -4 to +122°F     |
| 250-004-57F    | 57F              | —            | 57F CERTIFIED @ ASTM specified test points of -3, +32, 77, 122°F                           |                  |
| 250-000-58C    | 58C              | —            | Tank Gauging                                                                               | -34 to +49°C     |
| 250-004-58C    | 58C              | —            | 58C CERTIFIED @ ASTM specified test points of -30, 0, +25, 45°C                            |                  |
| 250-000-58F    | 58F              | —            | Tank Gauging                                                                               | -30 to +120°F    |
| 250-004-58F    | 58F              | —            | 58F CERTIFIED @ ASTM specified test points of -20, +32, 80, 120°F                          |                  |
| 250-000-59C    | 59C              | —            | Tank Gauging                                                                               | -18 to +82°C     |
| 250-004-59C    | 59C              | —            | 59C CERTIFIED @ ASTM specified test points of 0, 25, 55, 80°C                              |                  |
| 250-000-59F    | 59F              | —            | Tank Gauging                                                                               | 0 to 180°F       |
| 250-004-59F    | 59F              | —            | 59F CERTIFIED @ ASTM specified test points of 32, 80, 130, 180°F                           |                  |
| 250-000-60C    | 60C              | —            | Tank Gauging                                                                               | 77 to 260°C      |
| 250-004-60C    | 60C              | —            | 60C CERTIFIED @ ASTM specified test points of 100, 175, 255°C                              |                  |
| 250-000-60F    | 60F              | —            | Tank Gauging                                                                               | 170 to 500°F     |
| 250-004-60F    | 60F              | —            | 60F CERTIFIED @ ASTM specified test points of 212, 350, 490°F                              |                  |
| 250-000-61C    | 61C              | 63C          | Petrolatum Melting Point                                                                   | 32 to 127°C      |
| 250-004-61C    | 61C              | 63C          | 61C CERTIFIED @ ASTM specified test points of 40, 60, 80, 100, 120°C                       |                  |
| 250-000-61F    | 61F              | —            | Petrolatum Melting Point                                                                   | 90 to 260°F      |
| 250-004-61F    | 61F              | —            | 61F CERTIFIED @ ASTM specified test points of 100, 150, 200, 250°F                         |                  |
| 250-000-62C    | 62C              | —            | Reference Standard                                                                         | -38 to +2°C      |
| 250-004-62C    | 62C              | —            | 62C CERTIFIED @ ASTM specified test points of -37, -30, -20, -10, 0°C                      |                  |
| 250-000-62F    | 62F              | —            | Reference Standard                                                                         | -36 to +35°F     |
| 250-004-62F    | 62F              | —            | 62F CERTIFIED @ ASTM specified test points of -35, -15, 0, +15, 32°F                       |                  |

## ASTM THERMOMETERS

| Catalog Number | ASTM Designation | IP Reference | Name                                                                   | Range            |
|----------------|------------------|--------------|------------------------------------------------------------------------|------------------|
| 250-000-63C    | 63C              | —            | Reference Standard                                                     | –8 to +32°C      |
| 250-004-63C    | 63C              | —            | 63C CERTIFIED @ ASTM specified test points of –7, 0, +10, 20, 30°C     |                  |
| 250-000-63F    | 63F              | —            | Reference Standard                                                     | 18 to 89°F       |
| 250-004-63F    | 63F              | —            | 63F CERTIFIED @ ASTM specified test points of 20, 32, 50, 70, 88°F     |                  |
| 250-000-64C    | 64C              | —            | Reference Standard                                                     | 25 to 55°C       |
| 250-004-64C    | 64C              | —            | 64C CERTIFIED @ ASTM specified test points of 0, 25, 35, 45, 55°C      |                  |
| 250-000-64F    | 64F              | —            | Reference Standard                                                     | 77 to 131°F      |
| 250-004-64F    | 64F              | —            | 64F CERTIFIED @ ASTM specified test points of 32, 80, 95, 115, 130°F   |                  |
| 250-000-65C    | 65C              | —            | Reference Standard                                                     | 50 to 80°C       |
| 250-004-65C    | 65C              | —            | 65C CERTIFIED @ ASTM specified test points of 0, 50, 60, 70, 80°C      |                  |
| 250-000-65F    | 65F              | —            | Reference Standard                                                     | 122 to 176°F     |
| 250-004-65F    | 65F              | —            | 65F CERTIFIED @ ASTM specified test points of 32, 125, 145, 160, 175°F |                  |
| 250-000-66C    | 66C              | —            | Reference Standard                                                     | 75 to 105°C      |
| 250-004-66C    | 66C              | —            | 66C CERTIFIED @ ASTM specified test points of 0, 75, 85, 95, 105°C     |                  |
| 250-000-66F    | 66F              | —            | Reference Standard                                                     | 167 to 221°F     |
| 250-004-66F    | 66F              | —            | 66F CERTIFIED @ ASTM specified test points of 32, 168, 185, 200, 220°F |                  |
| 250-000-67C    | 67C              | —            | Reference Standard                                                     | 95 to 155°C      |
| 250-004-67C    | 67C              | —            | 67C CERTIFIED @ ASTM specified test points of 0, 100, 110, 130, 150°C  |                  |
| 250-000-67F    | 67F              | —            | Reference Standard                                                     | 203 to 311°F     |
| 250-004-67F    | 67F              | —            | 67F CERTIFIED @ ASTM specified test points of 32, 205, 240, 275, 310°F |                  |
| 250-000-68C    | 68C              | —            | Reference Standard                                                     | 145 to 205°C     |
| 250-004-68C    | 68C              | —            | 68C CERTIFIED @ ASTM specified test points of 0, 150, 170, 190, 205°C  |                  |
| 250-000-68F    | 68F              | —            | Reference Standard                                                     | 293 to 401°F     |
| 250-004-68F    | 68F              | —            | 68F CERTIFIED @ ASTM specified test points of 32, 300, 340, 370, 400°F |                  |
| 250-000-69C    | 69C              | —            | Reference Standard                                                     | 195 to 305°C     |
| 250-004-69C    | 69C              | —            | 69C CERTIFIED @ ASTM specified test points of 0, 200, 235, 270, 305°C  |                  |
| 250-000-69F    | 69F              | —            | Reference Standard                                                     | 383 to 581°F     |
| 250-004-69F    | 69F              | —            | 69F CERTIFIED @ ASTM specified test points of 32, 400, 460, 520, 580°F |                  |
| 250-000-70C    | 70C              | —            | Reference Standard                                                     | 295 to 405°C     |
| 250-004-70C    | 70C              | —            | 70C CERTIFIED @ ASTM specified test points of 0, 300, 335, 370, 400°C  |                  |
| 250-000-70F    | 70F              | —            | Reference Standard                                                     | 563 to 761°F     |
| 250-004-70F    | 70F              | —            | 70F CERTIFIED @ ASTM specified test points of 32, 570, 640, 700, 760°F |                  |
| 250-000-71C    | 71C              | 72C          | Oil in Wax                                                             | –37 to +21°C     |
| 250-004-71C    | 71C              | 72C          | 71C CERTIFIED @ ASTM specified test points of –35, –18, 0, +20°C       |                  |
| 250-000-71F    | 71F              | 72F          | Oil in Wax                                                             | –35 to +70°F     |
| 250-004-71F    | 71F              | 72F          | 71F CERTIFIED @ ASTM specified test points of –30, 0, +32, 70°F        |                  |
| 250-000-72C    | 72C              | 67C          | Kinematic Viscosity @ –17.8C                                           | –19.4 to –16.6°C |
| 250-004-72C    | 72C              | 67C          | 72C CERTIFIED @ ASTM specified test points of –19, –17.8, 0°C          |                  |
| 250-000-72F    | 72F              | 67F          | Kinematic Viscosity @ 0F                                               | –2.5 to +2.5°F   |
| 250-004-72F    | 72F              | 67F          | 72F CERTIFIED @ ASTM specified test points of –2, 0, +32°F             |                  |
| 250-000-73C    | 73C              | 68C          | Kinematic Viscosity @ –40C                                             | –41.4 to –38.6°C |
| 250-004-73C    | 73C              | 68C          | 73C CERTIFIED @ ASTM specified test points of –41, –40, 0°C            |                  |
| 250-000-73F    | 73F              | 68F          | Kinematic Viscosity @ –40F                                             | –42.5 to –37.5°F |
| 250-004-73F    | 73F              | 68F          | 73F CERTIFIED @ ASTM specified test points of –42, –40, +32°F          |                  |
| 250-000-74C    | 74C              | 69C          | Kinematic Viscosity @ –53.9C                                           | –55.4 to –52.6°C |
| 250-004-74C    | 74C              | 69C          | 74C CERTIFIED @ ASTM specified test points of –55, –53.9, 0°C          |                  |
| 250-000-74F    | 74F              | 69F          | Kinematic Viscosity @ –65F                                             | –67.5 to –62.5°F |
| 250-004-74F    | 74F              | 69F          | 74F CERTIFIED @ ASTM specified test points of –67, –65, +32°F          |                  |
| 250-000-75F    | 75F              | —            | Coolant Freezing Point                                                 | –35 to +35°F     |
| 250-004-75F    | 75F              | —            | 75F CERTIFIED @ ASTM specified test points of –35, 0, +32°F            |                  |

*Koehler now offers mercury-free, liquid-in-glass thermometers that have the performance of mercury. Please contact Koehler Customer Service for availability of non-mercury type thermometer of interest. Please note, not all ASTM thermometers are available as non-mercury type.*

## ASTM THERMOMETERS

| Catalog Number | ASTM Designation | IP Reference | Name                                                               | Range         |
|----------------|------------------|--------------|--------------------------------------------------------------------|---------------|
| 250-000-76F    | 76F              | —            | Coolant Freezing Point                                             | –65 to +5°F   |
| 250-004-76F    | 76F              | —            | 76F CERTIFIED @ ASTM specified test points of –65, –30, +32°F      |               |
| 250-000-77F    | 77F              | —            | Saybolt Viscosity                                                  | 245 to 265°F  |
| 250-004-77F    | 77F              | —            | 77F CERTIFIED @ ASTM specified test points of 250, 260°F           |               |
| 250-000-78F    | 78F              | —            | Saybolt Viscosity                                                  | 295 to 315°F  |
| 250-004-78F    | 78F              | —            | 78F CERTIFIED @ ASTM specified test points of 300, 310°F           |               |
| 250-000-79F    | 79F              | —            | Saybolt Viscosity                                                  | 345 to 365°F  |
| 250-004-79F    | 79F              | —            | 79F CERTIFIED @ ASTM specified test points of 350, 360°F           |               |
| 250-000-80F    | 80F              | —            | Saybolt Viscosity                                                  | 395 to 415°F  |
| 250-004-80F    | 80F              | —            | 80F CERTIFIED @ ASTM specified test points of 400, 410°F           |               |
| 250-000-81F    | 81F              | —            | Saybolt Viscosity                                                  | 445 to 465°F  |
| 250-004-81F    | 81F              | —            | 81F CERTIFIED @ ASTM specified test points of 450, 460°F           |               |
| 250-000-82C    | 82C              | —            | Fuel Rating, Engine                                                | –15 to +105°C |
| 250-004-82C    | 82C              | —            | 82C CERTIFIED @ ASTM specified test points of 0, 50, 100°C         |               |
| 250-000-82F    | 82F              | —            | Fuel Rating, Engine                                                | 0 to 220°F    |
| 250-004-82F    | 82F              | —            | 82F CERTIFIED @ ASTM specified test points of 32, 100, 200°F       |               |
| 250-000-83C    | 83C              | —            | Fuel Rating, Air                                                   | 15 to 70°C    |
| 250-004-83C    | 83C              | —            | 83C CERTIFIED @ ASTM specified test points of 25, 70°C             |               |
| 250-000-83F    | 83F              | —            | Fuel Rating, Air                                                   | 60 to 160°F   |
| 250-004-83F    | 83F              | —            | 83F CERTIFIED @ ASTM specified test points of 85, 135°F            |               |
| 250-000-84C    | 84C              | —            | Fuel Rating, Orifice                                               | 25 to 80°C    |
| 250-004-84C    | 84C              | —            | 84C CERTIFIED @ ASTM specified test points of 30, 80°C             |               |
| 250-000-84F    | 84F              | —            | Fuel Rating, Orifice                                               | 75 to 175°F   |
| 250-004-84F    | 84F              | —            | 84F CERTIFIED @ ASTM specified test points of 100, 150°F           |               |
| 250-000-85C    | 85C              | —            | Fuel Rating, Surge                                                 | 40 to 150°C   |
| 250-004-85C    | 85C              | —            | 85C CERTIFIED @ ASTM specified test points of 50, 150°C            |               |
| 250-000-85F    | 85F              | —            | Fuel Rating, Surge                                                 | 100 to 300°F  |
| 250-004-85F    | 85F              | —            | 85F CERTIFIED @ ASTM specified test points of 150, 250°F           |               |
| 250-000-86C    | 86C              | —            | Fuel Rating, Mix                                                   | 95 to 175°C   |
| 250-004-86C    | 86C              | —            | 86C CERTIFIED @ ASTM specified test points of 100, 175°C           |               |
| 250-000-86F    | 86F              | —            | Fuel Rating, Mix                                                   | 200 to 350°F  |
| 250-004-86F    | 86F              | —            | 86F CERTIFIED @ ASTM specified test points of 225, 325°F           |               |
| 250-000-87C    | 87C              | —            | Fuel Rating, Coolant                                               | 150 to 205°C  |
| 250-004-87C    | 87C              | —            | 87C CERTIFIED @ ASTM specified test points of 160, 200°C           |               |
| 250-000-87F    | 87F              | —            | Fuel Rating, Coolant                                               | 300 to 400°F  |
| 250-004-87F    | 87F              | —            | 87F CERTIFIED @ ASTM specified test points of 300, 400°F           |               |
| 250-000-88C    | 88C              | —            | Vegetable Oil Flash                                                | 10 to 200°C   |
| 250-004-88C    | 88C              | —            | 88C CERTIFIED @ ASTM specified test points of 40, 100, 150, 200°C  |               |
| 250-000-88F    | 88F              | —            | Vegetable Oil Flash                                                | 50 to 392°F   |
| 250-004-88F    | 88F              | —            | 88F CERTIFIED @ ASTM specified test points of 110, 212, 300, 392°F |               |
| 250-000-89C    | 89C              | —            | Solidification Point                                               | –20 to +10°C  |
| 250-004-89C    | 89C              | —            | 89C CERTIFIED @ ASTM specified test points of –20, –10, 0, +10°C   |               |
| 250-000-90C    | 90C              | —            | Solidification Point                                               | 0 to 30°C     |
| 250-004-90C    | 90C              | —            | 90C CERTIFIED @ ASTM specified test points of 0, 10, 20, 30°C      |               |
| 250-000-91C    | 91C              | —            | Solidification Point                                               | 20 to 50°C    |
| 250-004-91C    | 91C              | —            | 91C CERTIFIED @ ASTM specified test points of 20, 30, 40, 50°C     |               |
| 250-000-92C    | 92C              | —            | Solidification Point                                               | 40 to 70°C    |
| 250-004-92C    | 92C              | —            | 92C CERTIFIED @ ASTM specified test points of 40, 50, 60, 70°C     |               |
| 250-000-93C    | 93C              | —            | Solidification Point                                               | 60 to 90°C    |
| 250-004-93C    | 93C              | —            | 93C CERTIFIED @ ASTM specified test points of 60, 70, 80, 90°C     |               |

## ASTM THERMOMETERS

| Catalog Number | ASTM Designation | IP Reference | Name                                                                    | Range            |
|----------------|------------------|--------------|-------------------------------------------------------------------------|------------------|
| 250-000-94C    | 94C              | —            | Solidification Point                                                    | 80 to 110°C      |
| 250-004-94C    | 94C              | —            | 94C CERTIFIED @ ASTM specified test points of 80, 90, 100, 110°C        |                  |
| 250-000-95C    | 95C              | —            | Solidification Point                                                    | 100 to 130°C     |
| 250-004-95C    | 95C              | —            | 95C CERTIFIED @ ASTM specified test points of 100, 110, 120, 130°C      |                  |
| 250-000-96C    | 96C              | —            | Solidification Point                                                    | 120 to 150°C     |
| 250-004-96C    | 96C              | —            | 96C CERTIFIED @ ASTM specified test points of 120, 130, 140, 150°C      |                  |
| 250-000-97C    | 97C              | —            | Tank Gauging                                                            | –18 to +49°C     |
| 250-004-97C    | 97C              | —            | 97C CERTIFIED @ ASTM specified test points of –15, 0, +20, 45°C         |                  |
| 250-000-97F    | 97F              | —            | Tank Gauging                                                            | 0 to 120°F       |
| 250-004-97F    | 97F              | —            | 97F CERTIFIED @ ASTM specified test points of 0, 32, 70, 110°F          |                  |
| 250-000-98C    | 98C              | —            | Tank Gauging                                                            | 16 to 82°C       |
| 250-004-98C    | 98C              | —            | 98C CERTIFIED @ ASTM specified test points of 20, 40, 60, 80°C          |                  |
| 250-000-98F    | 98F              | —            | Tank Gauging                                                            | 60 to 180°F      |
| 250-004-98F    | 98F              | —            | 98F CERTIFIED @ ASTM specified test points of 60, 100, 140, 180°F       |                  |
| 250-000-99C    | 99C              | —            | Weathering Test                                                         | –50 to +5°C      |
| 250-004-99C    | 99C              | —            | 99C CERTIFIED @ ASTM specified test points of –46, –32, –18, 0°C        |                  |
| 250-000-99F    | 99F              | —            | Weathering Test                                                         | –58 to +41°F     |
| 250-004-99F    | 99F              | —            | 99F CERTIFIED @ ASTM specified test points of –50, –25, 0, +32°F        |                  |
| 250-000-100C   | 100C             | —            | Solidification Point                                                    | 145 to 205°C     |
| 250-004-100C   | 100C             | —            | 100C CERTIFIED @ ASTM specified test points of 145, 165, 185, 205°C     |                  |
| 250-000-101C   | 101C             | —            | Solidification Point                                                    | 195 to 305°C     |
| 250-004-101C   | 101C             | —            | 101C CERTIFIED @ ASTM specified test points of 200, 250, 300°C          |                  |
| 250-000-102C   | 102C             | 83C          | Solvents Distillation                                                   | 123 to 177°C     |
| 250-004-102C   | 102C             | 83C          | 102C CERTIFIED @ ASTM specified test points of 125, 140, 155, 175°C     |                  |
| 250-000-103C   | 103C             | 84C          | Solvents Distillation                                                   | 148 to 202°C     |
| 250-004-103C   | 103C             | 84C          | 103C CERTIFIED @ ASTM specified test points of 150, 165, 180, 200°C     |                  |
| 250-000-104C   | 104C             | 85C          | Solvents Distillation                                                   | 173 to 227°C     |
| 250-004-104C   | 104C             | 85C          | 104C CERTIFIED @ ASTM specified test points of 175, 190, 205, 225°C     |                  |
| 250-000-105C   | 105C             | 86C          | Solvents Distillation                                                   | 198 to 252°C     |
| 250-004-105C   | 105C             | 86C          | 105C CERTIFIED @ ASTM specified test points of 200, 215, 230, 250°C     |                  |
| 250-000-106C   | 106C             | 87C          | Solvents Distillation                                                   | 223 to 277°C     |
| 250-004-106C   | 106C             | 87C          | 106C CERTIFIED @ ASTM specified test points of 225, 240, 255, 275°C     |                  |
| 250-000-107C   | 107C             | 88C          | Solvents Distillation                                                   | 248 to 302°C     |
| 250-004-107C   | 107C             | 88C          | 107C CERTIFIED @ ASTM specified test points of 250, 265, 280, 300°C     |                  |
| 250-000-108F   | 108F             | —            | Saybolt Viscosity                                                       | 270 to 290°F     |
| 250-004-108F   | 108F             | —            | 108F CERTIFIED @ ASTM specified test points of 275, 285°F               |                  |
| 250-000-109F   | 109F             | —            | Saybolt Viscosity                                                       | 320 to 340°F     |
| 250-004-109F   | 109F             | —            | 109F CERTIFIED @ ASTM specified test points of 325, 335°F               |                  |
| 250-000-110C   | 110C             | 93C          | Kinematic Viscosity @ 135C                                              | 133.6 to 136.4°C |
| 250-004-110C   | 110C             | 93C          | 110C CERTIFIED @ ASTM specified test points of 0, 135, 136°C            |                  |
| 250-000-110F   | 110F             | —            | Kinematic Viscosity @ 275F                                              | 272.5 to 277.5°F |
| 250-004-110F   | 110F             | —            | 110F CERTIFIED @ ASTM specified test points of 32, 275, 277°F           |                  |
| 250-000-111C   | 111C             | —            | Tar Acid Distillation                                                   | 170 to 250°C     |
| 250-004-111C   | 111C             | —            | 111C CERTIFIED @ ASTM specified test points of 170, 200, 250°C          |                  |
| 250-000-112C   | 112C             | —            | Solidification Benzene                                                  | 4 to 6°C         |
| 250-004-112C   | 112C             | —            | 112C CERTIFIED @ ASTM specified test points of 0, 4, 5, 6°C             |                  |
| 250-000-113C   | 113C             | 89C          | Bituminous Materials Softening Point                                    | –1 to +175°C     |
| 250-004-113C   | 113C             | 89C          | 113C CERTIFIED @ ASTM specified test points of 0, 50, 100, 150, 175°C   |                  |
| 250-000-113F   | 113F             | 89F          | Bituminous Materials Softening Point                                    | 30 to 350°F      |
| 250-004-113F   | 113F             | 89F          | 113F CERTIFIED @ ASTM specified test points of 32, 122, 212, 302, 347°F |                  |

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## ASTM THERMOMETERS

| Catalog Number | ASTM Designation | IP Reference | Name                                                                        | Range                                 |
|----------------|------------------|--------------|-----------------------------------------------------------------------------|---------------------------------------|
| 250-000-114C   | 114C             | 14C          | Aviation Fuel Freezing Point                                                | -80 to +20°C                          |
| 250-004-114C   | 114C             | 14C          | 114C CERTIFIED @ ASTM specified test points of -75, -60, -40, 0°C           |                                       |
| 250-000-114F   | 114F             | —            | Aviation Fuel Freezing Point                                                | -112 to +70°F                         |
| 250-004-114F   | 114F             | —            | 114F CERTIFIED @ ASTM specified test points of -103, -76, -40, +32°F        |                                       |
| 250-000-115C   | 115C             | —            | Beckman Differential                                                        | 0 to 6°C CERTIFICATION DOES NOT APPLY |
| 250-000-116C   | 116C             | —            | Bomb Colorimeter                                                            | 18.9 to 25.1°C                        |
| 250-004-116C   | 116C             | —            | 116C CERTIFIED @ ASTM specified test points of 19, 20, 21, 22, 23, 24, 25°C |                                       |
| 250-000-117C   | 117C             | —            | Bomb Colorimeter                                                            | 23.9 to 30.1°C                        |
| 250-004-117C   | 117C             | —            | 117C CERTIFIED @ ASTM specified test points of 24, 25, 26, 27, 28, 29, 30°C |                                       |
| 250-000-118C   | 118C             | —            | Kinematic Viscosity @ 30C                                                   | 28.6 to 31.4°C                        |
| 250-004-118C   | 118C             | —            | 118C CERTIFIED @ ASTM specified test points of 0, 30, 31°C                  |                                       |
| 250-000-118F   | 118F             | —            | Kinematic Viscosity @ 86F                                                   | 83.5 to 88.5°F                        |
| 250-004-118F   | 118F             | —            | 118F CERTIFIED @ ASTM specified test points of 32, 86, 88°F                 |                                       |
| 250-000-119C   | 119C             | —            | Coolant Freezing Point                                                      | -38.3 to -30°C                        |
| 250-004-119C   | 119C             | —            | 119C CERTIFIED @ ASTM specified test points of -38, -30, 0°C                |                                       |
| 250-000-119F   | 119F             | —            | Coolant Freezing Point                                                      | -37 to -22°F                          |
| 250-004-119F   | 119F             | —            | 119F CERTIFIED @ ASTM specified test points of -36, -22, +32°F              |                                       |
| 250-000-120C   | 120C             | 92C          | Kinematic Viscosity @ 40C                                                   | 38.6 to 41.4°C                        |
| 250-004-120C   | 120C             | 92C          | 120C CERTIFIED @ ASTM specified test points of 0, 40, 41°C                  |                                       |
| 250-000-121C   | 121C             | 32C          | Kinematic Viscosity @ 100C                                                  | 98.6 to 101.4°C                       |
| 250-004-121C   | 121C             | 32C          | 121C CERTIFIED @ ASTM specified test points of 0, 100, 101°C                |                                       |
| 250-000-122C   | 122C             | 94C          | Brookfield Viscosity                                                        | -45 to -35°C                          |
| 250-004-122C   | 122C             | 94C          | 122C CERTIFIED @ ASTM specified test points of -45, -40, -35°C              |                                       |
| 250-000-123C   | 123C             | 95C          | Brookfield Viscosity                                                        | -35 to -25°C                          |
| 250-004-123C   | 123C             | 95C          | 123C CERTIFIED @ ASTM specified test points of -35, -30, -25°C              |                                       |
| 250-000-124C   | 124C             | 96C          | Brookfield Viscosity                                                        | -25 to -15°C                          |
| 250-004-124C   | 124C             | 96C          | 124C CERTIFIED @ ASTM specified test points of -25, -20, -15°C              |                                       |
| 250-000-125C   | 125C             | 97C          | Brookfield Viscosity                                                        | -15 to -5°C                           |
| 250-004-125C   | 125C             | 97C          | 125C CERTIFIED @ ASTM specified test points of -15, -10, -5°C               |                                       |
| 250-000-126C   | 126C             | 71C          | Kinematic Viscosity @ -26.1C                                                | -27.4 to -24.6°C                      |
| 250-004-126C   | 126C             | 71C          | 126C CERTIFIED @ ASTM specified test points of -27, -26.1, 0°C              |                                       |
| 250-000-126F   | 126F             | 71F          | Kinematic Viscosity @ -15F                                                  | -17.5 to -12.5°F                      |
| 250-004-126C   | 126F             | 71F          | 126F CERTIFIED @ ASTM specified test points of -17, -15, +32°F              |                                       |
| 250-000-127C   | 127C             | 99C          | Kinematic Viscosity @ -20C                                                  | -21.4 to -18.6°C                      |
| 250-004-127C   | 127C             | 99C          | 127C CERTIFIED @ ASTM specified test points of -21, -20, 0°C                |                                       |
| 250-000-128C   | 128C             | 33C          | Kinematic Viscosity @ 0C                                                    | -1.4 to +1.4°C                        |
| 250-004-128C   | 128C             | 33C          | 128C CERTIFIED @ ASTM specified test points of 0, 1°C                       |                                       |
| 250-000-128F   | 128F             | 33F          | Kinematic Viscosity @ 32F                                                   | 29.5 to 34.5°F                        |
| 250-004-128F   | 128F             | 33F          | 128F CERTIFIED @ ASTM specified test points of 32, 34°F                     |                                       |
| 250-000-129C   | 129C             | 36C          | Kinematic Viscosity @ 93.3C                                                 | 91.6 to 94.4°C                        |
| 250-004-129C   | 129C             | 36C          | 129C CERTIFIED @ ASTM specified test points of 0, 93.3, 94°C                |                                       |
| 250-000-129F   | 129F             | 36F          | Kinematic Viscosity @ 200F                                                  | 197.5 to 202.5°F                      |
| 250-004-129F   | 129F             | 36F          | 129F CERTIFIED @ ASTM specified test points of 32, 200, 202°F               |                                       |
| 250-000-130C   | 130C             | —            | Tank Gauging                                                                | -7 to +105°C                          |
| 250-004-130C   | 130C             | —            | 130C CERTIFIED @ ASTM specified test points of 0, 35, 70, 105°C             |                                       |
| 250-000-130F   | 130F             | —            | Tank Gauging                                                                | 20 to 220°F                           |
| 250-004-130F   | 130F             | —            | 130F CERTIFIED @ ASTM specified test points of 32, 100, 160, 220°F          |                                       |
| 250-000-132C   | 132C             | —            | Kinematic Viscosity @ 150C                                                  | 148.6 to 151.4°C                      |
| 250-004-132C   | 132C             | —            | 132C CERTIFIED @ ASTM specified test points of 0, 150, 151°C                |                                       |

## GLASS APPARATUS FOR ASTM TEST METHODS

### **C70 Determination of the Percentage of Voids and Surface Moisture in Fine Aggregates**

K00C70 Specific Gravity Flask, Chapman, graduated at 200mL and 375-450mL

### **C128 Determination of Specific Gravity of Hydraulic Cement, Sand, Powdered Materials**

K0C128 Specific Gravity Flask, Le Chatelier, 250mL, 17mL Bulb, Graduated Neck

### **C135 Determination of Specific Gravity of Pigments, Drying Oils, Varnishes, Resins, etc.**

KDOC135-10 Pycnometer, 10mL, with Thermometer and Cap

KDOC135-25 Pycnometer, 25mL, with Thermometer and Cap

KDOC135-50 Pycnometer, 50mL, with Thermometer and Cap

KDOC135-100 Pycnometer, 100mL, with Thermometer and Cap

### **C188 Determination of Specific Gravity of Hydraulic Cement, Sand, Other Powdered Materials**

K0C128 Specific Gravity Flask, Le Chatelier, 250mL, 17mL Bulb, Graduated Neck

### **D20 Distillation of Bituminous Products**

K00D20-300 Flask, Distillation, 300mL, Side Arm, 10mm ID x 220mm

K00D20-500 Flask, Distillation, 500mL, Side Arm, 10mm ID x 220mm

### **D29 Analysis of Dry Shellac and Shellac Varnishes**

K00D29-125 Iodine Flask, 125mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-250 Iodine Flask, 250mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-300 Iodine Flask, 300mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-500 Iodine Flask, 500mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-1000 Iodine Flask, 1000mL, S/T 24/40 Mercury Seal w/Hollow Stopper

### **D70 Specific Gravity and Density of Semi-Solid Bituminous Materials**

K00D70 Pycnometer Bottle, 24-30mL, Uncalibrated

### **D115 Determination of Specific Gravity of Solid (Bituminous) Materials, Asphalt Cements, and Soft Tar Pitches**

KOD115-750 Specific Gravity Flask, 750mL, w/Capillary Stem and Cap

KOD115-750 Specific Gravity Flask, 1000mL, w/Capillary Stem and Cap

### **D153 Determination of Specific Gravity of Pigments, Drying Oils, Varnishes, Resins, etc.**

K0C135-10 Pycnometer, 10mL, with Thermometer and Cap

K0C135-25 Pycnometer, 25mL, with Thermometer and Cap

K0C135-50 Pycnometer, 50mL, with Thermometer and Cap

K0C135-100 Pycnometer, 100mL, with Thermometer and Cap

### **D215 Determination of Carbon Dioxide and Sulfur Dioxide in Carbonates**

KOD215 Alkalimeter, Knorr, 250mL Flask, S/T 24/40 and S/T 16

### **D297 Direct Determination of Isoprene Polymer Using Heating Mantles.**

KOD297 Rubber Distillation System consisting of 500mL Steam Generating Flask, 100mL Digestion Flask, Claisen Head, Spray Bulb, Condensing Adapter, two 500mL Receiving Flasks, and Condenser (supplied **without heat mantles**)

### **D301 Determination of Consistency of Soluble Nitrocellulose by Falling Ball Method**

KOD301 Falling Ball Viscosity Tube, 1" x 14", graduated 10" apart, with 5 Steel Balls, .312" OD

### **D322 Determination of Dilution in Crankcase Oil**

KOD322-5 Distillation Receiver, S/T 24/40, graduated 5mL in 0.1mL divisions

KOD322-12 Distillation Receiver, S/T 24/40, graduated 12.5mL x 0.1 divisions

### **D369 Determination of Specific Gravity**

KOD369-1 Specific Gravity Bottle, Gas-Lussac, 1mL, Unadjusted

KOD369-2 Specific Gravity Bottle, Gas-Lussac, 2mL, Unadjusted

KOD369-5 Specific Gravity Bottle, Gas-Lussac, 5mL, Unadjusted

KOD369-10 Specific Gravity Bottle, Gas-Lussac, 10mL, Unadjusted

### **D402 Distillation of Cut-Back Asphaltic (Bituminous) Products**

KOD402-F Flask, Distillation, 500mL, Side arm 13x220mm

KOD402-C Condenser, Liebig, Plain, 300mm

KOD402-A Adapter, Glass, 105 Degree, 18mm ID x 5mm ID

### **D422 Soil Testing Hydrometer Cylinders**

KOD422-1000 Hydrometer Cylinder, 1000mL TC, 460mm tall

KOD422-1205 Hydrometer Cylinder, graduated 1130 and 1205mL, 460mm tall

### **D453 Determination of Tar Acid**

KOD453 Separatory Funnel, Tar Acid, S/T 19 Stopper, 2mm Stopcock, Graduated Stem between Bulbs, 65 to 100mL in 0.2mL divisions

### **D555 Iodine Determination**

K00D29-125 Iodine Flask, 125mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-250 Iodine Flask, 250mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-300 Iodine Flask, 300mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-500 Iodine Flask, 500mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-1000 Iodine Flask, 100mL, S/T 24/40 Mercury Seal w/Hollow Stopper

### **D565 Carbonizable Substances in White Mineral Oil**

KOD565 Test Tube, Ground Stopper, 15x140, graduated 5 and 10mL

### **D612 Carbonizable Substances in Paraffin Wax**

KOD565 Test Tube, Ground Stopper, 15x140, graduated 5 and 10mL

### **D789 Determination of Relative Viscosity of Polymer Solution in Formic Acid Solution**

KOD789 Viscometry Apparatus, consisting of 25mL Pipette, 50mL Flask with S/T 19/22 joints, and Pipette Adapter

## GLASS APPARATUS FOR ASTM TEST METHODS

### D848 Acid Wash Color of Industrial Aromatic Hydrocarbons

|          |                                                                                                                               |
|----------|-------------------------------------------------------------------------------------------------------------------------------|
| K0D848-A | Sample Bottle, 1 ounce capacity, flat bottom, square, glass stoppered and graduated at 7mL and 28mL                           |
| K0D848-B | Individual Color Standard Bottle, 1 ounce capacity, flat bottom, square, glass stoppered, with a Specified number (0-14)      |
| K0D848-C | Set of Fifteen (15) Color Standard Bottles numbered 0-14, empty                                                               |
| K0D848-D | Individual Color Standard Bottle, filled with specific number solution                                                        |
| K0D848-E | Set of Fifteen(15) Color Standard bottles (0-14) filled                                                                       |
| K0D848-F | Color Standard Set with Case, lighted white plexiglass, full set of color standards sealed in bottles, and two sample bottles |

### D854 Determination of Specific Gravity

|           |                                                       |
|-----------|-------------------------------------------------------|
| K0D369-1  | Specific Gravity Bottle, Gas-Lussac, 1mL, Unadjusted  |
| K0D369-2  | Specific Gravity Bottle, Gas-Lussac, 2mL, Unadjusted  |
| K0D369-5  | Specific Gravity Bottle, Gas-Lussac, 5mL, Unadjusted  |
| K0D369-10 | Specific Gravity Bottle, Gas-Lussac, 10mL, Unadjusted |

### D888 Determination of Dissolved Oxygen in Water

|        |                                                                                    |
|--------|------------------------------------------------------------------------------------|
| K0D888 | Gas Collecting Tube, McLean type, 500mL, 3mm Stopcocks, graduated 2mL on Tube Ends |
|--------|------------------------------------------------------------------------------------|

### D889 Determination of Volatile Oil in Rosin

|        |                                                          |
|--------|----------------------------------------------------------|
| K0D889 | Distillation Receiver, 5mL in 0.1mL divisions, S/T 24/40 |
|--------|----------------------------------------------------------|

### D891 Determination of Specific Gravity of Liquid Chemicals, Halogenated Organic Solvents, Ethylene Glycols, Propylene Glycols

|           |                                                              |
|-----------|--------------------------------------------------------------|
| K0D891-25 | Specific Gravity Bottle for Volatile Liquids, 25mL, Jacketed |
| K0D891-50 | Specific Gravity Bottle for Volatile Liquids, 50mL, Jacketed |

### D914 Testing Ethylcellulose and Methylcellulose

|        |                                      |
|--------|--------------------------------------|
| K0D914 | Apparatus for Testing Ethylcellulose |
|--------|--------------------------------------|

### D941 Density and Relative Density (Specific Gravity) of Liquids by Lipkin Bicapillary Pycnometer

|        |                                                             |
|--------|-------------------------------------------------------------|
| K0D941 | Pycnometer, side-arm type, 4.5 ±0.5mL, Weight less than 30g |
|--------|-------------------------------------------------------------|

### D1015 Freezing Points of High Purity Hydrocarbons

|           |                                                  |
|-----------|--------------------------------------------------|
| KD1015-FT | Freezing Point Tube, Glass, with Hi-Vac Stopcock |
|-----------|--------------------------------------------------|

### D1016 Purity of Hydrocarbons from Freezing Points

|           |                                                                                                                                                                    |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| KD1015-AS | Apparatus for Obtaining Sample, consisting of Dewar Flask, 50mL Condensing Tube, 3-way Stopcock, and Connecting Tubes 10mm OD with S/J 18/7 Ball and Socket Joints |
| KD1015-NG | Distilling Apparatus for Gaseous Substances, consisting of two Dewar Flasks, Distilling Tube, and Receiver                                                         |
| KD1015-NL | Distilling Apparatus for Normally Liquid Substances, consisting of Dewar Flask, Receiver, and 200mL Flask with Cap                                                 |

### D1018 Hydrogen in Petroleum Fractions

|           |                                                 |
|-----------|-------------------------------------------------|
| KD1018-A  | Absorber Only, Turner Type                      |
| KD1018-B  | Lamp Burner, S/T 14/20 Joints, Concentric Tubes |
| KD1018-CH | Hydrogen Determination Chimney                  |

|            |                                               |
|------------|-----------------------------------------------|
| KD1018-D-1 | Erlenmeyer Flask, 14/10 S/T Outer Joint, 25mL |
| KD1018-D-2 | Standard Burner, 14/10 S/T Inner Joints       |
| KD1018-D-3 | Chimney for Lamp Hydrogen Apparatus           |
| KD1018-E   | Absorption Bulbs                              |
| KD1018-F   | Drierite U-Tube                               |

### D1065 Determination of Unsaponifiable Matter in Gum and Wood Rosin

|        |                                                                      |
|--------|----------------------------------------------------------------------|
| KD1065 | Extraction Apparatus, Ether, S/T 24/40, 400mm Condenser, 250mL Flask |
|--------|----------------------------------------------------------------------|

### D1072 Total Sulfur in Fuel Gases

|           |                                                         |
|-----------|---------------------------------------------------------|
| KD1072-B  | Burner, S/T 14/10 Joint, Gas                            |
| KD1266-C  | Chimney, S/T 14/10 and S/T 24/40 Joints                 |
| KD1266-A  | Absorber, S/T 24/40 Joints, Parallel Chambers, AU Shape |
| KD1266-ST | Spray Trap, S/T 24/40 Joint, 65mm OD                    |

### D1091 Phosphorus Lubricating Oils s in And Additives

|        |                                                              |
|--------|--------------------------------------------------------------|
| KD1091 | Flask, Kjeldahl, Digestion, 300mL, with Ground Glass Stopper |
|--------|--------------------------------------------------------------|

### D1093 Centrifuge Tube, 100mL

|          |                                                  |
|----------|--------------------------------------------------|
| K00D96-8 | Centrifuge Tube, Conical, A8-Inch (203mm), 100mL |
|----------|--------------------------------------------------|

### D1120 Determination of Equilibrium Boiling Point of Engine Antifreezes Miscible With Water

|        |                                                                 |
|--------|-----------------------------------------------------------------|
| KD1120 | Distillation Apparatus, 100mL Flask, 200mm Condenser, S/T 19/38 |
|--------|-----------------------------------------------------------------|

### D1168 Testing Hydrocarbon Waxes for Electrical Insulation

|        |                                                                       |
|--------|-----------------------------------------------------------------------|
| KD1168 | Dilatometer, 0-2mL in 0.02mL divisions, S/T 14/20 Joint, 2mm Stopcock |
|--------|-----------------------------------------------------------------------|

### D1173 Test For Foaming Properties of Surface-Active Agents

|        |                                                                                                                                         |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------|
| KD1173 | Pour Foam Test Apparatus, Ross-Miles, 200mL Pipette, Receiver graduated at 50mL and 250mL, Teflon Stopcocks, 2mm and 6mm Bore, Jacketed |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------|

### D1217 Density and Relative Density of Liquids By Bingham Pycnometer

|           |                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------|
| KD1217-P  | Pycnometer, Bingham type, Stoppered, 25mL 1.0 - 1.1mm neck                                              |
| KD1217-PC | Pycnometer Cleaning Apparatus, Hot Chromic Acid, consisting of 3-way Stopcock with Joint Inside Chamber |

### D1266 Sulfur in Petroleum Products (Lamp)

|           |                                                         |
|-----------|---------------------------------------------------------|
| KD1266-A  | Absorber, S/T 24/40 Joints, Parallel Chambers, AU shape |
| KD1266-C  | Chimney, S/T 14/10 and S/T 24/40 Joints                 |
| KD1266-ST | Spray Trap, S/T 24/40 Joint, 65mm OD                    |
| KD1266-SF | Standard Flask, 25mL, S/T 14/10 Joint, with Hooks       |
| KD1266-FA | Flask for Aromatic Samples with Side Arm                |
| KD1266-SB | Standard Burner, S/T 14/10 Joints                       |
| KD1266-BA | Burner for Aromatic Samples                             |

### D1347 Standard Method of Testing Methylcellulose

|       |                                      |
|-------|--------------------------------------|
| KD914 | Apparatus for Testing Ethylcellulose |
|-------|--------------------------------------|

### D1394 Jones-Blair Reductor

|        |                                                              |
|--------|--------------------------------------------------------------|
| KD1394 | Column, Jones-Blair Reductor, 19mm ID x 450mm Long, 4mm stpk |
|--------|--------------------------------------------------------------|

## GLASS APPARATUS FOR ASTM TEST METHODS

### D1480 Density and Relative Density of Viscous Materials by Bingham Pycnometer

KD1480 Pycnometer, Bingham Type, Stoppered, 2mm ID neck, 10mL

### D1481 Density and Relative Density of Viscous Materials by Lipkin Bicapillary Pycnometer

KD1481 Pycnometer, Side-Arm Type, Weight less than 35 grams, 10mL

### D1505 Density Gradient Determination

KD1505-C Density Gradient Column, Jacketed, 38mm ID x 44" long

KD1505-F Density Float (specify exact density and color identification)

### D1541 Iodine Flasks

K00D29-125 Iodine Flask, 125mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-250 Iodine Flask, 250mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-300 Iodine Flask, 300mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-500 Iodine Flask, 500mL, S/T 24/40 Mercury Seal w/Hollow Stopper

K00D29-1000 Iodine Flask, 1000mL, S/T 24/40 Mercury Seal w/Hollow Stopper

### D1607 Sampling Nitrogen Dioxide in Small Concentrations

KD1607 Gas Bubbler Apparatus, S/T 29/42, S/J 18/7, Coarse Pencil Frit

### D1638 Specific Gravity of Pigments, Drying Oils, Varnishes, Resins, etc.

KOC135-10 Pycnometer, 10mL, with Thermometer and Cap

KOC135-25 Pycnometer, 25mL, with Thermometer and Cap

KOC135-50 Pycnometer, 50mL, with Thermometer and Cap

KOC135-100 Pycnometer, 100mL, with Thermometer and Cap

### D1839 Amyl Nitrate in Diesel Fuels

KD1839-F Flask, Distilling, 300mL, S/T 24/40 Joint

KD1839-DC Distillate Collector, S/T 24/40 Joints

KD1839-C Condenser, Allihn, 300mm, S/T 24/40 Joint

KD1839-VF Volumetric Flask, 100mL, Stoppered

KD1839-FF Funnel for Volumetric Flask

### D1949 Separation of Tetraethyllead and Tetramethyllead in Gasoline

KD1949-F Flask, 200mL, S/T 24/40 Joint

KD1949-DC Distilling Column, 12mm IDx300, Vacuum Jacketed (w/o Beads)

KD1949-C Condenser, Liebig type, S/T 10/30 Top Joint, 100mm

### D1963 Specific Gravity of Pigments, Drying Oils, Varnishes, Resins, etc.

KOC135-10 Pycnometer, 10mL, with Thermometer and Cap

KOC135-25 Pycnometer, 25mL, with Thermometer and Cap

KOC135-50 Pycnometer, 50mL, with Thermometer and Cap

KOC135-100 Pycnometer, 100mL, with Thermometer and Cap

### D1966 Determination of Water and Sediment By Centrifuge Method

KD1966 Centrifuge Tube, Pear-Shape, 100mL with Lower Stem Graduated to 1.5mL in 0.1mL divisions

### D2001 Depentanization of Gasoline and Naphthas

KD2001-A Distillation Column, Jacketed, 13mm ID

KD2001-B Reflux Condenser Head for Distillation Column

KD2001-C Trap for Light End Depentanization

KD2001-D Receiver, Graduated, 12.5mL, S/T 19/38 Male Joint

KD2001-E Dewar Flask, for Immersion of Receiver

KD2001-F Flask, Distilling, 100mL, R.B., S/T 24/40 Joint

### D2002 Isolation of Representative Saturates Fractions from Low-Olefinic Petroleum Naphthas

KD2002-C-1 Alternate Analytical Absorption Column, w/top adapter

KD2002-C Absorption Column, Analytical, Water Jacketed

KD2002-ER Eluant Reservoir, 250mL, S/J 28/15 Joints with Stopper

KD2002-R Receiver, 10mL with TFE Stopcock and S/T 14/35 Joint

### D2003 Isolation of Representative Saturates Fraction from High-Olefinic Petroleum Naphthas

KD2003-AC Absorption Column, Water Jacketed, S/J 28/15 and S/T 14/35 Joints

KD2003-R Receiver, Graduated, 10mL, S/T 14/35 Joint, TFE Stopcock

### D2007 Characteristic Groups in Rubber Extender and Processing Oils and other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method

KD2007-C Clay-Gel Percolating Column (2 required), S/T 24/40, Fritted Disc

KD2007-F Distillation Flask, 3-neck, 500mL, S/T 24/40 Joint, for Extraction

KD2007-H Distillation Head with Vigreux Column, S/T 24/40, TFE Stopcock

KD2007-CT Connecting Tube from Flask to Column, S/T 24/40  
*(If ordered with Flask, Head, and Column, Tube can be supplied custom fitted. Otherwise user must heat glass tube to soften and align and conform to fit properly, or install a flexible connection device such as teflon bellows or slip-fit teflon tubing sleeve).*

KD2007-RC Reflux Condenser, S/T 24/40, Friedrichs

KD2007-B Beaker, Anticreep, 150mL

KD2007-APC Azobenzene Percolation Column, 12x600mm, 125mL Reservoir

KD2007-MV Teflon Metering Stopcock for Azobenzene Percolation Column

### D2036 Determination of Cyanides in Water

KD2036 Complete Distillation Apparatus, consisting of 1000mL 2-neck Flask, Cold Finger Condenser, Absorber Trap, Inlet Tube

### D2111 Determination of Specific Gravity of Liquid Chemicals, Halogenated Organic Solvents Ethylene Glycols and Propylene Glycols

KOD891-25 Specific Gravity Bottle for Volatile Liquids, 25mL, Jacketed

KOD891-50 Specific Gravity Bottle for Volatile Liquids, 50mL, Jacketed

### D2162 Basic Calibration of Master Viscometers And Viscosity Oil Standards

KD2162-C1 Cannon Master Viscometer, Approximately 0.001-0.003cSt/s

KD2162-C3 Cannon Master Viscometer, Approximately 0.003-0.009cSt/s

KD2162-U1 Ubbelohde Master Viscometer, Approximately 0.001-0.003cSt/s

KD2162-U3 Ubbelohde Master Viscometer, Approximately 0.003-0.009cSt/s

## GLASS APPARATUS FOR ASTM TEST METHODS

### D2184 Determination of Isotopic Concentration of Heavy Water.

KD2184-P Pycnometer, 25mL, S/T 7/15 Stopper  
KD2184-MS2 Matched Set of two Pycnometers

### D2352 Determination of Carbon Dioxide and Sulfur Dioxide in Carbonates

KD215 Alkalimeter, Knorr, 250mL Flask, S/T 24/40 and S/T 16

### D2363 Testing of Hydroxypropyl Methylcellulose

KD2363 Complete apparatus for Steam Distillation including Steam Boiler Tube with Inlet Adapter, 25mL Boiling Flask with Side Neck, Vigreux Column, 110mm long Liebig Type Condenser, and Vertical Adapter for delivery (S/T 14/20 Joints) (boiler has S/T 24/40 joints)

### D2385 Hydrogen Sulfide and Mercaptan Sulfur In Natural Gas (Cadmium Sulfate Iodometric Titration Method)

KD2385-GWB Gas Washing Bottle, 70x280mm, Coarse Fritted Disc, S/T 24/40  
KD2385-ST Spray Trap, S/T 24/40 Joint, 65mm OD Bulb

### D2420 Hydrogen Sulfide in LP Gases by Lead Acetate Method

KD2420 Apparatus including Cylinder, Stoppers, Watch Glass and Glass Rod

### D2533 Vapor-Liquid Ratio of Spark-Ignition Engine Fuels

KD2533 Buret, Vapor-Liquid Ratio, Graduated 0 - 35mL

### D2549 Separation of Representative Aromatics and Nonaromatics Fractions of High-Boiling Oils by Elution Chromatography

KD2549-C2 Chromatographic Column, 10x760mm, 100mL bulb, for 2 gram  
KD2549-C10 Chromatographic Column, 15x1150mm, 200mL bulb, for 10 gram

### D2569 Distillation of Pitch

KD2569-F Flask, Distillation, 300mLx131mm tall w/side arm 10x220mm  
KD2569-F Condenser, Air, 13x360mm

### D2619 Hydrolytic Stability of Hydraulic Fluids (Beverage Bottle Method)

K00D96-8 Centrifuge Tube, Conical, A8-Inch (203mm), 100mL

### D2717 Thermal Conductivity of Liquids

KD2717 Thermal Conductivity Cell, Platinum Resistance Thermometer

### D2748 Determination of Pyridine Bases in Acids

KD2748 Distillation Apparatus Consisting of 1000mL Boiling Flask, Bulb Trap Adapter, Connection Adapter, 600mm Liebig Type Condenser, and Lower Drip Adapter, S/T 24/40 Joints

### D2780 Solubility of Fixed Gases in Liquids

KD2780-PS Ambient Pressure Saturator, Glass, 1000mL, S/T 27 Joint, PTFE Stopcock w/O-Rings, Upper Head for Gas Inlet, Outlet and Dispersion Element, and Heating Mantel and Thermocouple wire x 6 ft long  
KD2780-ES Gas Extraction System consisting of KD2780-ES1 through KD2780-ES7  
KD2780-ES1 Reflux Condenser, Liebig, S/T 24/40, 300mm  
KD2780-ES2 Gas Extraction Chamber, 60 x 280mm, S/J 12/2 Joints  
KD2780-ES3 Boiler Flask, 500mL, Round Bottom, S/J 35/25 Socket Joint, with Adapter, 35/25 x 12/2 S/J Joint  
KD2780-ES4 Gas Buret, Water Jacketed, 100mL, with 3-Way, TEE Bore Stopcock and S/J 12/2 Joint  
KD2780-ES5 Leveling Bulb, 500mL  
KD2780-ES6 Connecting Manifold with 3 - TFE 120 Degree Stopcocks  
KD2780-ES7 Manometer, Open End, 1-Meter, S/J 12/2 Connection

### D2879 Vapor Pressure-Temperature Relationship and Initial Decomposition Temperature of Liquids by Isoteniscope

KD2879 Isoteniscope Pressure Manometer, 8mm Od x 500mm w/bulb

### D2886 Vacuum Trap

KD2886 Vacuum Trap, 22x125mm, Inlet & Outlet Arms 10mm OD

### D2892 Distillation of Crude Petroleum (15- Theoretical Plate Column)

Quotations submitted on request. Specify Type, Scale, and Sizes of Components Required.

### D2910 Extraction Apparatus

KD2910 Complete Extraction Apparatus consisting of 3000 mL Solvent Flask, Extractor Body with Extraction Chamber, Siphon Tube, Removable Filter and Top Lid, and Allihn Condenser 250mm. Joints are S/T 45/50

### D2912 Oxidant Content of Atmosphere

KD2912 Impinger, Midget, S/T 24/40, 25mm Body, 5mm Inlet, 1mm Nozzle, Body Graduated 0-25mL in 5mL Divisions

### D2913 Mercaptan Content of Atmosphere

KD2913 Impinger, Midget, S/T 24/40, 25mm Body Graduated to 25mL in 5mL Divisions, 5mm ID inlet, Coarse Fritted Pencil at Tip

### D2914 Oxidant Content of Atmosphere

KD2912 Impinger, Midget, S/T 24/40, 25mm Body, 5mm Inlet, 1mm Nozzle, Body Graduated 0-25mL in 5mL Divisions

### D2972 Determination of Arsenic in Water

KD2972 Arsenic Determination Apparatus consisting of 125mL Erlenmeyer Flask, Scrubber Tube, and Absorber Tube, S/T 24/40 and S/J 12/2

### D3120 Trace Quantities of Sulfur in Light Liquid Petroleum Hydrocarbons by Oxidative Microcoulometry

KD3120 Pyrolysis Tube, Quartz, S/J 18/9 Ball exit, 6mm Inlets, Septum

### D3234 Abrasion Resistance of Petroleum Wax Coatings

KD3234-T Glass Tube, 1" ID x 12" Long, with Support Device for #12 Sieve  
KD3234-S Screen Sieve, Size #12, cut 1" Diameter  
KD3234-F Separatory Funnel, 500mL, 4mm TFE Stopcock, Stem Cut Short

## GLASS APPARATUS FOR ASTM TEST METHODS

### D3242 Acidity in Aviation Turbine Fuel

KD3242 Titration Flask, 500mL, Erlenmeyer Shape, with Inlet Tube

### D3246 Sulfur in Petroleum Gas By Oxidative Microcoulometry

KD3120 Pyrolysis Tube, Quartz, S/J 18/9 Ball exit, 6mm Inlets, Septum

### D3431 Trace Nitrogen in Liquid Petroleum Hydrocarbons (Microcoulometric Method)

KD3120 Pyrolysis Tube, Quartz, S/J 18/9 Ball exit, 6mm Inlets, Septum

### D3505 Density of Liquid Hydrocarbon Materials

KD0941 Pycnometer, Side Arm Type, 4.5 ±0.5mL, Weight less than 30g

### D3608 Sampling Low Concentrations of Nitrogen Dioxide

KD1607 Gas Bubbler Apparatus, S/T 29/42, S/J 18/7, Coarse Pencil Fit

### D3712 Analysis of Oil-Soluble Petroleum Sulfonates by Liquid Chromatography

KD3712-C Chromatographic Column, 22 x 300mm  
w/250mL Reservoir, 28/15

KD3712-P Pycnometer for Determining Specific Gravity, 50mL ±1.0mL

### D3825 Dynamic Surface Tension by the Fast-Bubble Technique

KD3825 Glass Bubbler Unit, Jacketed, without Pressure Transducer

### D3831 Manganese in Gasoline by Atomic Absorption Spectrometry

KD3831 Automatic Pipette, 9.0mL, with Auto-zero and TFE Stopcock

### D3867 Test for Nitrite-Nitrate in Water

KD3867 Cadmium Reduction Column, 5x200mm, 85mL Reservoir

### D3904 Oil from Oil Shale (Resource Evaluation by the USBM Fischer Assay Procedure)

KD3904-R Receiver, 100mL Centrifuge Tube, Pear Shape

KD3904-A Adapter, S/T 24/40, to Receive Product from Retort

KD3904-C Condenser, Allihn, 300mm, S/T 24/40

### D3907 Testing Fluid Cracking Catalysts by Microactivity Test

KD3907-R Glass Reactor body, 18mmx376mm, S/T 28/15  
and 12/5 O-ring Joints

KD3907-PR Product Receiver, Liquid, S/T 12/5 O-ring Joints

### D3908 Hydrogen Chemisorption on Supported Platinum on Alumina Catalysts by Volumetric Vacuum Method.

KD3908 Sample Cell, S/T 10/30 Joints, 2mm Vacuum Stopcocks

### D3945 Shear Stability of Polymer-Containing Fluids Using a Diesel Injector Nozzle

KD3945-CV Cooling Vessel, Jacketed, 25mm IDx180mm long,  
TFE Stopcock

KD3945-FR Fluid Reservoir, 250mL, w/Distributor Plate  
and 3-way Stopcock

### D4006 Water in Crude Oil by Distillation

KD4006-A Distillation Trap, 5mL in 0.05

KD4006-B Drying tube for Distillation Apparatus

KD4006-C Condenser, 400mm, Liebig, S/T 24/40

KD4006-F Flask, 1000mL, S/T 24/40, Round Bottom

### D4180 Vibratory Packing Density of Formed Catalyst Carriers

KD4180 Feed Funnel, 100mm x 20mm ID

### D4484 Inorganic Particles in Marine Residual Fuel Oils by Selective Centrifugal Separation

KD2709 Centrifuge Tube, Conical, 100mL,  
Tip Graduated to .05mL in .01 Divisions

### D4486 Kinematic Viscosity of Volatile and Reactive Liquids

KD4486 Viscometer for Vulnerable Liquids  
(specify approximate constant)

### D4512 Vibrated Apparent Packing Density of Fine Catalyst Particles and Powder

KD4180 Feed Funnel, 100mm x 20mm ID

### D4629 Organically Bound Trace Nitrogen in Liquid Petroleum Hydrocarbons by Oxidative Combustion and Chemiluminescence Detection

KD4629 Pyrolysis Tube, Quartz, S/J 18/9 Ball outlet,  
6mm Inlets, Septum

### D4814 Automotive Spark-Ignition Engine Fuel

KD2533 Buret, Vapor-Liquid Ratio, Graduated, 0-35mL

### D4871 Guide for Universal Oxidation/Thermal Stability Test Apparatus

KD4871-TC Test Cell, 38 x 300mm, S/T 34/45 Joint

KD4871-C Condenser, Allihn, 330mm, S/T 34/45 Joint, Top 9mm ID

KD4871-G11 Gas Inlet Tube, 8x850mm with Capillary Tip (no Support Ring)

KD4871-G11A Alternate Gas Inlet Tube, 8x850mm with Capillary Tip  
but w/Support Ring

KD4871-G12 Gas Inlet Tube, 8x455mm, Capillary Tip, Top Bent 90 Degrees

KD4871-BH Basic Head, S/T 34/45 Joint, Septum Port, Screw Cap Joint

KD4871-1H Intermediate Head, S/T 34/45, 170mm long, Septum Port

KD4871-SH Sampling Head, S/T 34/45 x 175mm long, Septum Port

KD4871-SR Support Ring, 9.5mm IDx12.7mm ODx7mm long with 4 Hooks

KD4871-SP Spacer Ring, 9.5 mm ID x 12.7mm OD x 7mm Long

## STANDARDIZED METAL TEST SPECIMENS

For those specimens not previously mentioned in this catalog, following is a list, by test method, of available standardized metal test specimens. Please contact Koehler Customer Service for additional information.

### Test Method No.

#### Federal Test Methods

|          |          |
|----------|----------|
| 791-2503 | 791-5309 |
| 791-2504 | 791-5310 |
| 791-3007 | 791-5311 |
| 791-3462 | 791-5312 |
| 791-3805 | 791-5314 |
| 791-3810 | 791-5315 |
| 791-3814 | 791-5321 |
| 791-4001 | 791-5322 |
| 791-4011 | 791-5323 |
| 791-5304 | 791-5324 |
| 791-5305 | 791-5325 |
| 791-5306 | 791-5329 |
| 791-5307 | 791-5331 |
| 791-5308 | 791-6503 |
|          | 791-7001 |

#### ASTM Methods

|       |       |
|-------|-------|
| D115  | D2619 |
| D609  | D2688 |
| D849  | D2783 |
| D897  | D2847 |
| D1261 | D3810 |
| D1275 | D4635 |
| D1384 | D4871 |
| D1402 | E8    |
| D2266 | F483  |
| D2511 | F484  |
| D2570 | F519  |
| D2596 |       |

#### Military Standards (MIL)

|              |              |
|--------------|--------------|
| MIL-A-7866   | MIL-L-7808   |
| MIL-A-8243   | MIL-L-7870   |
| MIL-B-81705  | MIL-L-8937   |
| MIL-C-6529   | MIL-L-23398  |
| MIL-C-11796  | MIL-L-23699  |
| MIL-C-15074  | MIL-L-23699B |
| MIL-C-19853A | MIL-L-25017C |
| MIL-C-16173  | MIL-L-46000  |
| MIL-C-22230  | MIL-L-46010  |
| MIL-C-23411  | MIL-L-B1329  |
| MIL-C-25769H | MIL-R-81294  |
| MIL-C-46113  | MIL-R-25143A |
| MIL-C-81309A | MIL-S-8660   |
| MIL-L-6085   |              |

## SPARE PARTS

Spare parts are generally available from stock for immediate shipment from our manufacturing facility in Bohemia, New York. The parts listings in this section are for customers who may wish to maintain a stock of spares at their facility for several years of operation. This may be of particular interest to overseas customers. Suggested quantities are in parentheses ( ).

*Please note:* The parts listed in this section are for current equipment models at the time of printing. When ordering spare parts for new equipment from this catalog, substitutions may be made by Koehler to reflect engineering changes. Koehler will provide written notification of any changes before processing your order. When ordering spare parts for existing equipment, please specify the model number and serial number of your equipment. This will insure that the correct parts are supplied.

### **K10020 Powertrol Heater, 115V** .....Page 43

225-115-002 Heater 1000W (1)  
010-115-005 Wattstat, 115V

### **K10029 Powertrol Heater, 220-240V** .....Page 43

225-230-002 Heater, 1000W (1)  
010-230-005 Wattstat, 230V

### **K10090 U-Tube Aniline Apparatus, 115V** .....Page 43

K10050 Belt (1)  
K10060 Pyrex U-Tube (1)  
279-063-002 Bulb (1)  
288-115-001 Motor (1)  
289-002-001 Bearings (4)

### **K10091 U-Tube Aniline Apparatus, 220-240V** .....Page 43

K10050 Belt (1)  
K10060 Pyrex U-Tube (1)  
279-063-002 Bulb (1)  
K10091-09000 Motor, Modification (1)  
289-002-001 Bearings (4)

### **K10190 Thin Film Aniline Apparatus, 115V** .....Page 43

K10050 Belt (1)  
K10120 Pyrex Pump Body (1)  
K10130 Thin Film Tube (1)  
279-063-002 Bulb (1)  
288-115-001 Motor (1)  
289-002-001 Bearings (2)

### **K10191 Thin Film Aniline Apparatus, 220-240V** .....Page 43

K10050 Belt (1)  
K10120 Pyrex Pump Body (1)  
K10130 Thin Film Tube (1)  
279-063-002 Bulb (1)  
289-002-001 Bearings (2)  
K10091-09000 Motor, Modification (1)

### **K10200 Automatic Aniline Apparatus, 115V** .....Page 42

K10220 Heating & Cooling Tube (1)  
K102-5S Flexible Drive Shaft (1)  
280-115-001 Powerstat (1)  
288-115-001 Motor (1)  
279-115-001 Indicator Light Bulb (2)  
278-010-001 Fuse, 10A (1)  
K102-20 Heater Coil (1)  
289-001-001 Bearings (2)

### **K10290 Automatic Aniline Apparatus, 220-240V** .....Page 42

K10220 Heating & Cooling Tube (1)  
K102-5S Flexible Drive Shaft (1)  
280-115-001 Powerstat (1)  
288-115-001 Motor (1)  
279-115-001 Indicator Light Bulb (2)  
278-010-001 Fuse, 10A (1)  
K102-20 Heater Coil (1)  
289-001-001 Bearings (2)  
240-230-001 Transformer (1)

### **K10400 Oxidation Stability Bath, 2-Unit, 115V** .....Pages 81, 82

K10400-11001 Heater, 2000W  
379-001-001 Liquid Level Switch

### **K10401 Oxidation Stability Bath, 2 Unit, 115V** .....Pages 81, 82

220-120-007 Cartridge Heater, 250W (6)  
265-122-002 RTD Temperature Probe, 3 in., 2 Wire  
265-122-003 RTD Temperature Probe, 3 in., 3 Wire  
278-020-004 Fuse, 20A  
278-001-002 Fuse, 1A  
278-104-002 Fuse, 0.25A

### **K10402 Oxidation Stability Bath, 2-Unit, 220-240V** .....Pages 81, 82

K10402-11001 Heater, 2000W  
379-001-001 Liquid Level Switch

### **K10403 Oxidation Stability Bath, 4-Unit, 115V** .....Pages 81, 82

220-120-007 Cartridge Heater, 250W (10)  
265-122-002 RTD Temperature Probe, 3 in., 2 Wire  
265-122-003 RTD Temperature Probe, 3 in., 3 Wire  
278-030-002 Fuse, 30A  
278-001-002 Fuse, 1A  
278-104-002 Fuse, 0.25A

### **K10404 Oxidation Stability Bath, 6 Unit, 220-240V** .....Pages 81, 82

K70519 RTD Temperature Probe, 12 in.  
265-600-001 RTD Temperature Probe, 4 in.  
278-020-004 Fuse, 20A  
278-001-002 Fuse, 1A  
278-104-002 Fuse, 0.25A

### **K10491 Oxidation Stability Bath, 2-Unit, 220-240V** .....Pages 81, 82

220-240-006 Cartridge Heater, 250W (6)  
265-122-002 RTD Temperature Probe, 3 in., 2 Wire  
265-122-003 RTD Temperature Probe, 3 in., 3 Wire  
278-020-004 Fuse, 20A  
278-001-002 Fuse, 1A  
278-104-002 Fuse, 0.25A

### **K10493 Oxidation Stability Bath, 4-Unit, 220-240V** .....Pages 81, 82

220-240-006 Cartridge Heater, 250W (10)  
265-122-002 RTD Temperature Probe, 3 in., 2 Wire  
265-122-003 RTD Temperature Probe, 3 in., 3 Wire  
278-020-004 Fuse, 20A  
278-001-002 Fuse, 1A  
278-104-002 Fuse, 0.25A  
091-032-001 Relay, Solid State, 4-32 V DC, 20A  
275-103-024 Temperature Controller, 100-240V, 1 out

## SPARE PARTS (CONTINUED)

|                                                                                              |                                         |                                                                         |                                         |
|----------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------|-----------------------------------------|
| <b>K10500 Oxidation Pressure Vessel</b> .....Page 80                                         |                                         | <b>K12190 Oxidation Stability Bath, 220-240V</b> .....Page 123          |                                         |
| K10510                                                                                       | Composition Gaskets                     | K121A-0-17                                                              | Heater, 750W, 230V (1)                  |
| K105-0-12                                                                                    | Relief Tube                             | 288-230-002                                                             | Motor, 230V, 50/60Hz (1)                |
| 260-102-005                                                                                  | Rupture Disc, Alum with Liner           | K70519                                                                  | RTD Temperature Probe, 12 in.           |
| 260-104-015                                                                                  | Burst Disc Holder                       | 265-600-001                                                             | RTD Temperature Probe, 4 in.            |
| 461-001-001                                                                                  | Silicone Vacuum Grease                  | 278-020-004                                                             | Fuse, 20A                               |
| <b>K10901 Oxidation Bath, 115V</b> .....Page 152-153                                         |                                         | 278-001-002                                                             | Fuse, 1A                                |
| K70519                                                                                       | RTD Temperature Probe, 12 in.           | 278-104-002                                                             | Fuse, 0.25A                             |
| 265-600-001                                                                                  | RTD Temperature Probe, 4 in.            | 275-103-024                                                             | Temperature Controller, 100-240V, 1 out |
| 278-030-002                                                                                  | Fuse, 30A                               | <b>K12200 Oxidation Stability Bath, 8-Unit, 115V</b> .....Page 120      |                                         |
| 278-001-002                                                                                  | Fuse, 1A                                | K122-2-15B                                                              | Heater, 750W, Inner, 115V (1)           |
| 278-104-002                                                                                  | Fuse, 0.25A                             | K122-2-15C                                                              | Heater, 750W, Outer, 115V (1)           |
| 275-103-024                                                                                  | Temperature Controller, 100-240V, 1 out | K23700-03013A                                                           | Motor, 115V 60Hz (1)                    |
| <b>K10991 Oxidation Bath, 220-240V</b> .....Page 152-153                                     |                                         | K70519                                                                  | RTD Temperature Probe, 12 in.           |
| K70519                                                                                       | RTD Temperature Probe, 12 in.           | 265-600-001                                                             | RTD Temperature Probe, 4 in.            |
| 265-600-001                                                                                  | RTD Temperature Probe, 4 in.            | 278-020-004                                                             | Fuse, 20A                               |
| 278-020-004                                                                                  | Fuse, 20A                               | 278-001-002                                                             | Fuse, 1A                                |
| 278-001-002                                                                                  | Fuse, 1A                                | 278-104-002                                                             | Fuse, 0.25A                             |
| 278-104-002                                                                                  | Fuse, 0.25A                             | 275-103-024                                                             | Temperature Controller, 100-240V, 1 out |
| 275-103-024                                                                                  | Temperature Controller, 100-240V, 1 out | <b>K12201 Solid Block Oxidation Bath, 220-240V</b> .....Page 121        |                                         |
| <b>K11201 Reid Vapor Pressure Bomb for LPG</b> .....Page 92                                  |                                         | 091-240-003                                                             | Relay, 120/240V, 25A                    |
| AS568-210                                                                                    | O-ring (1)                              | 265-400-004                                                             | RTD Probe, 10 in.                       |
| AS568-113                                                                                    | O-ring (1)                              | 220-240-009                                                             | Heater, 750W, 220V (6)                  |
| <b>K11415/K11416 Reid Vapor Pressure Bath, 21-Unit, 220-240V, 50Hz and 60Hz</b> .....Page 93 |                                         | <b>K12212 Oxidation Stability Bath, 12-Unit, 115V</b> .....Page 120     |                                         |
| 235-240-005                                                                                  | Heater, 6000W (1)                       | K122-12-2-22A                                                           | Heater, 1500W, back, 115V (1)           |
| 265-400-002                                                                                  | RTD Temperature Probe (1)               | K122-12-2-22B                                                           | Heater, 1500W, middle, 115V (1)         |
| <b>K11450 Reid Vapor Pressure Bath, 4-Unit, 115V</b> .....Page 93                            |                                         | K122-12-2-22C                                                           | Heater, 750W, front, 115V (1)           |
| K11450-0-1                                                                                   | Heater, 2000W, 115V                     | K70519                                                                  | RTD Temperature Probe, 12 in.           |
| K70519                                                                                       | RTD Temperature Probe, 12 in.           | 265-600-001                                                             | RTD Temperature Probe, 4 in.            |
| 278-020-004                                                                                  | Fuse, 20A                               | K23700-03013A                                                           | Motor, 115V 60Hz (1)                    |
| 278-001-002                                                                                  | Fuse, 1A                                | K23300-03009                                                            | Stirrer Shaft                           |
| K23700-03013A                                                                                | Motor, 115V 60Hz                        | 091-032-004                                                             | Relay, Solid State, 32 V DC             |
| 275-103-020                                                                                  | Temperature Controller, 100-240V, 2 out | 278-040-001                                                             | Fuse, 40A, Time Delay CLSG              |
| <b>K11459 Vapor Pressure Bath, 4-Unit, 220-240V</b> .....Page 93                             |                                         | 275-103-027                                                             | Temperature Controller, 100-240V        |
| K11459-0-1                                                                                   | Heater, 2000W, 230V                     | <b>K12219 Oxidation Stability Bath, 12-Unit, 220-240V</b> .....Page 120 |                                         |
| K70519                                                                                       | RTD Temperature Probe, 12 in.           | K122-12A-2-22A                                                          | Heater, 1500W, back, 220V (1)           |
| 278-020-004                                                                                  | Fuse, 20A                               | K122-12A-2-22B                                                          | Heater, 1500W, middle, 220V (1)         |
| 278-001-002                                                                                  | Fuse, 1A                                | K122-12A-2-22C                                                          | Heater, 750W, front, 220V (1)           |
| K23700-03014A                                                                                | Motor, 230V 50/60Hz                     | K70519                                                                  | RTD Temperature Probe, 12 in.           |
| 275-103-020                                                                                  | Temperature Controller, 100-240V, 2 out | 265-600-001                                                             | RTD Temperature Probe, 4 in.            |
| <b>K12100 Oxidation Stability Bath, 115V</b> .....Page 123                                   |                                         | 278-030-002                                                             | Fuse, 30A                               |
| K121-0-17                                                                                    | Heater, 750W, 115V (1)                  | 278-001-002                                                             | Fuse, 1A                                |
| K70519                                                                                       | RTD Temperature Probe, 12 in.           | 278-104-002                                                             | Fuse, 0.25A                             |
| 265-600-001                                                                                  | RTD Temperature Probe, 4 in.            | K23700-03014A                                                           | Motor, 230V 50/60Hz (1)                 |
| 278-020-004                                                                                  | Fuse, 20A                               | 275-103-024                                                             | Temperature Controller, 100-240V, 1 out |
| 278-001-002                                                                                  | Fuse, 1A                                | <b>K12290 Oxidation Stability Bath, 8-Unit, 220-240V</b> .....Page 120  |                                         |
| 278-104-002                                                                                  | Fuse, 0.25A                             | K122A-2-15B                                                             | Heater, 750W, Inner, 230V (1)           |
| K23700-03013A                                                                                | Motor, 115V, 60Hz (1)                   | K122A-2-15C                                                             | Heater, 750W, Outer, 230V (1)           |
| 275-103-024                                                                                  | Temperature Controller, 100-240V, 1 out | K70519                                                                  | RTD Temperature Probe, 12 in.           |
|                                                                                              |                                         | 265-600-001                                                             | RTD Temperature Probe, 4 in.            |
|                                                                                              |                                         | 278-020-004                                                             | Fuse, 20A                               |
|                                                                                              |                                         | 278-001-002                                                             | Fuse, 1A                                |
|                                                                                              |                                         | 278-104-002                                                             | Fuse, 0.25A                             |
|                                                                                              |                                         | K23700-03014A                                                           | Motor, 230V 50/60Hz (1)                 |
|                                                                                              |                                         | 275-103-024                                                             | Temperature Controller, 100-240V, 1 out |

## SPARE PARTS (CONTINUED)

### **K12300 Series Oxidation Stability Bath, 220-240V, 50 and 60Hz ..Page 121**

#### **Model Numbers K12330, K12339, K12300, K12395**

|             |                               |
|-------------|-------------------------------|
| 235-240-005 | Heater, 6000W, 240V           |
| 265-400-002 | RTD Temperature Probe, 12 in. |

### **K13009 Saybolt Chromometer .....Page 44**

|        |                                        |
|--------|----------------------------------------|
| K13018 | Gasket (pkg. of 12)                    |
| K13020 | Color Standard (Full) (2)              |
| K13029 | Color Standard (Half) (1)              |
| K13032 | Glass Set, Turret & Draincock Assembly |
| K13061 | Glassware Set with Connections         |
| K13090 | Frosted Mirror without Base (1)        |
| K13012 | Graduated Tube Gasket                  |

### **K13100 Saybolt Wax Chromometer, 115V .....Page 44**

|           |                                      |
|-----------|--------------------------------------|
| K13018    | Gasket (pkg. of 12)                  |
| K13020    | Color Standard (Full) (1)            |
| K13029    | Color Standard (Half) (1)            |
| K13033    | Glass Set, Turret and Graduated Tube |
| K13090    | Frosted Mirror without Base (1)      |
| K131-0-26 | Cartridge Heater, 115V (1)           |
| K131-0-28 | Strip Heater, 200W, 115V (1)         |
| AS568-211 | O-ring (2)                           |

### **K13190 Saybolt Wax Chromometer, 220-240V .....Page 44**

|            |                                      |
|------------|--------------------------------------|
| K13018     | Gasket (pkg. of 12)                  |
| K13020     | Color Standard (Full) (1)            |
| K13029     | Color Standard (Half) (1)            |
| K13033     | Glass Set, Turret and Graduated Tube |
| K13090     | Frosted Mirror without Base (1)      |
| K131A-0-26 | Cartridge Heater, 50W, 230V (1)      |
| K131A-0-28 | Strip Heater, 200W, 230V (1)         |
| AS568-211  | O-ring (2)                           |

### **K13900 Cleveland Flash Tester, 115V .....Page 36**

|             |                               |
|-------------|-------------------------------|
| K138-1-17   | Insulation Plate (1)          |
| 225-115-002 | Brick Heater, 1000W, 115V (1) |
| AS568-008   | O-ring (1)                    |
| 010-115-005 | Wattstat, 115V (1)            |

### **K13990 Cleveland Flash Tester, 220-240V .....Page 36**

|             |                               |
|-------------|-------------------------------|
| K138-1-17   | Insulation Plate (1)          |
| 225-230-002 | Brick Heater, 1000W, 230V (1) |
| AS568-008   | O-ring (1)                    |
| 010-230-004 | Wattstat, 230V (1)            |

### **K14600 Tag Electric Closed Tester, 115V .....Page 35**

|             |                       |
|-------------|-----------------------|
| 190-120-001 | Ring Heater, 200W (1) |
| 010-115-005 | Wattstat, 115V (1)    |

### **K14670 Tag Electric Closed Tester, 220-240V .....Page 35**

|             |                       |
|-------------|-----------------------|
| 190-240-009 | Ring Heater, 150W (1) |
| 010-230-004 | Wattstat, 230V (1)    |

### **K15600 Tag Electric Open Cup Flash Tester, 115V .....Page 37**

|             |                                          |
|-------------|------------------------------------------|
| 190-120-001 | Ring Heater, 200W (1)                    |
| K138-0-11   | Valve Stem (2)                           |
| K156-0-1A   | Flame Test Burner and Pilot Assembly (1) |

### **K15670 Tag Electric Open Cup Flash Tester, 220-240V .....Page 37**

|             |                                          |
|-------------|------------------------------------------|
| 190-240-009 | Ring Heater, 150W (1)                    |
| K138-0-11   | Valve Stem (2)                           |
| K156-0-1A   | Flame Test Burner and Pilot Assembly (1) |

### **K16000 Pensky-Martens Flash Tester, Gas.....Page 34**

|            |                              |
|------------|------------------------------|
| K160-9     | Flexible Stirrer Shaft (1)   |
| K16220-0-6 | Drive Belt for Stirrer Motor |

### **K16200 Pensky-Martens Flash Tester, 115V .....Page 34**

|             |                              |
|-------------|------------------------------|
| 225-115-002 | Brick Heater, 1000W (1)      |
| K160-9      | Flexible Stirrer Shaft (1)   |
| K16220-0-6  | Drive Belt for Stirrer Motor |

### **K16270 Pensky-Martens Flash Tester, 220-240V.....Page 34**

|             |                              |
|-------------|------------------------------|
| 225-230-002 | Brick Heater, 1000W (1)      |
| K160-9      | Flexible Stirrer Shaft (1)   |
| K16220-0-6  | Drive Belt for Stirrer Motor |

### **K17100 Wax Coating Device, 115V .....Page 177**

|             |                       |
|-------------|-----------------------|
| 190-120-009 | Ring Heater, 200W (1) |
| K171-0-12   | Doctor Rod Assembly   |
| 280-115-004 | Variable Transformer  |

### **K17190 Wax Coating Device, 220-240V .....Page 177**

|             |                          |
|-------------|--------------------------|
| 190-120-009 | Ring Heater, 200W (1)    |
| K171-0-12   | Doctor Rod Assembly      |
| 240-230-001 | Stepdown Transformer (1) |

### **K17200 Type A Blocking Plate, 115V .....Page 177**

|             |                        |
|-------------|------------------------|
| 236-115-001 | Strip Heater, 250W (1) |
|-------------|------------------------|

### **K17290 Type A Blocking Plate, 220-240V.....Page 177**

|             |                        |
|-------------|------------------------|
| 236-230-001 | Strip Heater, 250W (1) |
|-------------|------------------------|

### **K17300 Type B Blocking Plate, 115V .....Page 177**

|             |                  |
|-------------|------------------|
| K173-0-11A  | Heater, 100W (1) |
| K173-0-11C  | Heater, 300W (1) |
| 288-115-001 | Motor (1)        |

### **K17390 Type B Blocking Plate, 220-240V.....Page 177**

|             |                  |
|-------------|------------------|
| K173-0-11B  | Heater, 100W (1) |
| K173-0-11D  | Heater, 300W (1) |
| 288-230-002 | Motor (1)        |

### **K17500 Wax Melting Point Apparatus.....Page 178**

|             |                              |
|-------------|------------------------------|
| K175-0-5    | Cork, Sample Thermometer (1) |
| K175-0-6    | Cork, Bath Thermometer (1)   |
| 285-000-006 | Cork without hole (1)        |
| K175-0-8    | Sample Tube (1)              |

### **K17600 Oil Solvent Extractables Content Apparatus, 115V .....Page 179**

|             |                          |
|-------------|--------------------------|
| K176-1-0-26 | Glass Manifold (1)       |
| 279-115-006 | Lamp, 100W, 115V (1)     |
| 332-003-004 | 15mL Weighing Bottle (4) |

### **K17690 Oil Solvent of Extractables Content Apparatus, 220-240V.....Page 179**

|             |                          |
|-------------|--------------------------|
| K176-1-0-26 | Glass Manifold (1)       |
| 279-230-004 | Lamp, 100W, 230V (1)     |
| 332-003-004 | 15mL Weighing Bottle (4) |

### **K17970/K17979 Corrosion Preventive Properties Apparatus, 115V and 220-240V.....Page 154**

|             |                       |
|-------------|-----------------------|
| K17910      | Test Bearings (3)     |
| K17930      | Containers/Lids (3)   |
| K179-0-6    | Spring                |
| K179-0-8    | Lockscrew             |
| 288-115-036 | Motor, 115/230V, 60Hz |

## SPARE PARTS (CONTINUED)

### **K17980/K17989 Corrosion Preventive Properties Apparatus, 115V and 220-240V**.....Page 154

|             |                                      |
|-------------|--------------------------------------|
| AS568-224   | O-ring (3)                           |
| AS568-329   | O-ring (3)                           |
| 360-115-015 | Motor Speed Control                  |
| 289-004-002 | Outboard Bearing Set (3)             |
| 288-115-053 | Motor, 1/4 hp, 130 V DC and Resistor |

### **K18000 Manual Grease Working Machine** .....Page 28

|             |                 |
|-------------|-----------------|
| 22H-308-20C | Wing Screws (6) |
|-------------|-----------------|

### **K18100 Series Mechanical Grease Workers, Single-Unit, 115V and 220-240V**.....Pages 26, 28

#### **Model Numbers K18100, K18110, K18119**

|             |                              |
|-------------|------------------------------|
| 289-001-002 | Ball Bearing (1)             |
| 320-115-001 | Counter                      |
| 050-001-006 | Start/Stop Switch            |
| 050-001-007 | Proximity Switch             |
| K180-1-0-11 | Clamp Spring (2)             |
| 271-015-001 | Thermal Circuit Breaker, 15A |

### **K18190 Series Mechanical Grease Workers, Double-Unit, 115V and 220-240V**.....Page 28

#### **Model Numbers K18190, K18191, K18192**

|             |                              |
|-------------|------------------------------|
| 289-001-002 | Ball Bearing (2)             |
| 320-115-001 | Counter                      |
| 050-001-006 | Start/Stop Switch            |
| 050-001-007 | Proximity Switch             |
| K180-1-0-11 | Clamp Spring (4)             |
| 271-015-001 | Thermal Circuit Breaker, 15A |

### **K18200 Water Spray Apparatus, 115V, 60Hz** .....Page 163

|             |                                   |
|-------------|-----------------------------------|
| 301-002-006 | Timing Belt (1)                   |
| K182-0-10   | Heater, 750W (1)                  |
| K18210      | Stainless Steel Test Panel        |
| 275-250-003 | Electronic Temperature Controller |
| 356-001-005 | Gear Pump                         |
| 039-104-00B | Snubber, Brass                    |
| 165-308-001 | Leveling Foot (4)                 |
| 288-115-015 | Motor 115V, 60Hz, 1/3 hp          |

### **K18290/K18295 Water Spray Apparatus, 220-240V, 50Hz and 60Hz**.....Page 163

|             |                                   |
|-------------|-----------------------------------|
| 301-002-006 | Timing Belt (1)                   |
| K182A-0-10  | Heater, 750W (1)                  |
| K18210      | Stainless Steel Test Panel        |
| 275-250-003 | Electronic Temperature Controller |
| 356-001-005 | Gear Pump                         |
| 039-104-00B | Snubber, Brass                    |
| 165-308-001 | Leveling Foot (4)                 |
| 288-115-012 | Motor 115/230V, 60Hz, 1/3 hp      |
| 288-115-010 | Motor, 220-240V, 50Hz             |

### **K18300/K18320 Roll Stability Tester, Single/Double Unit, 115V**.....Pages 27, 156

|                |                                         |
|----------------|-----------------------------------------|
| 325-000-025    | #25 Chain (30")                         |
| 237-115-002    | Heater, Finned, Strip, 600W, 115V (2)   |
| 265-600-001    | RTD Temperature Probe, 4 in. (1)        |
| 289-001-012    | Ball Bearing (7)                        |
| AS568A-117-V01 | Viton O-Ring                            |
| AS568A-154-V01 | Viton O-Ring                            |
| 278-020-004    | Fuse, 20A                               |
| 278-001-002    | Fuse, 1A                                |
| 091-032-001    | Relay, Solid State, 4-32V DC, 20A       |
| 275-103-020    | Temperature Controller, 100-240V, 2 out |

### **K18305 Series Roll Stability Tester, Single/Double-Unit, 220-240V, 50Hz**.....Page 156

#### **Model Numbers K18305, K18306, K18325, K18326**

|                |                                         |
|----------------|-----------------------------------------|
| 325-000-025    | #25 Chain (30")                         |
| 237-240-004    | Heater, Finned, Strip, 600W, 240V (2)   |
| 265-600-001    | RTD Temperature Probe, 4 in. (1)        |
| 091-032-001    | Relay, Solid State, 4-32VDC, 20A        |
| 275-103-020    | Temperature Controller, 100-240V, 2 out |
| 278-020-004    | Fuse, 20A                               |
| 278-001-002    | Fuse, 1A                                |
| K18348-13000   | Motor Fan                               |
| AS589A-117-V01 | Viton O-Ring                            |
| AS568A-154-V01 | Viton O-Ring                            |

### **K18340 Roll Stability Tester, 4-Unit, 115V, 60Hz**.....Page 156

|                |                                         |
|----------------|-----------------------------------------|
| 237-115-001    | Heater, Finned, Strip, 1000W, 115V (2)  |
| 265-600-001    | RTD Temperature Probe, 4 in. (1)        |
| 289-001-012    | Ball Bearing (17)                       |
| 289-001-022    | Ball Bearing (17)                       |
| 091-032-001    | Relay, Solid State, 4-32VDC, 20A        |
| 288-115-035    | Motor, Gear, 115V, 60Hz, 83rpm          |
| 278-020-004    | Fuse, 20A                               |
| 278-001-002    | Fuse, 1A                                |
| AS589A-117-V01 | Viton O-Ring                            |
| AS568A-154-V01 | Viton O-Ring                            |
| 275-103-020    | Temperature Controller, 100-240V, 2 out |

### **K18345/K18346 Roll Stability Tester, 4-Unit, 220-240V, 50Hz and 60Hz**.....Page 156

|                |                                         |
|----------------|-----------------------------------------|
| 275-103-020    | Temperature Controller, 100-240V, 2 out |
| 265-600-001    | RTD Temperature Probe, 4 in. (1)        |
| K18348-13000   | Motor, Fan                              |
| 278-020-004    | Fuse, 20A                               |
| 278-001-002    | Fuse, 1A                                |
| AS589A-117-V01 | Viton O-Ring                            |
| AS568A-154-V01 | Viton O-Ring                            |
| 288-230-009    | Motor, Gear, 230V, 50Hz, 70rpm          |

### **K18500 High Temperature Wheel Bearing Tester, 115V, 60Hz**.....Page 161

|             |                          |
|-------------|--------------------------|
| 215-115-001 | Heater, 1200W, 115V (1)  |
| 288-115-004 | Fan Motor (1)            |
| K185-0-42   | Cabinet Thermocouple (1) |
| 288-018-021 | Spindle Thermocouple (1) |
| 289-004-001 | Inboard Bearing Set      |
| 289-004-002 | Outboard Bearing Set     |
| K185-1-66   | Motor, modification      |

### **K18590/K18595 High Temperature Wheel Bearing Tester, 220-240V, 50Hz and 60Hz**.....Page 161

|             |                          |
|-------------|--------------------------|
| 215-230-001 | Heater, 1200W, 230V (1)  |
| 288-115-004 | Fan Motor (1)            |
| 278-010-001 | Fuse, 10A (5)            |
| 278-015-001 | Fuse, 15A (5)            |
| 278-020-003 | Fuse, 20A (5)            |
| K185-0-42   | Cabinet Thermocouple (1) |
| 288-018-021 | Spindle Thermocouple (1) |
| 289-004-001 | Inboard Bearing Set      |
| 289-004-002 | Outboard Bearing Set     |

## SPARE PARTS (CONTINUED)

### **K18700 Leakage Tendencies of Automotive Wheel Bearing Greases, 115V, 60Hz**.....Page 160

|             |                                         |
|-------------|-----------------------------------------|
| 275-103-020 | Temperature Controller, 100-240V, 2 out |
| 200-115-006 | Coil Heater, 1000W (2)                  |
| 301-004-002 | Vee Belt (60Hz) (1)                     |
| 288-115-027 | Motor                                   |
| 265-122-002 | RTD Temperature Probe, 3 in. (1)        |

### **K18790 Leakage Tendencies of Automotive Wheel Bearing Greases, 220-240V, 60Hz**.....Page 160

|             |                                         |
|-------------|-----------------------------------------|
| 200-230-006 | Coil Heater, 1000W (2)                  |
| 301-004-002 | Vee Belt (60Hz) (1)                     |
| 265-122-002 | RTD Temperature Probe, 3 in. (1)        |
| 288-115-027 | Motor                                   |
| 275-103-020 | Temperature Controller, 100-240V, 2 out |

### **K18795 Leakage Tendencies of Automotive Wheel Bearing Greases, 220-240V, 50Hz**.....Page 160

|             |                                  |
|-------------|----------------------------------|
| 200-230-006 | Coil Heater, 1000W (2)           |
| 301-004-005 | Vee Belt (50Hz) (1)              |
| 265-122-002 | RTD Temperature Probe, 3 in. (1) |
| 288-230-005 | Motor, 50Hz                      |

### **K18850 Series Low Temperature Torque Apparatus, 220-240V, 50Hz and 60Hz**.....Page 159

#### **Model Numbers K18850, K18851, K18852, K18853, K18854, K18855, K18860, K18861, K18862, K18863, K18864, K18865**

|             |                                               |
|-------------|-----------------------------------------------|
| 301-002-007 | Timing Belt (2)                               |
| 265-000-002 | Spindle Thermocouple (2) For all D4693 models |
| 289-007-001 | Boston 5F x 3/8 Flanged Bearing (4)           |
| 360-108-001 | Strain Gauge (2)                              |
| K18860-0-16 | Small Bearing Set (2) For all D4693 models    |
| K18860-0-24 | Large Bearing Set (2) For all D4693 models    |
| 288-230-007 | Motor, 230V, 50/60Hz, 1/15 hp, 1.4A (1)       |

### **K18910 Constant Temperature Air Cabinet, 115V**.....Page 165

|               |                                  |
|---------------|----------------------------------|
| K23700-03013A | Motor, 115V, 60Hz                |
| K189-1-0-17   | Heater, 115V, 50W                |
| 283-120-002   | Solenoid Valve, 115V (2)         |
| 265-400-002   | RTD Temperature Probe            |
| 275-103-023   | Temperature Controller, 100-240V |
| 278-001-002   | Fuse, 1A, Slo-blo                |

### **K18919 Constant Temperature Air Cabinet, 220-240V**.....Page 165

|              |                                  |
|--------------|----------------------------------|
| 288-230-002  | Motor, 230V                      |
| K189-1A-0-17 | Heater, 230V, 100W               |
| 283-240-001  | Solenoid Valve, 230V (2)         |
| 265-400-002  | RTD Temperature Probe            |
| 275-103-023  | Temperature Controller, 100-240V |
| 278-001-002  | Fuse, 1A, Slo-blo                |

### **K19200 Water Washout Tester, 115V, 60Hz**.....Page 162

|             |                         |
|-------------|-------------------------|
| K192-4-4    | Heater, 380 W, 115V (1) |
| 301-004-008 | Vee Belt, 22"           |
| 301-004-007 | Vee Belt, 37"           |
| 289-001-009 | Ball Bearing (2)        |
| 289-001-006 | Test Bearing (3)        |
| K192-4-3    | Thermoregulator         |
| K192-2-5    | Flowmeter               |
| 288-115-027 | Motor                   |
| AS568-214   | O-ring (2)              |
| 356-001-005 | Water Pump              |
| K192-1-8    | Bearing Housing Gasket  |

### **K19290 Water Washout Tester, 220-240V, 60Hz**.....Page 162

|             |                        |
|-------------|------------------------|
| K192A-4-4   | Heater, 380W, 220V (1) |
| 301-004-008 | Vee Belt, 22"          |
| 301-004-007 | Vee Belt, 37"          |
| 289-001-009 | Ball Bearing (2)       |
| 289-001-006 | Test Bearing (3)       |
| AS568-214   | O-ring (2)             |
| K192-1-8    | Bearing Housing Gasket |
| K192-4-3    | Thermoregulator        |
| K192-2-5    | Flowmeter              |
| 288-115-027 | Motor                  |
| 356-001-005 | Water Pump             |

### **K19295 Water Washout Tester, 220-240V, 50Hz**.....Page 162

|             |                          |
|-------------|--------------------------|
| K192A-4-4   | Heater, 380W, 220V (1)   |
| 301-004-003 | Vee Belt, 37", 50 Hz (1) |
| 288-230-005 | Motor, 110/220V, 50Hz    |

### **K19400 High Temperature Dropping Point Apparatus, 115V**.....Page 151

|             |                                           |
|-------------|-------------------------------------------|
| 220-120-001 | Heater (cartridge), 750W, 120V (1)        |
| 279-115-002 | Lamp (1)                                  |
| 278-001-002 | Fuse, 1A                                  |
| 265-203-001 | Temperature Probe, Type "K", 3/8 dia x 4" |
| K194EB      | Test Tube 13x100mm (10)                   |
| K194EC      | Cup Support (10)                          |
| 275-103-023 | Temperature Controller, 100-240V          |
| 091-240-002 | Solid State Relay, 25A, 90-240V           |

### **K19410 High Temperature Dropping Point Apparatus, 220-240V**.....Page 151

|             |                                    |
|-------------|------------------------------------|
| 220-240-001 | Heater (cartridge), 750W, 240V (1) |
| 279-115-002 | Lamp (1)                           |
| 278-001-002 | Fuse, 1A                           |
| 265-203-001 | Temperature Probe, Type "K" (1)    |
| K194EB      | Test Tube 13x100mm (10)            |
| K194EC      | Cup Support (10)                   |
| 275-103-023 | Temperature Controller             |
| 091-240-002 | Solid State Relay, 25A, 90-240V    |

### **K19490 Dropping Point Apparatus, 115V**.....Page 150

|             |                             |
|-------------|-----------------------------|
| K19492      | Test Tube with Indentations |
| K19493      | Thermometer Cork            |
| K194A-0-7   | Bath Thermometer Cork       |
| 332-002-005 | 400mL Beaker                |
| 010-115-005 | Wattstat, 115V              |
| 225-115-002 | Heater Element, 1000W, 115V |
| 288-115-001 | Motor                       |

### **K19491 Dropping Point Apparatus, 220-240V**.....Page 150

|             |                               |
|-------------|-------------------------------|
| K19492      | Test Tube with Indentation    |
| K19493      | Thermometer Cork              |
| K194A-0-7   | Bath Thermometer Cork         |
| 332-002-005 | 400mL Beaker                  |
| 010-230-004 | Wattstat, 230V                |
| 225-230-002 | Heater Element, 1000W, 230V   |
| K19491-0-12 | Motor, 230V, 50/60Hz, 1/40 hp |

### **K19500 Penetrometer**.....Page 24

|             |                             |
|-------------|-----------------------------|
| 332-005-008 | 5" diameter Watch Glass (1) |
| K195-11     | Plunger Drop Cushion        |
| K195-23     | Plunger Release Spacer      |
| K195-24     | Plunger Release Lever (1)   |
| K195-29     | Teflon Inserts              |

## SPARE PARTS (CONTINUED)

### **K21404/K21494 Automatic Saybolt Viscosity Timing Sensor** .....Page 16

|              |                       |
|--------------|-----------------------|
| K21404-03009 | Sensor Assembly       |
| K21404-23000 | Cabinet Power Supply  |
| K21404-03013 | Flask Holder Assembly |

### **K21410 Saybolt Viscometer Bath, 115V** .....Page 16

|               |                               |
|---------------|-------------------------------|
| K21410-0-15   | Heater, 1200W, 115V (2)       |
| K23700-03013A | Motor, 115V, 60Hz (1)         |
| 265-500-001   | RTD Temperature Probe, 12 in. |
| 265-600-001   | RTD Temperature Probe, 4 in.  |
| 278-020-004   | Fuse, 20A                     |
| 278-001-002   | Fuse, 1A                      |
| 278-104-002   | Fuse, 0.25A                   |

### **K21420 Saybolt Viscometer Bath, 220-240V** .....Page 16

|               |                               |
|---------------|-------------------------------|
| K21420-0-15   | Heater, 1200W, 230V (2)       |
| K23700-03014A | Motor, 230V, 50/60Hz (1)      |
| 265-500-001   | RTD Temperature Probe, 12 in. |
| 265-600-001   | RTD Temperature Probe, 4 in.  |
| 278-020-004   | Fuse, 20A                     |
| 278-001-002   | Fuse, 1A                      |
| 278-104-002   | Fuse, 0.25A                   |

### **K22600/K22610 Pressure Viscometer, 115V and 220-240V** .....Page 157

|             |                          |
|-------------|--------------------------|
| K226-0-20   | Cylinder Gasket (6)      |
| K226-0-21   | Capillary Gasket (8)     |
| 265-000-001 | Thermocouple (3)         |
| 288-115-014 | Motor, 115/230V 60Hz (1) |
| 349-000-009 | Coupling Spider (1)      |

### **K22615 Pressure Viscometer, 220-240V, 50Hz** .....Page 157

|             |                           |
|-------------|---------------------------|
| K226-0-20   | Cylinder Gasket (6)       |
| K226-0-21   | Capillary Gasket (8)      |
| 265-000-001 | Thermocouple (3)          |
| 288-230-005 | Motor, 115/230V, 50Hz (3) |
| 349-000-009 | Coupling Spider (1)       |

### **K22680 Series Grease Mobility Tester, 115V and 220-240V** .....Page 158

#### **Model Numbers K22680, K22685, K22686**

|           |                      |
|-----------|----------------------|
| K226-0-20 | Cylinder Gasket (2)  |
| K226-0-21 | Capillary Gasket (1) |

### **K22690 Series Low Temperature Pressure Viscometer, 115V and 220-240V, 50Hz and 60Hz** .....Page 157

#### **Model Numbers K22690, K22695, K22696**

|             |                        |
|-------------|------------------------|
| 320-000-003 | Counter                |
| 288-115-014 | Motor, 115/230V, 60Hz  |
| 288-230-005 | Motor, 115/230V, 50Hz  |
| K226-0-22   | Capillary Set, No. 1-8 |
| 265-000-001 | Thermocouple (3)       |
| AS568-231   | O-ring                 |

### **K22751 Digital Refrigerated Kinematic Viscosity Bath, 115V** .....Page 7

|             |                                 |
|-------------|---------------------------------|
| 091-032-001 | Solid State Relay, 4-32VDC, 20A |
| 288-115-058 | Stirrer Motor, 115V, 60Hz       |
| 335-115-004 | Condenser Fan Motor, 115V       |
| 220-120-009 | Heater (Cartridge), 500W, 115V  |
| 279-115-009 | Fluorescent Lamp, 50W, 120V     |
| 278-020-004 | Fuse, 20A                       |
| 278-001-002 | Fuse, 1A                        |
| 278-104-002 | Fuse, 0.25A                     |
| 265-500-001 | RTD Temperature Probe           |
| 271-030-005 | Switch, Circuit Breaker, 30A    |

### **K22752/K22754 Digital Refrigerated Kinematic Viscosity Bath, 220-240V** .....Page 7

|             |                              |
|-------------|------------------------------|
| 091-032-001 | Solid State Relay            |
| 288-230-020 | Motor, 230V, 50/60Hz         |
| 335-230-001 | Condenser Fan Motor, 230V    |
| 220-240-013 | Heater, 500W, 230V (2)       |
| 265-500-001 | RTD Temperature Probe        |
| 279-115-009 | Fluorescent Lamp, 50W, 120V  |
| 278-020-004 | Fuse, 20A                    |
| 278-001-002 | Fuse, 1A                     |
| 278-104-002 | Fuse, 0.25A                  |
| 271-030-005 | Switch, Circuit Breaker, 30A |

### **K22753 Digital Refrigerated Kinematic Viscosity Bath, 115V** .....Page 7

|             |                              |
|-------------|------------------------------|
| 091-032-001 | Solid State Relay            |
| 288-115-058 | Motor, 115V, 60Hz            |
| 335-115-004 | Condenser Fan Motor, 115V    |
| 220-120-009 | Heater, 500W, 115V (2)       |
| 265-500-001 | RTD Temperature Probe        |
| 279-115-009 | Fluorescent Lamp, 50W, 120V  |
| 278-020-004 | Fuse, 20A                    |
| 278-001-002 | Fuse, 1A                     |
| 278-104-002 | Fuse, 0.25A                  |
| 271-025-001 | Switch, Circuit Breaker, 25A |

### **K23700/K23800 Series Kinematic Viscosity Baths, 115V, 60Hz** .....Pages 4-5

#### **Model Numbers K23700, K23702, K23706, K23708, K23800, K23802**

|               |                                                      |
|---------------|------------------------------------------------------|
| K23700-02003  | RTD Temperature Probe                                |
| 278-104-002   | Fuse, 0.25A                                          |
| 279-115-009   | Fluorescent Lamp, 50W, 120V                          |
| 335-115-005   | Fan, 115V, 50/60Hz, 53CFM                            |
| 332-001-001   | Borosilicate Glass Jar, 12"x12"                      |
| 332-001-003   | Borosilicate Glass Jar, 12"x18"                      |
| K23700-03006  | Heater, 1250W, 115V, For Standard Temperature Models |
| K23800-03006  | Heater, 1700W, 115V, For High Temperature Models     |
| K23700-03013A | Motor, 115V 60Hz                                     |
| 275-103-027   | Temperature Controller, 100-240V                     |

### **K23700/K23800 Series Kinematic Viscosity Baths, 220-240V, 50Hz/60Hz** .....Pages 4-5

#### **Model Numbers K23790, K23792, K23796, K23798, K23890, K23892**

|               |                                                      |
|---------------|------------------------------------------------------|
| K23700-02003  | RTD Temperature Probe                                |
| 278-104-002   | Fuse, 0.25A, Slo-blo                                 |
| 278-101-002   | Fuse, 1A                                             |
| 278-101-004   | Fuse, 20A                                            |
| 279-115-009   | Fluorescent Lamp, 50W, 120V                          |
| 335-230-005   | Fan, 230V, 50/60Hz, 53CFM                            |
| 332-001-001   | Borosilicate Glass Jar, 12"x12"                      |
| 332-001-003   | Borosilicate Glass Jar, 12"x18"                      |
| K23700-03015  | Heater, 1250W, 230V, For Standard Temperature Models |
| K23800-03015  | Heater, 1700W, 230V, For High Temperature Models     |
| K23700-03014A | Motor, 230V 50/60Hz                                  |

### **K23702-OS, K23792-OS, K23708-OS, K23798-OS Kinematic Viscosity Bath** .....Pages 5

|                |                                 |
|----------------|---------------------------------|
| 360-030-001    | Amplifier, 110-30 VDC, blue led |
| 275-600-007    | Touch Screen Interface, PLC     |
| 275-600-005    | Controller, PLC, 100-240 VAC    |
| K23702OS-03038 | Holder, Reflector               |

### **K25310/K25320 Copper Strip Corrosion Test Bath, 4-Unit and 8-Unit, 115V** .....Pages 90, 91, 99

|             |                                |
|-------------|--------------------------------|
| K253-1-0-8  | Heater, 750W (K25310) (1)      |
| K253-2-0-8  | Heater, 750W (K25320) (1)      |
| 191         | RTD Probe Assembly             |
| 275-250-003 | Electronic Temperature Control |

## SPARE PARTS (CONTINUED)

### **K25319/K25329 Copper Strip Corrosion Test Bath,**

**4-Unit and 8-Unit, 220-240V**.....Pages 90, 91, 99

|             |                                |
|-------------|--------------------------------|
| K253-1A-0-8 | Heater, 750W (K25319) (1)      |
| K253-2A-0-8 | Heater, 750W (K25329) (1)      |
| 191         | RTD Probe Assembly             |
| 275-250-003 | Electronic Temperature Control |

### **K25330 Test Tube Bath, 115V**.....Pages 90, 91, 131, 155

|               |                                         |
|---------------|-----------------------------------------|
| K346-0-3      | Heater, 750W, 115V (1)                  |
| K23700-03013A | Motor, 115V 60Hz                        |
| K70519        | RTD Temperature Probe, 12 in.           |
| 278-020-004   | Fuse, 20A                               |
| 278-001-002   | Fuse, 1A                                |
| 091-032-001   | Relay, Solid State, 4-32V DC, 20A       |
| 275-103-020   | Temperature Controller, 100-240V, 2 out |

### **K25339 Test Tube Bath, 220-240V**.....Pages 90, 91, 131, 155

|               |                                         |
|---------------|-----------------------------------------|
| K346A-0-3     | Heater, 750W, 230V (1)                  |
| K70519        | RTD Temperature Probe, 12 in.           |
| 278-020-004   | Fuse, 20A                               |
| 278-001-002   | Fuse, 1A                                |
| K23700-03014A | Motor, 230V 50/60Hz                     |
| 091-032-001   | Relay, Solid State, 4-32V DC, 20A       |
| 275-103-020   | Temperature Controller, 100-240V, 2 out |

### **K25900 Constant Temperature Water Bath, 115V 60Hz**.....Page 103

|               |                                     |
|---------------|-------------------------------------|
| K25900-0-15   | Heater, 750W (1)                    |
| 010-500-003   | Temperature Probe, 500 $\Omega$ (1) |
| K23700-03013A | Motor, 115V 60Hz                    |
| 010-115-002   | Type "B" Controller                 |
| 010-010-002   | Potentiometer                       |
| 356-115-001   | Pump                                |

### **K25990/K25995 Constant Temperature Water Bath, 220-240V, 50Hz and 60Hz**.....Page 103

|               |                                    |
|---------------|------------------------------------|
| K25990-0-15   | Heater, 1000W (1)                  |
| 010-500-003   | Temperature Probe 500 $\Omega$ (1) |
| K23700-03014A | Motor, 230V 50/60Hz                |
| 010-115-002   | Type "B" Controller                |
| 010-010-002   | Potentiometer                      |
| 356-115-001   | Pump                               |

### **K26150 Pressure Hydrometer Cylinder**.....Page 103

|             |                             |
|-------------|-----------------------------|
| AS568-032   | O-Ring, Buna 'N' (2)        |
| K26015      | Lucite Cylinder             |
| 260-104-001 | Pressure Relief Valve, 1/4" |
| K26150-0-6  | Neoprene Cushion (2)        |

### **K26200 Constant Temperature Hydrometer Bath, 115V**.....Page 50

|             |                  |
|-------------|------------------|
| K262-0-10   | Heater, 500W (1) |
| 354-001-002 | Rheostat (1)     |

### **K26290 Constant Temperature Hydrometer Bath, 220-240V**.....Page 50

|             |                  |
|-------------|------------------|
| K262A-0-10  | Heater, 500W (1) |
| 354-001-002 | Rheostat (1)     |

### **K26400 Constant Temperature Hydrometer Bath, 115V**.....Page 50

|             |                                         |
|-------------|-----------------------------------------|
| K26400-1-5  | Heater, 1500W (1)                       |
| K26400-1-5A | Heater, 1000W (1)                       |
| K70519      | RTD Temperature Probe, 12 in.           |
| 265-600-001 | RTD Temperature Probe, 4 in.            |
| 091-032-002 | Relay, Solid State, 4-32 V DC, 30A      |
| 275-103-024 | Temperature Controller, 100-240V, 1 out |

### **K26490 Constant Temperature Hydrometer Bath, 220-240V**.....Page 50

|             |                                         |
|-------------|-----------------------------------------|
| K26490-1-5  | Heater, 1500W (1)                       |
| K70519      | RTD Temperature Probe, 12 in.           |
| 265-600-001 | RTD Temperature Probe, 4 in.            |
| 091-032-001 | Relay, Solid State, 4-32 V DC, 20A      |
| 275-103-024 | Temperature Controller, 100-240V, 1 out |

### **K26500 Thermometer Calibration Bath, 115V**.....Page 63

|             |                                   |
|-------------|-----------------------------------|
| K26500-0-15 | Heater, 750W (1)                  |
| 265-500-001 | RTD Temperature Probe (1)         |
| 288-115-001 | Motor (1)                         |
| 091-032-001 | Relay, Solid State, 4-32V DC, 20A |
| 275-103-025 | Temperature Controller, 100-240V  |

### **K26590 Thermometer Calibration Bath, 220-240V**.....Page 63

|              |                                  |
|--------------|----------------------------------|
| K26500-0-15A | Heater, 750W (1)                 |
| 265-500-001  | RTD Temperature Probe (1)        |
| 288-230-010  | Motor 230V 50/60Hz (1)           |
| 275-103-025  | Temperature Controller, 100-240V |

### **K27000 Smoke Point Lamp**.....Page 95

|           |                        |
|-----------|------------------------|
| K27040    | Replacement Window (1) |
| K270-0-22 | Scale (1)              |

### **K27100 Ramsbottom Carbon Residue Apparatus, 115V**.....Page 59

|             |                                                      |
|-------------|------------------------------------------------------|
| 230-115-001 | Heater, 2400W (1)                                    |
| 265-203-001 | Temperature Probe, Type "K", $\frac{3}{16}$ dia x 4" |
| 278-030-002 | Fuse, 30A                                            |
| 278-001-002 | Fuse, 1A                                             |
| 278-104-002 | Fuse, 0.25A                                          |
| 091-032-002 | Relay, Solid State, 4-32V DC, 30A                    |
| 275-103-024 | Temperature Controller, 100-240V, 1 out              |

### **K27190 Ramsbottom Carbon Residue Apparatus, 220-240V**.....Page 59

|             |                                                      |
|-------------|------------------------------------------------------|
| 230-230-002 | Heater, 2400W (1)                                    |
| 265-203-001 | Temperature Probe, Type "K", $\frac{3}{16}$ dia x 4" |
| 278-020-004 | Fuse, 20A                                            |
| 278-001-002 | Fuse, 1A                                             |
| 278-104-002 | Fuse, 0.25A                                          |
| 091-032-001 | Relay, Solid State, 4-32V DC, 20A                    |
| 275-103-024 | Temperature Controller, 100-240V, 1 out              |

### **K28300 Bending Apparatus**.....Page 173

|           |                 |
|-----------|-----------------|
| K283-0-14 | Test Panel (12) |
|-----------|-----------------|

### **K28310 Cooling Apparatus**.....Page 173

|             |               |
|-------------|---------------|
| K28310-0-1  | Large Stopper |
| K28310-0-2  | Small Stopper |
| K28310-0-3  | Inner Flask   |
| K297-0-1    | Vacuum Flask  |
| 332-014-001 | Funnel        |

### **K29300 High Temperature Evaporation Loss Apparatus**.....Page 149

|             |                                         |
|-------------|-----------------------------------------|
| 190-240-003 | Ring Heater, 500W, 240V (2)             |
| 220-240-002 | Cartridge Heater, 650W (2)              |
| 265-203-001 | Temperature Probe, Type "K", 4 in., (2) |
| 278-020-004 | Fuse, 20A                               |
| 278-001-002 | Fuse, 1A                                |
| 278-104-002 | Fuse, 0.25A                             |
| 010-230-004 | Wattstat (2)                            |
| K293-0-12   | Thermocouple (2)                        |
| K293-0-20   | Flowmeter (2)                           |

## SPARE PARTS (CONTINUED)

|                                                                                                   |                                         |                                                                                                 |                                         |
|---------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------|
| <b>K29400 Evaporation Loss Bath, 115V</b> .....Page 148                                           |                                         | <b>K30165/K30167 Rust Preventing Characteristics Oil Bath, 220-240V, 50Hz</b> .....Page 98, 128 |                                         |
| K294-0-1                                                                                          | Heater, 1000W (1)                       | 301-005-001                                                                                     | Belt (1)                                |
| K23700-03013A                                                                                     | Motor, 115V 60Hz                        | K301A-1-0-5                                                                                     | Heater, 1500W (1)                       |
| K70519                                                                                            | RTD Temperature Probe, 12 in.           | 288-230-001                                                                                     | Motor, 230V 50Hz (1)                    |
| 265-600-001                                                                                       | RTD Temperature Probe, 4 in.            | 265-600-001                                                                                     | RTD Temperature Probe, 4 in., 600F      |
| 278-020-004                                                                                       | Fuse, 20A                               | 278-020-004                                                                                     | Fuse, 20A                               |
| 278-001-002                                                                                       | Fuse, 1A                                | 278-001-002                                                                                     | Fuse, 1A                                |
| 278-104-002                                                                                       | Fuse, 0.25A                             | 278-104-002                                                                                     | Fuse, 0.25A                             |
| 091-032-001                                                                                       | Relay, Solid State, 4-32V DC, 20A       | 091-032-001                                                                                     | Relay, Solid State, 4-32 V DC, 20A      |
| 275-103-024                                                                                       | Temperature Controller, 100-240V, 1 out | 275-103-024                                                                                     | Temperature Controller, 100-240V, 1 out |
| <b>K29490 Evaporation Loss Test Bath, 220-240V</b> .....Page 148                                  |                                         | <b>K30166/K30168 Rust Preventing Characteristics Oil Bath, 220-240V, 60Hz</b> .....Page 98, 128 |                                         |
| K294A-0-1                                                                                         | Heater, 1000W (1)                       | 301-005-001                                                                                     | Belt (1)                                |
| K23700-03014A                                                                                     | Motor, 230V 50/60Hz                     | K301A-1-0-5                                                                                     | Heater, 1500W (1)                       |
| K70519                                                                                            | RTD Temperature Probe, 12 in.           | 288-230-003                                                                                     | Motor, 230V 60Hz (1)                    |
| 265-600-001                                                                                       | RTD Temperature Probe, 4 in.            | 265-600-001                                                                                     | RTD Temperature Probe, 4 in.            |
| 278-020-004                                                                                       | Fuse, 20A                               | 278-020-004                                                                                     | Fuse, 20A                               |
| 278-001-002                                                                                       | Fuse, 1A                                | 278-001-002                                                                                     | Fuse, 1A                                |
| 278-104-002                                                                                       | Fuse, 0.25A                             | 278-104-002                                                                                     | Fuse, 0.25A                             |
| 091-032-001                                                                                       | Relay, Solid State, 4-32V DC, 20A       | 091-032-001                                                                                     | Relay, Solid State, 4-32V DC, 20A       |
| 275-103-024                                                                                       | Temperature Controller, 100-240V, 1 out | 275-103-024                                                                                     | Temperature Controller, 100-240V, 1 out |
| <b>K29700 Freezing Point Apparatus</b> .....Page 96                                               |                                         | <b>K31956 Connection Apparatus</b> .....Page 176                                                |                                         |
| K297-0-1                                                                                          | Vacuum Flask (1)                        | K319-0-6                                                                                        | Condenser                               |
| K297-0-2                                                                                          | Sample Tube (Jacketed) (1)              | 363-102-003                                                                                     | ½ ID Latex Tubing, 2"                   |
| K297-0-8                                                                                          | Cork Strip (1)                          | K319-0-9                                                                                        | Tube Connecting Cork                    |
| K297-0-5                                                                                          | #2 Neoprene Stopper                     | K319-0-10                                                                                       | Thermometer Cork (2)                    |
| <b>K29750/K29758/K29759 Freezing Point Apparatus (ASTM D1177), 115V and 220-240V</b> .....Page 68 |                                         | K319-0-7                                                                                        | End Tube                                |
| K29750-1-1                                                                                        | 200mL Tube (1)                          | K319-0-8                                                                                        | Borosilicate Glass Tube                 |
| 332-003-012                                                                                       | 2 quart Dewar Flask (1)                 | <b>K33700 Existent Gum Evaporation Bath, 6-Unit, 220-240V</b> .....Page 86                      |                                         |
| <b>K29760/K29768/K29769 Wax Appearance Point Apparatus, 115V and 220-240V</b> .....Page 94        |                                         | 220-240-008                                                                                     | Cartridge Heater, 500W (6)              |
| K297-0-1                                                                                          | Vacuum Flask (1)                        | 265-203-001                                                                                     | Temperature Probe, Type "K", ⅜ dia x 4" |
| K29760-0-2                                                                                        | Sample Tube (1)                         | 278-020-004                                                                                     | Fuse, 20A                               |
| <b>K29900/K29990 Lead Corrosion Apparatus, 220-240V, 50Hz and 60Hz</b> .....Page 130              |                                         | 278-001-002                                                                                     | Fuse, 1A                                |
| K23700-03014A                                                                                     | Bath Motor, 230V 50/60Hz (1)            | K337-2-14                                                                                       | Flowmeter                               |
| K299-0-45A                                                                                        | Outer Heater, 500W (1)                  | 091-032-001                                                                                     | Relay, Solid State, 4-32V DC, 20A       |
| K299-0-45B                                                                                        | Middle Heater, 500W (1)                 | 275-103-020                                                                                     | Temperature Controller, 100-240V, 2 out |
| K299-0-45C                                                                                        | Inner Heater, 2000W (1)                 | <b>K33780 Existent Gum Evaporation Bath, 3-Unit, 115V</b> .....Page 86                          |                                         |
| 265-600-001                                                                                       | RTD Temperature Probe, 4 in.            | 190-120-005                                                                                     | Heater, Ring, 500W, 120V (3)            |
| K70519                                                                                            | RTD Temperature Probe, 12 in.           | 265-122-002                                                                                     | RTD Temperature Probe                   |
| 278-020-004                                                                                       | Fuse, 20A                               | 090-120-014                                                                                     | Relay, SPDT, 120V, 20A                  |
| 278-001-002                                                                                       | Fuse, 1A                                | K337-2-14                                                                                       | Flowmeter                               |
| 278-104-002                                                                                       | Fuse, 0.25A                             | 275-103-020                                                                                     | Temperature Controller, 100-240V, 2 out |
| 091-032-001                                                                                       | Relay, Solid State, 4-32 V DC, 20A      | 278-020-004                                                                                     | Fuse, 20A                               |
| 275-103-024                                                                                       | Temperature Controller, 100-240V, 1 out | 278-001-002                                                                                     | Fuse, 1A                                |
| <b>K30160/K30161 Rust Preventing Characteristics Oil Bath, 115V, 60Hz</b> .....Pages 98, 128      |                                         | 091-032-001                                                                                     | Relay, Solid State, 4-32V DC, 20A       |
| K301A-0-5                                                                                         | Heater, 1500W (1)                       | <b>K33781 Existent Gum Evaporation Bath, 3-Unit, 220-240V</b> .....Page 86                      |                                         |
| 301-005-001                                                                                       | Belt (1)                                | 190-240-003                                                                                     | Heater, Ring, 500W, 240V (3)            |
| 288-115-056                                                                                       | Motor, 115V 60Hz (1)                    | 265-122-002                                                                                     | RTD Temperature Probe                   |
| 265-600-001                                                                                       | RTD Temperature Probe, 4 in.            | 091-032-001                                                                                     | Relay, Solid State, 4-32V DC, 20A       |
| 278-020-004                                                                                       | Fuse, 20A                               | K337-2-14                                                                                       | Flowmeter                               |
| 278-001-002                                                                                       | Fuse, 1A                                | 275-103-020                                                                                     | Temperature Controller, 100-240V, 2 out |
| 278-104-002                                                                                       | Fuse, 0.25A                             | 278-020-004                                                                                     | Fuse, 20A                               |
| 275-103-024                                                                                       | Temperature Controller, 100-240V, 1 out | 278-001-002                                                                                     | Fuse, 1A                                |

## SPARE PARTS (CONTINUED)

### **K33800 Existent Gum Evaporation Bath w/Superheater, 220-240V** .....Pages 86, 87

|             |                                           |
|-------------|-------------------------------------------|
| 278-002-001 | 2A Fuse (2)                               |
| 220-240-008 | Cartridge Heater, 500W (6)                |
| 220-240-003 | Superheater Cartridge Heater, 1500W (1)   |
| 265-203-001 | Temperature Probe, Type "K", 3/8 dia x 4" |
| 275-103-032 | Temperature Controller, 100-240V          |
| K337-2-14   | Flowmeter                                 |
| 275-550-001 | Superheater Temperature Controller        |
| 265-550-002 | RTD Temperature Probe                     |
| 091-032-001 | Relay, Solid State, 90-240V, 20A          |

### **K33810 Steam Superheater, 220-240V** .....Page 87

|             |                             |
|-------------|-----------------------------|
| 220-240-003 | Cartridge Heater, 1500W (1) |
| 265-550-002 | RTD Temperature Probe (1)   |

### **K34000/K34010 Viscometer Cleaning & Drying Apparatus** .....Page 9

|             |            |
|-------------|------------|
| 261-104-001 | Filter (1) |
| AS568-015   | O-ring (1) |

### **K35000 Corrosion and Oxidation Stability Apparatus, 220-240V** ...Page 124

|             |                                               |
|-------------|-----------------------------------------------|
| 220-240-006 | Cartridge Heater, 250W (14)                   |
| 265-203-001 | Temperature Probe, Type "K", 3/8 dia x 4" (2) |
| K350-0-23   | Test Tube (6)                                 |
| K350-0-24   | Air Tube (6)                                  |
| K350-0-25   | Condenser (6)                                 |
| 278-020-004 | Fuse, 20A                                     |
| 278-001-002 | Fuse, 1A                                      |
| 278-104-002 | Fuse, 0.25A                                   |
| 091-032-001 | Relay, Solid State, 4-32 V DC, 20A            |
| 275-103-024 | Temperature Controller, 100-240V, 1 out       |

### **K34700 Brookfield Viscosity Air Bath, 115V 60Hz** .....Page 14

|             |                                   |
|-------------|-----------------------------------|
| 278-001-002 | Fuse, 1A                          |
| 278-020-004 | Fuse, 20A                         |
| 278-104-002 | Fuse, 0.25A                       |
| 288-115-059 | Motor 115V                        |
| 091-032-001 | Relay, Solid State, 4-32V DC, 20A |
| 271-040-002 | Circuit Breaker, 40A              |

### **K34701/K34702 Brookfield Viscosity Air Bath, 230V 50/60Hz** .....Page 14

|             |                                   |
|-------------|-----------------------------------|
| 278-001-002 | Fuse, 1A                          |
| 278-020-004 | Fuse, 20A                         |
| 278-104-002 | Fuse, 0.25A                       |
| 288-230-020 | Motor, 230V 50/60Hz               |
| 091-032-001 | Relay, Solid State, 4-32V DC, 20A |

### **K35200 Humidity Cabinet for Rust Protection, 115V, 60Hz** .....Page 65

|           |                    |
|-----------|--------------------|
| K352-0-22 | Heater, 750W (2)   |
| 191       | RTD Probe Assembly |

### **K35295/K35296 Humidity Cabinet for Rust Protection, 220-240V, 50Hz and 60Hz** .....Page 65

|            |                    |
|------------|--------------------|
| K352A-0-22 | Heater, 750W (2)   |
| 191        | RTD Probe Assembly |

### **K39103 Stirrer** .....Page 112

|              |                    |
|--------------|--------------------|
| 289-002-015  | Flange Bearing (2) |
| 289-002-014  | Bearing (1)        |
| K39100-23021 | Stirrer Motor      |

### **K39179 Conditioning Bath** .....Page 112

|             |                                   |
|-------------|-----------------------------------|
| K26490-1-5  | Control Heater, 1500W (2)         |
| K70519      | RTD Temperature Probe, 12 in.     |
| 288-230-002 | Motor                             |
| 278-020-004 | Fuse, 20A                         |
| 278-001-002 | Fuse, 1A                          |
| 278-104-002 | Fuse, 0.25A                       |
| 091-032-001 | Relay, Solid State, 4-32V DC, 20A |
| 271-025-004 | Circuit Breaker, 25A              |

### **K39190/K39199 Digital Demulsibility Characteristics Bath, 115V and 220-240V** .....Page 112

|               |                                 |
|---------------|---------------------------------|
| 265-500-001   | RTD Temperature Probe           |
| 279-115-002   | Lamp                            |
| K39180-0-10   | Heater, 1000W, 115V             |
| K39189-0-10   | Heater, 1000W, 230V             |
| 332-001-003   | Borosilicate Glass Jar, 12"x18" |
| K23700-03013A | Stirrer Motor, 115V 60Hz        |
| K23700-03014A | Motor, 230V 50/60Hz             |

### **K39900 LPG Copper Corrosion Water Bath, 115V** .....Page 89

|             |                                   |
|-------------|-----------------------------------|
| K253-1-0-8  | Heater, 750W (1)                  |
| 275-250-003 | Electronic Temperature Controller |
| 191         | RTD Probe Assembly                |

### **K39990 LPG Copper Corrosion Water Bath, 220-240V** .....Page 89

|             |                                   |
|-------------|-----------------------------------|
| K253-1A-0-8 | Heater, 750W (1)                  |
| 275-250-003 | Electronic Temperature Controller |
| 191         | RTD Probe Assembly                |

### **K40000 LPG Corrosion Test Cylinder** .....Page 89

|           |            |
|-----------|------------|
| AS568-218 | O-ring (1) |
|-----------|------------|

### **K42000/K42090 Powertrol Heater, 115V/230V** .....Pages 61, 72, 172

|             |                     |
|-------------|---------------------|
| 225-115-002 | Heater, 1000W, 115V |
| 225-230-002 | Heater, 1000W, 230V |
| 010-115-005 | Wattstat, 115V      |
| 010-230-004 | Wattstat, 230V      |

### **K43002 Dual Twin Foaming Characteristics Apparatus, 115V** .....Page 109

|               |                                      |
|---------------|--------------------------------------|
| K43012        | Cylinder and Holder Assembly (4)     |
| 265-400-002   | RTD Temperature Probe (2)            |
| K43002-0-9    | Heater, Outer, 750W (1)              |
| K43002-0-11   | Heater, Inner, 750W (1)              |
| K23700-03013A | Motor, 115V 60Hz (2)                 |
| 275-103-029   | Temperature Controller, 100-240V (2) |
| 091-120-001   | Relay, Solid State, 120V (2)         |
| K430-0-13     | Air Outlet Elbow (4)                 |
| K430-0-8      | Rubber Stopper (4)                   |
| 278-001-002   | Fuse, 1A                             |

### **K43003 Automatic Time Sequence Foaming Characteristics, 115V** .....Page 109

|               |                                      |
|---------------|--------------------------------------|
| K430-0-8      | Rubber Stopper (4)                   |
| 275-103-029   | Temperature Controller, 100-240V (2) |
| 265-400-002   | RTD Temperature Probe (2)            |
| K23700-03013A | Motor, 115V 60Hz (2)                 |
| 050-002-001   | Line Switch (2)                      |
| K430-0-13     | Air Outlet Elbow (4)                 |
| K43002-0-9    | Heater, Outer, 750W (1)              |
| K43002-0-11   | Heater, Inner, 750W (1)              |
| K43012        | Cylinder and Holder Assembly (4)     |
| 092-240-001   | Timer (3)                            |
| 278-001-002   | Fuse, 1A                             |
| 091-120-001   | Relay, Solid State, 120 V            |

## SPARE PARTS (CONTINUED)

|                                                                               |                                      |                                                                                              |                                  |
|-------------------------------------------------------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------|
| <b>K43025 Diffuser Stone Tester</b> .....                                     | Page 110                             | <b>K45090 Front View Distillation Apparatus, Right-Hand, 220-240V</b> .....                  | Page 55                          |
| 332-003-011                                                                   | Flask 500mL                          | 225-230-003                                                                                  | Brick Heater, 1250W (1)          |
| K43025-0-5                                                                    | Stopper                              |                                                                                              |                                  |
| 338-000-001                                                                   | Clamp Holder (2)                     | <b>K45100 Front View Distillation Apparatus, Left-Hand, 115V</b> .....                       | Page 55                          |
| 337-000-008                                                                   | Clamp Extension (2)                  | 225-115-003                                                                                  | Brick Heater, 1250W (1)          |
| 332-002-016                                                                   | Graduated Cylinder, 250mL            |                                                                                              |                                  |
| <b>K43041 Sequence IV Foaming Characteristics Apparatus, 115V</b> .....       | Page 109                             | <b>K45190 Front View Distillation Apparatus, Left-Hand, 220-240V</b> ....                    | Page 55                          |
| K43012                                                                        | Cylinder and Holder Assembly (2)     | 225-230-003                                                                                  | Brick Heater, 1250W (1)          |
| K43002-0-9                                                                    | Heater, Outer, 750W (1)              |                                                                                              |                                  |
| K43002-0-11                                                                   | Heater, Inner, 750W (1)              | <b>K45200 Group 4 Distillation Apparatus, Right-Hand, 115V</b> .....                         | Page 55                          |
| 265-400-002                                                                   | RTD Temperature Probe (1)            | K452-0-3                                                                                     | Heater (condenser), 300W (1)     |
| K430-0-8                                                                      | Rubber Stopper (2)                   | 225-115-003                                                                                  | Brick Heater, 1250W (1)          |
| 275-103-023                                                                   | Temperature Controller, 100-240V     | 265-550-004                                                                                  | RTD Probe 0.25 OD x 90 deg. bend |
| K23700-03013A                                                                 | Motor, 115V 60Hz                     |                                                                                              |                                  |
| 091-240-002                                                                   | Relay, Solid State, 90-240V, 25A     | <b>K45290 Group 4 Distillation Apparatus, Right-Hand, 220-240V</b> .....                     | Page 55                          |
| 090-120-010                                                                   | Relay, 120V                          | K452A-0-3                                                                                    | Heater (condenser), 300W (1)     |
| 278-001-002                                                                   | Fuse, 1A                             | 225-230-003                                                                                  | Brick Heater, 1250W (1)          |
|                                                                               |                                      | 265-550-004                                                                                  | RTD Probe 0.25 OD x 90 deg. bend |
| <b>K43049 Sequence IV Foaming Characteristics Apparatus, 220-240V</b> .....   | Page 109                             | <b>K45300 Group 4 Distillation Apparatus, Left-Hand, 115V</b> .....                          | Page 55                          |
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| K43092-0-9                                                                    | Heater, Outer, 750W (1)              | 225-115-003                                                                                  | Brick Heater, 1250W (1)          |
| K43092-0-11                                                                   | Heater, Inner, 750W (1)              | 265-550-004                                                                                  | RTD Probe 0.25 OD x 90 deg. bend |
| K430-0-8                                                                      | Rubber Stopper (2)                   |                                                                                              |                                  |
| 275-103-023                                                                   | Temperature Controller, 100-240V     | <b>K45390 Group 4 Distillation Apparatus, Left-Hand, 220-240V</b> .....                      | Page 55                          |
| 265-400-002                                                                   | RTD Temperature Probe                | K452A-0-3                                                                                    | Heater (condenser), 300W (1)     |
| K23700-03014A                                                                 | Motor, 230V 50/60Hz                  | 225-230-003                                                                                  | Brick Heater, 1250W (1)          |
| 090-240-012                                                                   | Relay, 240V                          | 265-550-004                                                                                  | RTD Probe 0.25 OD x 90 deg. bend |
| 091-240-004                                                                   | Relay, Solid State, 240V             |                                                                                              |                                  |
| 278-001-002                                                                   | Fuse, 1A                             | <b>Main Part: K45603, K45604, K45703-TS, K45704-TS Automatic Distillation Analyzer</b> ..... | Page 57                          |
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| K43012                                                                        | Cylinder and Holder Assembly (4)     | 220-240-016                                                                                  | Cartridge Heater 300W, 240V      |
| 265-400-002                                                                   | RTD Temperature Probe (2)            | K45658                                                                                       | Heating Element                  |
| K43092-0-9                                                                    | Heater, Outer, 750W (1)              | K45658-A                                                                                     | Ceramic Coil Support, set 4pc.   |
| K43092-0-11                                                                   | Heater, Inner, 750W (1)              | K45662-A                                                                                     | Fuse, 6.3A Time Lag F220-Pk 10   |
| K23700-03014A                                                                 | Motor, 230V 50/60Hz (2)              |                                                                                              |                                  |
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| K23700-03014A                                                                 | Motor, 230V 50/60Hz                  | K460-0-8                                                                                     | Thermometer Holder (4)           |
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| 050-002-001                                                                   | Line Switch (2)                      | AS568-219                                                                                    | O-ring (4)                       |
| K430-0-13                                                                     | Air Outlet Elbow (4)                 | AS568-131                                                                                    | O-ring (4)                       |
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| 225-115-003                                                                   | Brick Heater, 1250W (1)              |                                                                                              |                                  |

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|--------------|-------------------------------|
| K46100-03002 | Foam Covers                   |
| K46100-03030 | Copper Test Jacket            |
| 091-032-003  | Relay                         |
| 265-400-005  | RTD Temperature Probe         |
| 275-103-030  | Temperature Controller, 1 out |
| 283-120-006  | Solenoid Coil, 120-208-240V   |
| 283-308-002  | Solenoid Valve                |
| 278-001-002  | Fuse, 1A                      |

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#### **Model Numbers K46300, K46395, K46396**

|              |                               |
|--------------|-------------------------------|
| K46300-03002 | Foam Covers                   |
| K46100-03030 | Copper Test Jacket            |
| 091-032-003  | Relay                         |
| 265-400-005  | RTD Temperature Probe         |
| 275-103-031  | Temperature Controller, 1 out |
| 283-120-006  | Solenoid Coil, 120-208-240V   |
| 283-308-002  | Solenoid Valve                |
| 278-001-002  | Fuse, 1A                      |

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| 354-001-003 | Rheostat (1) |
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| K470-0-1-10 | Thermocouple (1) |
| K470-0-1-15 | Thermocouple (3) |
| 332-003-007 | 500mL Flask (1)  |

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|-------------|------------------------|
| 311-015-003 | Pressure Gauge (1)     |
| 290-010-001 | Pressure Regulator (1) |
| 037-108-00B | Toggle Valve (1)       |
| 261-104-001 | Filter (1)             |

### **K47590 Wickbold Apparatus, 220-240V**.....Page 58

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|-------------|--------------------------|
| 311-015-003 | Pressure Gauge (1)       |
| 290-010-001 | Pressure Regulator (1)   |
| 037-108-00B | Toggle Valve (1)         |
| 261-104-001 | Filter (1)               |
| 240-230-001 | Stepdown Transformer (1) |

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| 275-103-029 | Temperature Controller, 100-240V |
| 360-115-014 | Motor Control                    |
| 360-115-009 | Tachometer                       |
| 360-000-002 | Digital Pick Up                  |
| K299-4-52   | Flowmeter                        |
| K185-0-66   | Motor                            |
| 381-115-002 | Electronic Timer, 115V           |
| 381-240-001 | Electronic Timer, 240V           |
| 265-203-002 | Thermocouple                     |
| 236-115-003 | Strip Heater, 400W, 115V         |
| 236-230-003 | Strip Heater, 400W, 240V         |
| 332-017-001 | Separatory Funnel, 500mL         |
| 220-240-010 | Cartridge Heater, 300W, 240V     |
| 220-120-008 | Cartridge Heater, 300W, 115V     |
| 091-240-002 | Relay, Solid State, 90-240V, 25A |
| 278-104-003 | Fuse, 6A (1)                     |
| 278-003-001 | Fuse, 3.15A                      |
| 278-002-001 | Fuse, 2A (1)                     |
| 278-001-002 | Fuse, 2A (2)                     |

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| 190-120-009 | Ring Heater, 200W (4)                                    |
| 230-115-002 | Band Heater, 600W (1)                                    |
| AS568-213   | O-ring (24)                                              |
| K56110      | Oxidation Tubes and Absorption Tubes 12 Sets (2 per set) |
| 265-122-002 | RTD Temperature Probe, 3 in., 2 Wire                     |
| 265-122-003 | RTD Temperature Probe, 3 in., 3 Wire                     |
| 278-020-004 | Fuse, 20A                                                |
| 278-001-002 | Fuse, 1A                                                 |
| 278-104-002 | Fuse, 0.25A                                              |

### **K56190 Cigre Bath, 220-240V**.....Page 126

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|-------------|----------------------------------------------------------|
| 190-240-008 | Ring Heater, 200W (4)                                    |
| 230-230-003 | Band Heater, 600W (1)                                    |
| AS568-213   | O-ring (24)                                              |
| K56110      | Oxidation Tubes and Absorption Tubes 12 Sets (2 per set) |
| 265-122-002 | RTD Temperature Probe, 3 in., 2 Wire                     |
| 265-122-003 | RTD Temperature Probe, 3 in., 3 Wire                     |
| 278-020-004 | Fuse, 20A                                                |
| 278-001-002 | Fuse, 1A                                                 |
| 278-104-002 | Fuse, 0.25A                                              |

### **K70000 Oxidation Bomb**.....Page 114

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| K70050-00000 | Silicone O-ring (qty. depends on usage) |
| K70060       | Valve (1)                               |

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|---------------|-------------------------------|
| K702-0-8      | Control Heater, 1000W (1)     |
| K702-0-8A     | Continuous Heater, 1000W (1)  |
| K702-0-8B     | Control Heater, 750W (1)      |
| AS568-345-V14 | O-Ring, Viton (2)             |
| K700B-0-41    | Drive Shaft Seal (8)          |
| K702-CHAIN    | Chain Kit (1)                 |
| 050-230-002   | Switch                        |
| K700B-0-43    | Ball Bearing (2)              |
| K70519        | RTD Temperature Probe, 12 in. |
| 265-600-001   | RTD Temperature Probe, 4 in.  |
| 278-020-004   | Fuse, 20A                     |
| 278-001-002   | Fuse, 1A                      |
| 278-104-002   | Fuse, 0.25A                   |

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| K703-0-8      | Heater, 1000W (2)             |
| K703-0-8A     | Control Heater, 750W (1)      |
| 301-004-001   | Vee Belt (1)                  |
| AS568-345-V14 | O-Ring, Viton (3)             |
| K700B-0-41    | Drive Shaft Seal (12)         |
| K703-CHAIN    | Chain Kit (1)                 |
| K700B-0-43    | Ball Bearing (3)              |
| 288-115-009   | Motor, 1/2 hp                 |
| 050-230-002   | Switch                        |
| K70519        | RTD Temperature Probe, 12 in. |
| 265-600-001   | RTD Temperature Probe, 4 in.  |
| 278-020-004   | Fuse, 20A                     |
| 278-001-002   | Fuse, 1A                      |
| 278-104-002   | Fuse, 0.25A                   |

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| K704-0-8                                                             | Heater, 1000W (4)                                     | KLA-4S-008-04                                                     | CFPP calibrated glass cell       |
| 301-004-001                                                          | Vee Belt (1)                                          | KLA-4S-008-041                                                    | "O" ring for CFPP test jar       |
| AS568-345-V14                                                        | O-Ring, Viton (4)                                     | KLA-4S-008-12                                                     | PT100 product w/ connector       |
| K700B-0-43                                                           | Ball Bearing (4)                                      | KLA-4S-008-13                                                     | Calibrated aspiration pipette    |
| K700B-0-41                                                           | Drive Shaft Seal (16)                                 | KLA-4S-013-01                                                     | Filter assembly                  |
| K704-CHAIN                                                           | Chain Kit (1)                                         | KLA-4S-013-02                                                     | Filter                           |
| 288-115-009                                                          | Motor, 1/2 hp                                         | KLA-4S-1232                                                       | "O" ring (small) for CFPP filter |
| 050-230-002                                                          | Switch                                                | KLA-4S-1288                                                       | "O" ring for CFPP filter         |
| K70519                                                               | RTD Temperature Probe, 12 in.                         |                                                                   |                                  |
| 265-600-001                                                          | RTD Temperature Probe, 4 in.                          | <b>KLA-5-TS Automatic Freezing Point System</b> .....             | Pages 97                         |
| 278-020-004                                                          | Fuse, 20A                                             | KLA-5S-008-07                                                     | Fiber optic for Freezing point   |
| 278-001-002                                                          | Fuse, 1A                                              | KLA-5S-008-12A                                                    | Removable freezing glass cell    |
| 278-104-002                                                          | Fuse, 0.25A                                           |                                                                   |                                  |
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| K87100-6                                                             | Detection Cable                                       |                                                                   |                                  |
| K87100-7                                                             | PT 100 Probe                                          |                                                                   |                                  |
| K87100-8                                                             | Electric Ignitor (consumable)                         |                                                                   |                                  |
| K87100-9                                                             | Roll of Printer Paper (consumable)                    |                                                                   |                                  |
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| K87400-4                                                             | Electric Ignitor (consumable)                         |                                                                   |                                  |
| K87400-5                                                             | Roll of Printer Paper (consumable)                    |                                                                   |                                  |
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| 277-001-001                                                          | Fuse Holder and Cap                                   |                                                                   |                                  |
| 278-004-001                                                          | Fuse, 4A                                              |                                                                   |                                  |
| 459-012-001                                                          | Battery, 12V (1)                                      |                                                                   |                                  |
| K95500-02001                                                         | Light Assembly                                        |                                                                   |                                  |
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| KLA-1S-008-04                                                        | Calibrated glass cell for cloud (silver bottom)       |                                                                   |                                  |
| KLA-1S-008-041                                                       | "O" ring for CP test jar                              |                                                                   |                                  |
| KLA-1S-008-06                                                        | Fiber optic for cloud point                           |                                                                   |                                  |
| KLA-1S-008-12                                                        | PT100 product w/ connector (white)                    |                                                                   |                                  |
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| KLA-2S-008-041                                                       | "O" ring for PP test jar                              |                                                                   |                                  |
| KLA-2S-008-12                                                        | PT100 product w/ connector (white)                    |                                                                   |                                  |
| KLA-2S-008-13                                                        | PT100 detection w/ connector (brown)                  |                                                                   |                                  |
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| KLA-3S-008-12A                                                       | PT100 product w/ connector (blue)                     |                                                                   |                                  |
| KLA-2S-008-13                                                        | PT100 detector w/ connector (brown)                   |                                                                   |                                  |
| KLA-1S-008-04                                                        | Calibrated Glass Cell for Cloud Point (silver bottom) |                                                                   |                                  |

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