

LUBRICATING OILS

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-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 air and liquid baths 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 1/2hp 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, 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
Diffuser Stones, calibrated and
certified
Air Delivery Tube Assemblies
Air Outlet Tubes
Rubber Stoppers
Bath Jars
Support Rack

*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.



K43092 Dual-Twin 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 Pyrex™ 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	Bath Jar
Diffuser Stones, calibrated and certified	Support Rack
Air Delivery Tube Assemblies	Rubber Stoppers
Air Outlet Tube	

Custom Configurations—In addition to the standard configurations described in this catalog, Koehler liquid-bath foaming characteristics test equipment can be ordered in the following custom configurations:

- Dual-Twin 24°C/D892-150°C/D6082
- Dual-Twin 93.5°C/D892-150°C/D6082
- Single-Bath model for ASTM D892 (for 24°C and 93.5°C tests)

Custom models have the same operating features and characteristics as the standard models and each bath is equipped with the necessary air flow and control accessories required to perform the applicable test method. Contact your Koehler representative for ordering information and pricing.

Foaming Characteristics of Lubricating Oils

Ordering Information

Model	Catalog No.	Electrical Requirements	Bath Temperature	Air Flow Rate	Bath Capacity	Dimensions lwxh, in. (cm)	Shipping Information
Dual-Twin	K43002	115V 50/60Hz 15.6A	24°C (75°F)	94mL/min	9 gal (38.5L) each bath	32½x15x31¼ (82x38x79.4) Net Weight: 108 lbs (49kg)	Shipping Wgt. 217 lbs (98.4kg) Dimensions 29.6 Cu. ft.
	K43092	220-240V 50/60Hz 8.1A	and 93.5°C (200°F)				
Automatic Time Sequence	K43003	115V 50/60Hz 16A	(Operator variable)	200mL/min	9 gal (38.5L)	32½x15x31¼ (82x38x79.4) Net Weight: 118 lbs (53.5kg)	Shipping Wgt. 227 lbs (103kg) Dimensions: 33 Cu. ft.
	K43093	220-240V 50/60Hz 8A					
Sequence IV Liquid	K43041	115V 50/60Hz 14A	150°C (302°F)	200mL/min	9 gal (38.5L)	16½x15x31¼ (42.5x38x79.4) Net Weight: 62 lbs (28.1kg)	Shipping Wgt. 89 lbs (40.4kg) Dimensions 16.3 Cu. ft.
	K43049	220-240V 50/60Hz	(Operator variable)				



K43041
Sequence IV
Liquid Foaming
Characteristics
Apparatus

High Temperature Air Foam Test Bath—For four tests in accordance with control ASTM D6082 or ASTM D892 specifications. Heated air bath features digital temperature control and an operating range to 150°C. Two digital-indicating mass flow controllers maintain the required flow rate of 94 or 200mL/min to the air diffusers. Includes a time sequence controller to automatically time the soaking, blowing and settling periods, with alarms to alert the operator to the next step in the test. 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

Diffuser Stones, calibrated and certified

Air Delivery Tube Assemblies

Air Outlet Tubes

Rubber Stoppers

Bath Jars

Support Rack

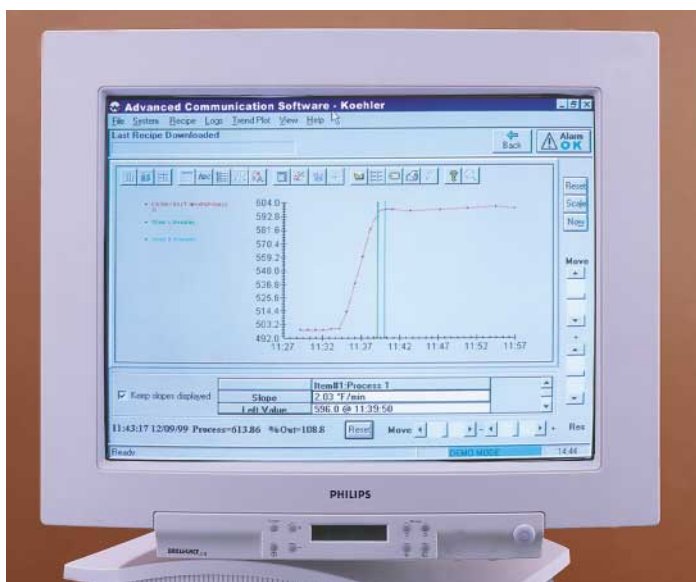
Accessories and Additional Ordering Information

For a complete listing of diffuser accessories and information on how to order a complete package for ASTM D892 or D6082 testing, please turn to page 110.



Digital Flowmeter option
is available for this unit.

Foaming Characteristics of Lubricating Oils



Advanced Communications Software Package for Data Management

Accessories

Catalog No.

387-115-001 Air Pump, oil-less. Delivers 100% oil-free air. 115V 50/60Hz

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°C

K23425 Acrylic Heat Shield, with base

For high temperature bath on Dual-Twin Foam Test Apparatus.

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.

Test apparatus for ASTM D892 Sequence I, II and III

Catalog No.

Catalog No.	Description	Order Qty
K43002	Dual Twin Foam Test Apparatus (or K43003 Automatic Time Sequence Model)	1
387-115-001	Air Pump	1
K43025	Diffuser Stone Test Apparatus	1
250-000-12F	ASTM 12F Thermometer (or 250-000-12C ASTM 12C Thermometer)	2
K43026	Wet Test Gas Meter (not required for Alternative Procedure)	1
332-005-005	Drying Tower	1
K23425	Acrylic Heat Shield (optional)	1

Test apparatus for ASTM D6082 Sequence IV

Catalog No.

Catalog No.	Description	Order Qty
K43041	Sequence IV Foam Test Bath	1
K43025	Diffuser Stone Test Apparatus	1
K43026	Wet Test Meter	1
332-005-005	Drying Tower	1
K23425	Acrylic Heating Shield (optional)	1
387-115-001	Air Pump	1
250-000-41C	ASTM 41C Thermometer	1

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

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 immersion circulator/heater assembly controls bath fluid temperature with greater than $\pm 1^\circ\text{C}$ accuracy and stability throughout the operating range of 25°C to 150°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°C and 82°C are attained within 10 minutes after placement of the test cylinders into the stabilized bath. Clear Pyrex™ bath 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. Finished aluminum cover assembly has built-in handles for removal when filling or cleaning the bath.

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

Specifications

Conforms to the specifications of: ASTM D1401, D6074, D6158; ISO 6614; DIN 51599; FTM 791-3201; NF T 60-125

Stirrer Range: 60-1800rpm

Accuracy: ± 1.0 rpm

Drive: $\frac{1}{2}$ hp (75W), high torque

Bath Temperature Range: 25°C to 150°C

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

Capacity: seven (7) 100mL graduated cylinders

Construction: Pyrex™ glass jar 12x12 in. (30.5x30.5cm)

Medium: Water or white technical oil

Medium Capacity: 21.9L (5.8 gal)

Electrical Requirements:

115V, 50/60Hz, Single Phase, 12A

220-240V 50/60 Hz, Single Phase, 6A



K39200 Water Separability Tester

large backlit LCD panel. A wide operating range of 60-1800rpm permits in-house customized testing with ± 1 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.

Included Accessories

Seven 100mL Cylinders

Shipping Information

Shipping Weight: 85 lbs (38.5kg)

Dimensions: 8.4 Cu. ft.

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

12x12x38 (30.5x30.5x96.5)

Net Weight: 55 lbs (24.9kg)

Ordering Information

Catalog No.		Order Qty
K39200	Water Separability Tester, 115V 60Hz	1
K39296	Water Separability Tester, 220-240V 50/60Hz	

Accessories

332-002-018	Cylinder 100mL, graduated from 5 to 100mL with 1.0mL divisions (Not suitable for use with discontinued models K39000 and K39096. Contact your Koehler representative for information.)
250-000-19F	ASTM 19F Thermometer. Range: 120 to 134°F
250-000-19C	ASTM 19C Thermometer. Range: 49 to 57°C
250-000-21F	ASTM 21F Thermometer. Range: 174 to 188°F
250-000-21C	ASTM 21C Thermometer. Range: 79 to 87°C
K39252	PTFE Policeman
K39251	Test Tube Rack

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

Demulsibility Characteristics of Lubricating Oils



K39180 Demulsibility Bath With K39102 Stirrers and K39120 Funnels



K39102 Stirrer

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 and DIN 51353
- Variable 150-8000rpm stirrer speed
- Choice of digital or analog bath models

Stirrer—Complete stirrer assembly per Fig. 1 and 2 of ASTM D2711, including high speed 1/8hp 8000rpm drive motor, stainless steel propeller shaft, top, center and bottom bearings, and steel motor housing with positioning plate. Entire assembly mounts vertically in K39110/K39119 Constant Temperature Bath. Built-in tachometer disc allows for precise stirrer speed adjustment. (Order tachometer separately).

Constant Temperature Baths—Standard model holds two K39100 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 (150-8000rpm range) are provided for each stirrer. All wetted parts are constructed of stainless steel. Order thermometer separately. Visibility model has microprocessor digital temperature control with dual LED displays for setpoint and actual temperatures and an illuminated bath interior with window for viewing sample cylinders. A separate digital LED speed control is provided for each stirrer.

Specifications

Conforms to the specifications of: ASTM D2711, DIN 51353
 Capacity: Two (2) sample-water mixtures
 Maximum Temperature: 212°F (100°C)
 Temperature Control: Electric solid state or microprocessor digital control with LED display
 Bath Medium: 10.7 gal (40.4L) water for K39110/K39119
 9 gal (38.5L) water for K39180/K39189

Dimensions: dia.xh.in.(cm)
 14¾x35½ (37x90)
 Net Weight: 72 lbs (32.6kg)

Shipping Information

Shipping Weight 133 lbs (60.3kg)
 Dimensions: 25.4 Cu. ft.

Accessories

Catalog No.		Order Qty
K39120	Separatory Funnel 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 50/60Hz High output 1400W dryer and brass cylinder mounted on a sturdy base. Rapidly dries stirrer assembly after cleaning.	1
K39149	Forced Warm Air Dryer, 220-240V 50/60Hz	1
K39150	Sampling Gauge and Centering Device Per Fig. X1 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 Hand held non-contact LCD tachometer takes measurements up to 3 ft away with ±1rpm accuracy. Supplied with four 1.5V AA batteries.	1
250-000-09F	ASTM 9F Thermometer Range: 20 to 230°F	1
250-000-09C	ASTM 9C Thermometer Range: -5 to +110°C	1
K39170	Conditioning Bath, 115V 50/60Hz 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	

Ordering Information

Catalog No.		Order Qty
K39110	Demulsibility Characteristics Bath, 115V 50/60Hz	1
K39119	Demulsibility Characteristics Bath, 220-240V 50/60Hz	1
K39100	Stirrer, 115V 50/60Hz* *Suitable for use with K39110 & K39119	2
K39180	Visibility Bath, 115V, 50/60Hz	
K39189	Visibility Bath, 220-240V, 50/60Hz	
K39102	Stirrer, 115V, 50/60Hz** **Suitable for use with K39180 & K39189	

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

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; non-pulsating air pump; compressed air heater with digital temperature controller, overtemperature and overpressure protection circuitry; pressure gauge; thermometer. Jacketed sample tube with air inlet and outlet tubes and baffle plate is ordered separately.

Specifications

Conforms to the specifications of:
 ASTM D3427; IP 313; DIN 51381;
 NF E 48-614
 Temperature Range:
 ambient to 75°C (167°F)
 Electrical Requirements:
 115V 60Hz, 3.0A
 230V 50Hz, 1.5A
 230V 60Hz, 1.5A

Dimensions

l x w x h, in. (cm)
 24x28x38¼ (61x71x97)
 (Air Release Value Apparatus only)

Net Weight for complete system:
 225 lbs (103kg)

Included Accessories

ASTM 12C Thermometer
 Sinker
 Drying oven
 Pressure gauge
 Circulating Bath
 Air Bath for Sinker
 Balance
 Platinum Wire

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, 115V 60Hz	1
K88501	Air Release Value Apparatus, 230V 50Hz	
K88502	Air Release Value Apparatus, 230V 60Hz	
Accessories		
K88500-1	Jacketed Test Vessel	1

Oxidation Stability

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 RBOT procedure employs severe oxidation conditions to rapidly determine oxidation stability. Suitable for both new and in-service oils, the 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 RBOT method is the "Thin Film Oxidation Uptake Test" (TFOUT) for gasoline automotive engine oils.

RBOT Test Apparatus

- 2, 3 and 4-unit systems
- Oxidata™ Pressure Measurement System
- Conforms to ASTM D2112, D2272 and IP 229 specifications for 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 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 RBOT/TFOUT test apparatus**

Complete electronic measurement systems for plotting pressure versus time and temperature in 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 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

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 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 disk or hard drive during testing to prevent loss of valuable data
- Operates in Windows® and Windows 95® environments
- Simple upgrade from existing Koehler data acquisition systems

Included Accessories (for the pressure measurement systems)

Rotary transducers (connects directly to bomb)

Data acquisition card

Multiplexer

Oxidata™ software

RTD probe assembly (1)

Mounting Bracket for bath

Connecting cables and hardware

Computer Requirements

Processor: 486 or higher

Memory (RAM): 8MB or higher

Speed: 66 MHz or higher

Windows® 3.1 or better, Windows 95®

Disk Space: 1.6MB

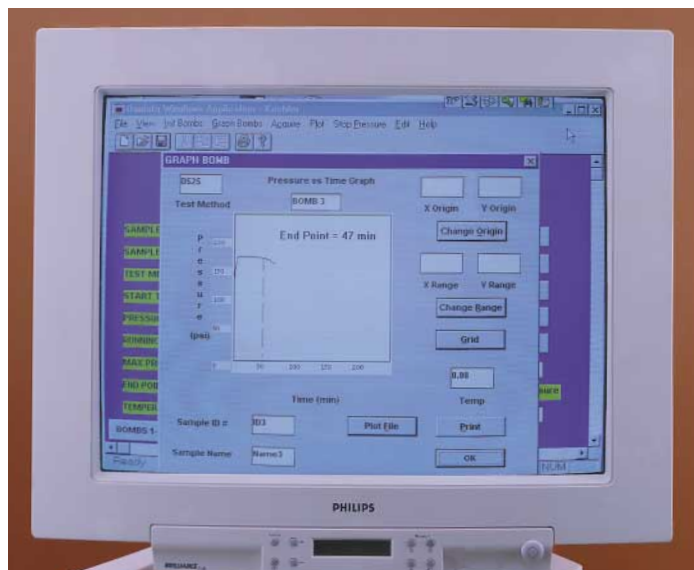
Ordering Information

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.

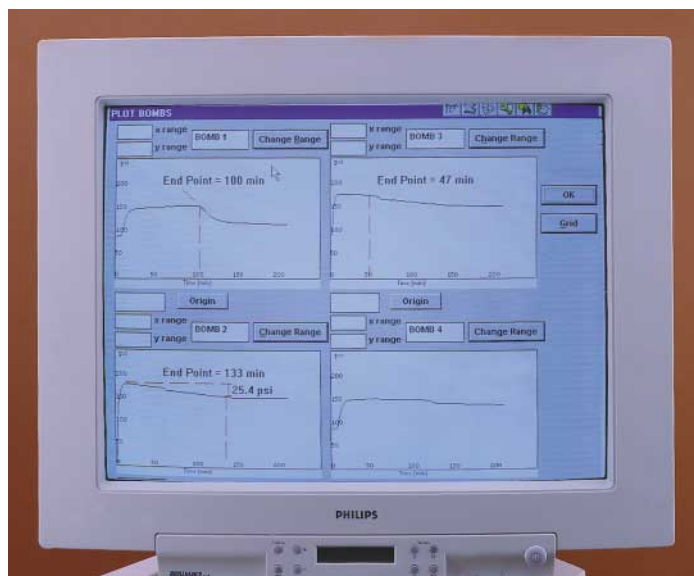
Catalog No.

RBOT/TFOUT Electronic Pressure Measurement System

K70502	Two-Unit System, 115V 60Hz
K70592	Two-Unit System, 220-240V 50/60Hz
K70503	Three-Unit System, 115V 60Hz
K70593	Three-Unit System, 220-240V 50/60Hz
K70504	Four-Unit System, 115V 60Hz
K70594	Four-Unit System, 220-240V 50/60Hz



Oxidata™ Software automatically calculates and displays the endpoint of RBOT/TFOUT test methods (TFOUT screen shown).



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

Oxidata™ Retrofit Kits

To upgrade your existing Koehler electronic pressure measurement system to the Oxidata™ software, please refer to page 118.

Oxidation Stability

Oxidation Baths

- Two, three and four-pressure vessel models
- Conforming to ASTM requirements for 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 —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	Bath Capacity, gal (L)	Dimensions, l x w x h, in. (cm)	Net Weight	Shipping Weight
K70200	2 oxidation vessels	220-240V 60Hz, 17.17A	18 (68)	28x26x33	237 lbs	356 lbs (161.5kg)
K70290		220-240V 50Hz, 17.17A		(71x66x84)	(107.5kg)	25.3 Cu. ft.
K70300	3 oxidation vessels	220-240V 60Hz, 17.17A	25 (95)	37x26x33	284 lbs	416 lbs (188.7kg)
K70390		220-240V 50Hz, 17.17A		(94x66x84)	(129kg)	32 Cu. ft.
K70400	4 oxidation vessels	220-240V 60Hz, 21.5A	32 (121)	46x26x33	375 lbs	542 lbs (245.9kg)
K70490		220-240V 50Hz, 21.5A		(117x66x84)	(170kg)	40.3 Cu. ft.

Bath Thermometers

- For verifying bath temperature in accordance with ASTM and IP test method specifications

Ordering Information

Catalog No.	Description
250-001-37C	IP 37C Thermometer. Range: 144 to 156°C For 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

Oxidation Pressure Vessel Accessories

- Sample beakers for RBOT and TFOUT methods
- Oxygen charging accessories

Ordering Information

Catalog No.

Sample Beakers

K70040	RBOT Sample Beaker Borosilicate glass, 175mL Meets ASTM D2112, D2272 specifications
K70091	TFOUT Sample Container Borosilicate glass. Meets ASTM D4742 specifications

Oxygen Charging Accessories

K70080	Charging Hose. 6 ft (1.8m), with connections
K70081	Quick Connect Coupling, for charging hose
K70083	Quick Connect Couplings, for oxidation pressure vessel
K70013	Oxygen Pressure Regulator

Oxidation Pressure Vessel Accessories

K70050	Silicone O-ring Replacement seal for pressure vessel lid-body connection
K70049	Sample Beaker Cover (PTFE disk)
K70048	TFOUT Sample Beaker Cover (PTFE disk)
K700-0-3	Spring. Inserts in pressure vessel to hold RBOT beaker and cover in place
K700-0-3A	Spring. Inserts in pressure vessel to hold 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

Catalog No.

K70010/24	Pressure Recorder, 24-hour
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Accessories

K70018	Replacement Cartridge Pen
308-000-004	Recorder Chart, 24-hour Box of 100 charts

Oxidata™ pressure measurement equipment is now available for the 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

Catalog No.

K70017	Pressure Vessel Support Rack, 2-Unit
K70011	Pressure Vessel Support Rack, 3-Unit
K70012	Pressure Vessel Support Rack, 4-Unit

Catalysts

- For Rotating Bomb Oxidation Test (RBOT)
- For Thin Film Oxidation Uptake Test (TFOUT)

Ordering Information

Catalog No.

Copper Catalyst for RBOT Method

K70030	Copper Catalyst Coil Prepared in accordance with ASTM specifications and packed in a sealed glass container with nitrogen atmosphere. Ready to use.
K70090	Copper Catalyst Wire 1.63mm electrolytic copper wire in 500 ft (152m) lengths.
K70002	Winding Mandrel Machined aluminum mandrel for winding copper wire into coils meeting ASTM specifications. Mounts on K70003/K70004 Drive Unit
K70003	Drive Unit for Winding Mandrel Slow speed gear motor mounted on a sturdy base. Facilitates coil winding procedure. 115V
K70004	Drive Unit Similar to K70003 but for operation on 220-240V

Catalyst Package for TFOUT Method

K70093	Catalyst Package A For simulating IIID engine test. Includes 3 catalyst packages.
K70094	Catalyst Package B For simulating IIIE engine test. Includes 5 catalyst packages. NIST certified
K70095	Catalyst Package B For simulating IIIE engine test. Includes 3 catalyst packages

Oxygen Stand Assembly

K70401	Oxidation Stand Assembly For K70400 & K70490
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Oxidation

2-Unit RBOT System:

K70200	Oxidation Bath (or K70290)	
K70000	Oxidation Pressure Vessel (2)	
K70502	Oxidata™ Pressure Measurement System (or K70592)	
K70002	Winding Mandrel	
K70003	Drive Unit (or K70004)	
K70017	Pressure Vessel Support Rack	
250-001-37C	IP 37C Bath Thermometer	
K70080	Charging Hose	
K70081	Quick Connect Coupling for charging hose	
K70083	Quick Connect Coupling for oxidation pressure vessel (2)	
K70013	Oxygen Pressure Regulator	
K70030	Copper Catalyst Coils	} Order sufficient quantity to meet anticipated testing requirements.
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	Oxidata™ Pressure Measurement System (or K70593)	
K70002	Winding Mandrel	
K70003	Drive Unit (or K70004)	
K70011	Pressure Vessel Support Rack	
250-001-37C	IP 37C Thermometer	
K70080	Charging Hose	
K70081	Quick Connect Coupling for charging hose	
K70083	Quick Connect Coupling for oxidation pressure vessel (3)	
K70013	Oxygen Pressure Regulator	
K70030	Copper Catalyst Coils	} Order sufficient quantity to meet anticipated testing requirements.
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	Oxidata™ Pressure Measurement System (or K70594)	
K70401	Oxidation Stand Assembly, 4-Unit RBOT	
K70002	Winding Mandrel	
K70003	Drive Unit (or K70004)	
K70012	Pressure Vessel Support Rack	
250-001-37C	IP 37C Thermometer	
K70080	Charging Hose	
K70081	Quick Connect Coupling for charging hose	
K70083	Quick Connect Coupling for oxidation pressure vessel (4)	
K70013	Oxygen Pressure Regulator	
K70030	Copper Catalyst Coil	} Order sufficient quantity to meet anticipated testing requirements.
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)
K70093	} TFOUT Catalyst Package (in lieu of K70030, K70090, K70002, K70003)
K70094	
K70095	
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.

K70502RETRO	2-Unit Oxidata™ Pressure Measurement System without Transducers, 115V 60Hz
K70592RETRO	2-Unit Oxidata™ Pressure Measurement System without Transducers, 220-240V 50/60Hz
K70503RETRO	3-Unit Oxidata™ Pressure Measurement System without Transducers, 115V 60Hz
K70593RETRO	3-Unit Oxidata™ Pressure Measurement System without Transducers, 220-240V 50/60Hz
K70504RETRO	4-Unit Oxidata™ Pressure Measurement System without Transducers, 115V 60Hz
K70594RETRO	4-Unit Oxidata™ Pressure Measurement System without Transducers, 220-240 50/60Hz

Accessories

K70500	Rotary Transducer Includes electronic transducer and rotating stainless steel housing
K70519	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, D5968, D6594;

DIN 51394, 51586, 51587; FTM 791-5307, 791-5308; UOT**

*with the appropriate glassware rack and flow control equipment installed
–see ordering information.

****Modified versions of this equipment are available for 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:

115V 50/60 Hz, Single Phase, 27.3A

220-240V 50/60Hz, Single Phase, 14.6A

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

Bath (without glassware): 25½ x 24 x 42 (65 x 61 x 107)

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 50/60Hz

K12239 High Temperature Convertible Oxidation Bath,
220-240V 50/60Hz

Accessories

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.

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 1/60 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: 25½x24x42 (65x61x107)

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.



Digital Flowmeter option is available for this unit.



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 50/60Hz, Single Phase, 13.0A

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

12-place model: 115V 50/60Hz, Single Phase, 32.6A

220-240V 50/60Hz, Single Phase, 17.0A

Ordering Information

Catalog No.

K12200 Oxidation Bath, 8-Unit, 115V 50/60Hz

K12290 Oxidation Bath, 8-Unit, 220-240V 50/60Hz

K12212 Oxidation Bath, 12-Unit, 115V 50/60Hz

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.

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: ±0.1°C (±0.2°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:

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

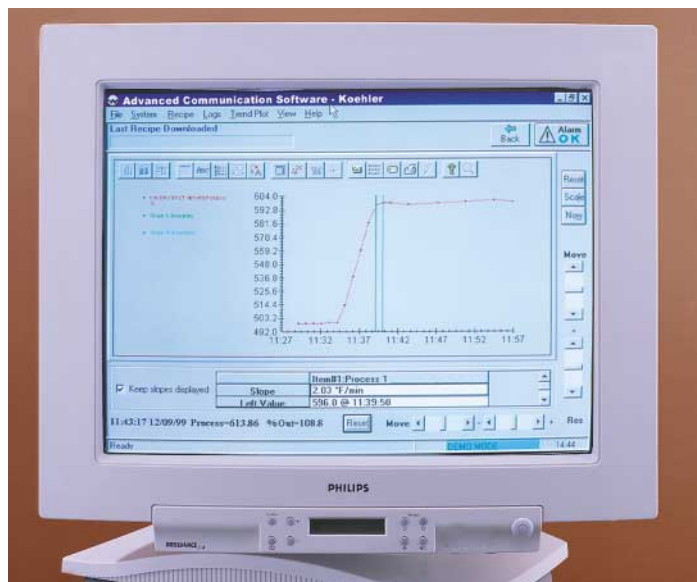
K12300 60-Place Oxidation Stability Bath, 220-240V 60Hz

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.



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: ±0.2°F (0.1°C)

Air Flow Rate: 3L/h

Electrical Requirements: 220-240V 50/60Hz, Single Phase, 16A

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



K12300 60-Place Oxidation Bath
Shown with optional pressure-temperature recorder

Oxidation Cell Glassware and Accessories

Ordering Information

Catalog No. K12281	Oxidation Cell Assembly for ASTM D943 and D4310 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
K122-0-18	Oxygen Delivery Tube
K122-0-19	Oxidation Test Tube
K122-0-20	Condenser
K122-0-21	Thermometer Bracket
K122-0-22	Oil Level Indicator Strip
K122-0-23	Syringe Sampling Tube Holder
K122-0-27	PTFE Stopper
K122-0-28	Syringe Sampling Spacer
K122-0-30	Syringe Sampling Tube
AS568-009-V14	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.

Iron-Copper Catalyst

For ASTM D943 and D4310

Ordering Information

Catalog No. K12210	Catalyst Coil 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.
K24000	Wire Coiling Mandrel Mounts on bench for winding steel and copper wire into catalyst coils meeting ASTM specifications.
K12250	Steel Wire Low metalloid steel wire, 0.0625" (1.59mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths.
K12260	Copper Wire Electrolytic copper wire, 0.064" (1.63mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths.
380-100-001	Silicone Carbide Paper Used to polish steel and copper wire prior to winding into catalyst coils. 100 grit.

Thermometers

Ordering Information

Catalog No. 250-002-001	Oxidation Cell Thermometer Range: 80 to 100°C. For ASTM D943 and D4310.
250-000-40C	ASTM 40C Thermometer 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:

115V 50/60Hz, 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.

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, 115V 50/60Hz	1
K12190	Oxidation Stability Bath, 220-240V 50/60Hz	
Accessories		
K12130	Copper Catalyst Coils Sealed in a glass jar with a nitrogen atmosphere. Pack of 24 (12 sets)	1
332-005-010	Drying Tower 250mL with ground glass stopper and side tubes	1
332-005-011	Glass Filter Crucible	1
250-000-95C	ASTM 95C Thermometer Range: 100 to 130°C	1
355-001-001	White Technical Oil 1 gal container. See page 8 for specifications.	3

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

Corrosiveness and Oxidation Stability

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.



K35100 FTM 791-5308 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

Dimensions lwxh,in.(cm)

32½x14½x41½ (83x37x105)

Net Weight: 271 lbs (122.9kg)

Shipping Information

Shipping Weight: 375 lbs (170.1kg)

Dimensions: 18.5 Cu. ft.

Ordering Information

Catalog No.		Order Qty
K35100	Corrosivity and Oxidation Stability Test Apparatus ASTM D4636, D5968 and FTM 791-5307 Model, 220-240V 50/60Hz	1
K35000	FTM 791-5308 Model, 220-240V 50/60Hz	
K35300	IHC BT-10 Model, 220-240V 50/60Hz	
Thermometers		
250-000-08F	ASTM 8F Thermometer Range: 30 to 760°F	
250-000-08C	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.



Digital Flowmeter option
is available for this unit.

Corrosiveness and Oxidation Stability

Glassware, Test Specimens and Accessories		Metal Test Specimens	
Catalog No.		Order Qty	Catalog No.
ASTM D4636, D5968, D6594 and FTM 791-5307			Washer Shaped Specimens for ASTM D4636 Standard Procedure and for FTM 791-5307
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
K351-0-7	Spacer	36	K35160 Silver
K351-0-8	PTFE Adapter	6	K35170 Titanium
K351-0-13	Oil Sampling Tube (for D5968 and FTM 791-5307)		
K351-0-14	Specimen Hanger (for D6594)		
K293-0-12	Thermocouple, Type J	6	Square Shaped Specimens for ASTM D4636 Alternate Procedure and for FTM 791-5308
K29310	Digital Thermometer	1	K35010 Copper
	Microprocessor based digital thermocouple thermometer with ten-channel input.		K35020 Mild Carbon Steel
	Monitors Type J thermocouples from sample tubes.		K35030 Aluminum Alloy
K35090	Test Panel Assembly Fixture	1	K35040 Magnesium Alloy
	Holds square-shaped metal specimens for tying with cord (for FTM 791-5307 and FTM 791-5308)		K35050 Cadmium Plated Steel
K35095	Test Panel Assembly Fixture	1	K35060 Silver
	Holds square-shaped metal specimens for tying with cord (for ASTM D5968)		K35070 Solid Cadmium (non standard)
			K35080 Titanium (non standard)
			Square Shaped Specimens for ASTM D5968 and D6594
			K35010 Copper
			K35011 Lead
			K35012 Tin
			K35013 Phosphor Bronze
FTM 791-5308			Rectangular Shaped Specimens for IHC BT-10
K350-0-23	Test Tube	6	K353-0-5 Aluminum
K350-0-24	Air Tube	6	K353-0-6 Copper
K350-0-25	Condenser	6	K353-0-7 Steel
K35090	Test Panel Assembly Fixture	1	K353-0-8 Brass
	Holds square-shaped metal specimens for tying with cord.		
IHC BT-10			Polishing Materials
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

Stability - Corrosion Test for Non-Aqueous Fire Resistant Fluids

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 ±0.1L/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 331, IP 335
 Testing Capacity: Twelve samples
 Temperature Range: 80 to 200°C
 Temperature Uniformity: ±0.2°C
 Air Flow Control:
 Standard Model: 1L/h to each sample
 IP 48 Model: 15L/h to each sample
 Electrical Requirements:
 115V 50/60Hz, Single Phase, 12.1A
 220-240V 50/60Hz, Single Phase, 6.3A

Included Accessories

Soap Bubble Flowmeter

Shipping Information

Shipping Weight: 245 lbs (111.1kg)
 Dimensions: 16.7 Cu. ft.

Dimensions

Bath: dia.xh,in.(cm)
 17x22 (43.2x55.9)
 Flowmeter Stand: lwxh,in.(cm)
 24x8x30¼ (61x20.3x76.8)
 Net Weight: 186 lbs (84.4kg)

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

Ordering Information

Catalog No.	Description	Order Qty
K56100	Oxidation Stability Apparatus 115V 50/60Hz	1
K56190	Oxidation Stability Apparatus 220-240V 50/60Hz	
K56200	Oxidation Stability Apparatus 115V 50/60Hz For IP 48 Method.	
K56290	Oxidation Stability Apparatus 220-240V 50/60Hz For IP 48 Method	
Accessories		
K56110	Set of Glassware Includes one each oxidation and absorption tube. For IP 48, IP 280, IP 306, IP 307, IP 335	12
K56112	Set of Glassware Includes one each oxidation and absorption tube. For IP 331	
250-000-09C	ASTM 9C Thermometer Range: -5 to +110°C (equivalent to IP 15C Thermometer)	1
250-000-41C	ASTM 41C Thermometer Range: 98 to 152°C (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.



Digital Flowmeter option is available for this unit.

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

Catalog No.	
K18660	L-60-1 Performance Test Apparatus, 220-240V 60Hz
K18650	L-60-1 Performance Test Apparatus, 220-240V 50Hz

Accessories

K18661	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)
380-150-001	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 D5074; 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:

220-240V 60Hz, Single Phase, 15A

220-240V 50Hz, Single Phase, 15A

Dimensions lwxh,ln.(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: ±0.5°C (±1°F)

Drive Motor: ½hp induction motor

Bath Medium: 11 gal (41.6L) white technical oil

Electrical Requirements:

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)

32½ x 14½ 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.

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 ±0.5°C (±1°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 °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.*

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.		Order Qty
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
332-002-006	Test Beaker, 400mL for ASTM D665 & D3603	6
250-000-09F	ASTM 9F Thermometer Range: 20 to 230°F	7
250-000-09C	ASTM 9C Thermometer Range: -5 to +110°C	
K30130	Chuck for polishing test specimens Includes locknut and shaft for mounting on accessory drive motor.	1
K30150	Drive Motor Drives K30130 Chuck. Mounted on base. 115V 50/60Hz	1
K30180	Drive Motor Similar to K30150 but for operation on 220-240V 50Hz	
380-150-002	Aluminum Oxide Cloth, 150-grit for preliminary grinding of test specimens Pack of 50	
380-240-002	Aluminum Oxide Cloth, 240-grit for final polishing of test specimens Pack of 50	1
K30140	Auxiliary Stirrer Blade - Attaches to stirrer shaft - for testing heavier than water samples - ASTM D665. Procedure C.	

Test Specimens	
Catalog No.	
K30110	Steel Test Specimen for ASTM D665 Machined to ASTM specifications. Without Holder
K30100	Test Specimen with Type 2 Plastic Holder for ASTM D665
K30119	Test Specimen with Type 1 Plastic Holder for ASTM D665
K30101	Test Specimen with Type 2 PTFE Holder
K30810	Horizontal Test Specimen for ASTM D3603
K30820	Vertical Test Specimen for ASTM D3603
K30800	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: ±0.05°C (±0.1°F)
Air Flow Control: 0.94±0.047L/min.
(2±0.1 Cu. ft./hr) six (6) flowmeters mounted on a common manifold
Electrical Requirements:
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 l x w x h, 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, 220-240V 60Hz	1
K29990	Lead Corrosion Apparatus, 220-240V 50Hz	
Accessories		
K29910	Pyrex™ Sample Tube	6
250-000-16F	ASTM 16F Thermometer Range: 85 to 392°F	1
250-000-16C	ASTM 16C Thermometer 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

Dimensions l x w x h, 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, 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 16 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 50/60Hz	1
K25339	Copper Strip Test Tube Bath, 220-240V 50/60Hz	
K25312	Vented Cork	
Accessories		
K25080	Copper Test Strips 12.5x1.5-30mmx75mm to ASTM specifications	16
332-004-004	Test Tube, 25x150mm	16
332-004-002	Viewing Test Tube	16
K25100	Protects copper strip during inspection or storage ASTM Copper Strip Corrosion Standard Colored reproductions of tarnished strips encased in a plastic plaque	1
380-240-001	Silicone Carbide Paper, 240-grit. For polishing copper strips prior to testing. Package of 50 sheets	1
380-150-001	Silicone Carbide Paper, 150-grit	1
380-150-000	Silicone Carbide Grain, 150-grit. For final polishing of copper strips prior to testing. 1 lb package	1
K25000	Polishing Vise Holds copper strip firmly in place without marring the edges. Stainless steel. mounted on a composition base	1
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:
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 <i>Specify electrical requirements when ordering.</i>	1
Accessories		
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

Accessories

332-004-001	Test Jar Clear, flat bottom jar with sample height graduation
250-000-05F	ASTM 5F Thermometer, range: -36 to +120°F
250-000-05C	ASTM 5C Thermometer, range: -38 to +50°C
250-000-06F	ASTM 6F Thermometer, range: -112 to +70°F
250-000-06C	ASTM 6C Thermometer, range: -80 to +20°C
K46120	Cork Disk
AS568-219	Gasket, for test jar
K460-0-8	Thermometer Holder, for test jar
K460-1-7B	Copper Jacket

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

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 +30, 0, and -30°F (-1, -18 and -35°C); floor model has four baths, set at +30, 0, -30 and -60°F (-1, -18 -35 and -51°C). 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, D6074, D6158; IP 15, 219;
ISO 3015, 3016; DIN 51597; FTM 791-201; NF T 60-105

Electrical Requirements:

Model K46100 Refrigerated Bench Model:
115V 60Hz, Single Phase, 12.2A
220-240V 50/60Hz, Single Phase, 6.9A
Model K46300 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: lxxh,in.(cm)
26x23x26 (66x59x66)
K46300: lxxh,in.(cm)
44x38x48 (112x97x122)

Net Weight:
K46000: 14lbs (6.3 kg)
K46100: 340lbs (155 kg)
K46300: 392lbs (178 kg)

Shipping Information

Shipping Weight:
K46000: 18 lbs (8.2 kg)
K46100: 550 lbs (250 kg)
K46300: 605 lbs (275 kg)
Dimensions:
K46000: 2.6 Cu. ft.
K46100: 14.1 Cu. ft.
K46300: 60.6 Cu. ft.

Automated Cloud Point and Pour Point of Petroleum Products

New Automated Cloud Point and Pour Point System

- Conforms to ASTM D97, D2500 and related specifications
- Direct cooling system eliminates the need for solvent cooling baths
- One-stage cooling system provides temperatures as low as -35°C and a two-stage cooling system down to -70°C
- Single start/stop push button makes system simple to use
- Minimal installation required to set-up software and instrumentation

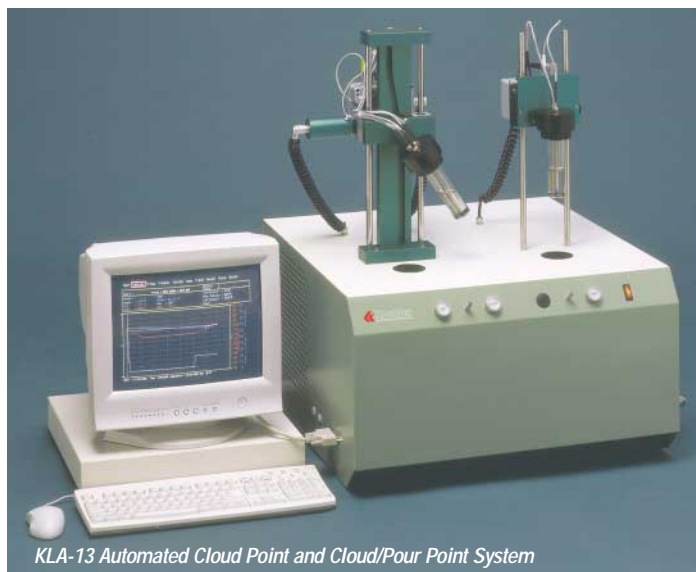
Cloud Point Detection—The cloud point detection system provides automated sample testing with the accuracy and repeatability in accordance with ASTM D2500 and related international test methods. The sophisticated dynamic measurement system emits a light pulse every 1°C from a coaxial fiber optic cable positioned above the test sample. The light pulse is then reflected off the silvered-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 testing with the accuracy and repeatability in accordance with ASTM D97 and related international test methods. The automated operation includes the 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 Pt-100 temperature 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.

Advanced Software Package—The Windows[®]-based software package can control either a stand-alone system or provides multiple analyzer networking with a single network control station. All analytical parameters are graphed and displayed in real-time as well as recorded in Microsoft[®] Excel file format. The software monitors the operation and performance of all the analyzer components for proper data measurement, including the solenoid valves, cooling system, other moving parts, as well as the Pt-100 temperature probes and the pressure sensors. The calibration curves for each probe and sensors are displayed individually and saved to the hard disk with date and time of test. Please refer to page 97 or 101 for a picture of the software screen.

Cooling System—For various user applications, the automated cloud point and pour point systems are available with either one-stage cooling for temperatures as low as -35°C or two-stage cooling for temperatures as low as -70°C . The direct cooling system requires no solvent cooling bath and thus eliminates operator exposure to solvents used in standard cooling systems. The direct system is capable of rapid cooling, approaching -70°C bath temperatures in approximately 15 minutes, and utilizes less electricity than in 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 up to six test positions with one of five possible test heads at each position: cloud point, pour point, cloud & pour point, freezing point, and cold filter plugging point. Standard and customized multiple configuration systems are readily available. Please refer to pages 97 and 101 about freezing point and cold filter plugging point product descriptions. *Please inquire with Koehler Customer Service about product specifications and ordering information.*



KLA-13 Automated Cloud Point and Cloud/Pour Point System

Specifications

Conforms to the cloud point and pour point specifications of:

ASTM D97, D2500; IP 15, IP 219; ISO 3015, ISO 3016; DIN 51597

Electrical Requirements:

115V 60Hz, Single Phase
220V 50Hz, Single Phase

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

(for the KLA-13 system)
28x23x28 (72x59x71)

Net Weight: 205 lbs (93kg)

Included Accessories

Internal built-in direct refrigeration system
One- or two-stage cooling system
Interface Cells
Operating Software
Acquisition Board
Cord Cable without plug
Interface Cables
Test Jars

Ordering Information

Catalog No.

KLA-1	Automatic Cloud Point System (one-head unit)
KLA-2	Automatic Pour Point System (one-head unit)
KLA-3	Automatic Cloud/Pour Point System (one-head unit)
KLA-4	Automatic Cold Filter Plugging Point System (one-head)
KLA-5	Automatic Freezing Point System (one-head unit)

Please specify voltage and cooling requirements when ordering.

When ordering a multiple configuration system with up to six heads, please specify each measurement head with its associated catalog number using the lowest possible number combination. For example, a two-head cloud point and cloud/pour point system would be KLA-13 and not KLA-31, and a three-head cloud point, pour point, and freezing point system would be KLA-125 and not KLA-152, KLA-215, KLA-251, KLA-512, or KLA-521.

PC Configuration—Operation of the software package requires the use of a PC, which should be ordered separately. *Please inquire with Koehler Customer Service if assistance is needed in procuring a PC.* The PC should have the following minimum requirements: Pentium III 800 MHz processor, 128 MB RAM, 2 GB hard drive, CD-ROM, Windows[®] 95/98 operating system, Microsoft[®] Excel, Windows[®] keyboard, monitor, mouse, graphic and video cards.

Dielectric Breakdown Voltage of Insulating Oils



K16171 Semi-Automatic High Voltage Insulating Oil Tester

Specifications

Conforms to the specifications of:

ASTM D877, D1816; IP 295; FTM 791-5702; NF C 27-221;

IEC 156; VDE 0370

Voltage Between Electrodes: 0-60 kV_{rms}

Voltage Increase, adjustable: 0.5, 2, 3, or 5 kV/sec

Switch-off Time: < 100µsec

Display: 7 segment LED

Electrical Requirements:

115-240V 50/60Hz.

Included Accessories

Epoxy Test Cup, 400mL

One Pair of Electrodes, spherical dome shape as per ASTM D1816

One Pair of Electrodes, polished brass disc type as per ASTM D877

Setting Gauge 2.5 / 10mm

Fuses (2)

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

17½ x 19¾ x 13½ (44.5 x 50 x 34.5)

Net Weight: 99 lbs (45kg)

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.

Semi-Automatic High Voltage Insulating Oil Tester

- Conforms to ASTM D877, D1816 and related test specifications
- Suitable for all insulating fluids
- Fast cut-out of the high voltage immediately after oil dielectric breakdown
- Overtemperature protection system with power cut-out

The Koehler Semi-Automatic High Voltage Insulating Oil Tester performs the determination of insulating oil dielectric breakdown for both single and multiple tests. The apparatus consists of a frame housing with LED display, sample compartment with indirect illumination, and a motor-driven rotary table. The measuring electrodes are swiveling and arranged eccentrically with respect to the axis of the table, enabling an easier cleaning and dispersing of any combustion sediments by the rotary motion. A thorough mixing of the oil is achieved by a magnetic rod inserted into the testing vessel. Contactless drive is provided by a small motor with an additional magnet below the lift. For operator security, the sample chamber is closed by a perspex door with an interlocking switch. A special safety feature locks the start button in case of improper electrical grounding.

Ordering Information

Catalog No.

K16171 Semi-Automatic High Voltage Insulating Oil Tester,
115-240V 50/60Hz

Accessories

K16172 Parallel Port Interface with BCD Printer

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 (a cyclic timer is available upon request). 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:
 115V 50/60Hz, 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.

Ordering Information

Catalog No.		Order Qty
K50100	Panel Coking Test Apparatus, 115V 50/60Hz	1
K50190	Panel Coking Test Apparatus, 220-240V 50/60Hz	
Accessories		
K50101	Aluminum Test Panel	1
K50102	Stainless Steel Test Panel (Type 321)	1

Evaporation Loss of Lubricating Oils (Noack Test)



K44001 Noack Evaporation Loss Analyzer

Test Method

A quantity of 65g of a lubricant is placed in an evaporative crucible and heated to 250°C for 60 minutes. The evaporation loss tendencies of the lubricant are determined by passing a constant air stream over the heated sample by means of a vacuum pump.

Noack Evaporation Loss Analyzer

- Conforms to ASTM D5800, DIN 51851, CEC L40 A93 specifications
- Non-Woods Metal or Woods Metal heating bath option

The Koehler Noack Evaporation Loss Analyzer tests the evaporation loss tendencies of lubricating oils at temperatures of up to 350°C, available with either a Non-Woods Metal or a Woods Metal heating bath.

Non-Woods Metal Option

Fully insulated aluminum block heating unit has a microprocessor-based digital temperature and pressure controller. A digital stopwatch is also included for recording test and cooling times. The test is started automatically after insertion of the crucible and displays both temperature and pressure curves in real-time throughout the test. The stainless steel evaporation crucible inserts into the aluminum block oven and includes a plated brass lid assembly with threaded support ring, hardened steel air nozzles, and extraction tube with threaded and sealed connection. Order required accessories separately.

Woods Metal Option

Fully insulated aluminum block heating unit has a microprocessor-based digital temperature controller and stopwatch for recording test and cooling times. The evaporation crucible is identical as listed above. Aluminum block accepts certified thermometers for temperature monitoring. Order required accessories, vacuum pump, and automated pressure control unit separately.

Ordering Information

Catalog No.		Order Qty
K44000	Noack Evaporation Loss Tester, 115V 60Hz	1
K44001	Non-Woods Metal Noack Evaporation Loss Tester, 115V 60Hz	
K44090	Noack Evaporation Loss Tester, 230V 50/60Hz	
K44091	Non-Woods Metal Noack Evaporation Loss Tester, 230V 50/60Hz	

Accessories

K44061	Vacuum Pump, 115V 60Hz	1
K44062	Vacuum Pump, 230V 50/60Hz	
K44063	Standardization Oil	
K44064	Glassware Set	
K44065	Evaporation Crucible	
K44066	Crucible Spanner and Clamp	
K44067	Reamer, 2mm diameter	
K44068	Test Balls (5), 3.5mm diameter	
K44069	Stand with Inclined Manometer and Bleed Valve	

Accessories (for Woods Metal Unit Only)

K44071	Automatic Vacuum Regulator, 115V 60Hz Automatically maintains difference pressure of 20mm H ₂ O throughout the test procedure.	1
K44072	Automatic Vacuum Regulator, 230V 50/60Hz	
K44073	Certified Thermometer Range: 40 to 260°C, with certificate	
K44074	Certified Thermometer Range: 200 to 400°C, with certificate	
K44075	Thermometer Holder	
K44076	300g Woods Metal and Brush	

Specifications

Conforms to the specifications of:
ASTM D5800; DIN 51581;
CEC L40 A93
Capacity: 1 sample
Temperature Range: 150 to 350°C
Temperature Accuracy: ±0.1°C
Electrical Requirements:
115V 60Hz, 12.0A
230V 50Hz, 5.8A

Dimensions lxxwxh,in.(cm)

Non-Woods Metal Noack Tester
with Stand and Glassware Set:
23¼x14½x26¾ (59x35x68)
Net Weight: 59 lbs (26.7kg)

Woods Metal Noack Tester:

18x14½x14½ (4x38x37)
Glassware Set and
Vacuum Regulator:
23¼x14½x26¾ (59x35x68)
Net Weight: 84¼ lbs (38.2kg)

Required Accessories

Glassware Set, consisting of
(2) bottles with ground stoppers,
glass tubes, and tubing set
Vacuum Pump
Evaporation Crucible
Crucible Spanner and Clamp
Reamer, 2mm diameter
5 Test Balls, 3.5mm diameter
Protection Gloves
300g Woods Metal and Brush
Stand with Inclined Manometer
(range: 0-30mm H₂O) and
Bleed Valve for Manual Regulation
of Air Stream

Shipping Information

Shipping Weight:

Non-Woods Metal Unit:
124 lbs (56kg)

Woods Metal Unit:
62½ lbs (28.4kg)

Dimensions:

Non-Woods Metal Unit: 5.0 Cu. ft.
Woods Metal Unit: 7.3 Cu. ft.

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 (TFOU) 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; CEC L40 A93

Balance	Naphtha
Toluene	

For more information, please contact us:

ExpotechUSA

10700 Rockley Road
Houston, Texas 77099
USA

281-496-0900 [voice]

281-496-0400 [fax]

E-mail: sales@expotechusa.com

Website: www.ExpotechUSA.com