



BROOKFIELD VISCOSITY LIQUID BATH K34710, K34711, K34712

OPERATION AND INSTRUCTION MANUAL

REV A

Koehler Instrument Company, Inc.

1595 Sycamore Avenue • Bohemia, New York 11716-1796 • USA

Toll Free: 1-800-878-9070 (US only) • Tel: +1 631 589 3800 • Fax: +1 631 589 3815

<http://www.koehlerinstrument.com> • e-mail: info@koehlerinstrument.com

Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing

CERTIFICATE OF CONFORMANCE

Low Temperature Brookfield Viscosity Bath, BVS3000 K34710, K34711, K34712

This certificate verifies that part numbers K34710, K34711, K34712 Low Temperature Brookfield Viscosity Bath, were manufactured in conformance with the applicable standards set forth in this certification.

Specifications:

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

This unit is tested before it leaves the factory, to ensure total functionality and compliance to the above specifications and ASTM standards. Test and inspection records are on file for verification.



Jesse Kelly
Application Engineer
Koehler Instrument Company

Table of Contents

1	Introduction	2
1.1	<i>Koehler's Commitment to Our Customers</i>	2
1.2	<i>Recommended Resources and Publications</i>	2
1.3	<i>Instrument Specifications</i>	3
2	Safety Information and Warnings	3
3	Unpacking & Installation	4
3.1	<i>Packing List</i>	4
3.2	<i>Unpacking</i>	4
3.3	<i>Instrument Installation</i>	4
4	Instrument Descriptions	5
4.1	<i>Temperature Controller Operation</i>	6
5	Operation	7
5.1	<i>Viscosity Bath</i>	7
5.2	<i>Testing Procedure</i>	7
6	Safety Features	7
6.1	<i>Over Power Protection</i>	7
7	Maintenance	7
7.1	<i>Routine Maintenance</i>	7
7.2	<i>Replacement Parts</i>	7
8	Service	8
9	Storage	8
10	Warranty	8
11	Returned Goods Policy	8

1 Introduction

Viscosity is of primary importance in the development and testing of a wide range of petroleum products. The K34710 / K34711 / K34712 Brookfield Viscosity Liquid Bath is the latest design for performing the sample cooling profile of the air chamber test method as specified in section 6.8.2 of the ASTM D2983 test method for low temperature viscosity tests.

The liquid bath permits soaking and testing of Brookfield viscosity lubricant samples in a single bath, eliminating the need for a separate air bath and the risk of sample temperature rise during testing. The viscosity measurement is done directly in the test bath after 16 hours of sample conditioning. Measuring sample viscosity while still in the liquid bath is specifically allowed by section 6.8.2 of ASTM D2983.

A mechanically refrigerated cascade system cools the test bath, and a digital PID controller regulates the bath temperature and cooling profiles. Multiple profiles can be stored in the controller. The following test profiles can be stored in the controller. The following test profiles are programmed at the factory: -10, -12, -17.6, -18, -20, -23.3, -25, -26, -29, -30, -34, -35, -40°C.

This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions. In addition, this manual should be used in conjunction with applicable published laboratory procedures. Information on these procedures is given below in section 1.2.

1.1 Koehler's Commitment to Our Customers

Providing quality testing instrumentation and technical support services for research and testing laboratories has been our specialty for more than 50 years. At Koehler, the primary focus of our business is providing you with the full support of your laboratory testing needs. Our products are backed by our staff of technically knowledgeable, trained specialists who are experienced in both petroleum products testing and instrument service to better understand your requirements and provide you with the best solutions. You can depend on Koehler for a full range of accurate and reliable instrumentation as well as support for your laboratory testing

programs. Please do not hesitate to contact us at any time with your inquiries about equipment, tests, or technical support.

Toll Free: 1-800-878-9070 (US only)
Tel: +1 631 589 3800
Fax: +1 631 589 3815

Email: info@koehlerinstrument.com
<http://www.koehlerinstrument.com>

1.2 Recommended Resources and Publications

1. American Society for Testing and Materials (ASTM)
100 Barr Harbor Drive
West Conshohocken, Pennsylvania 19428-2959, USA
Tel: +1 610 832 9500
Fax: +1 610 832 9555
<http://www.astm.org>
email: service@astm.org

ASTM Publication:

- ASTM D2983 (Note 1 and Appendix X3): Low Temperature Viscosity of Automatic Fluid Lubricants Measured by Brookfield Viscometer

2. Energy Institute (IP)
61 New Cavendish Street
London, WIM 8AR, United Kingdom
Tel: 44 (0)20 7467 7100
Fax: 44 (0)20 7255 1472
<http://www.energyinstpubs.org.uk/>

IP Publication:

- IP 267: Determination of Low Temperature Viscosity Automotive Fluids- Brookfield Viscometer Method

3. International Organization for Standardization (ISO)
1, rue de Varembe
Casa postale 56
CH-1211 Geneva 20, Switzerland
Tel : 41 22 749 01 11
Fax: 41 22 733 34 30
<http://www.iso.ch>
Email: central@iso.ch

ISO Publication

- ISO 2962

1.3 Instrument Specifications

Model:	K34710 K34711 K34712
Electrical Requirements:	115V 60Hz 220-240V 50Hz 220-240V 60Hz
Testing Capacity:	Ten (10) Samples
Port Type:	Round
Bath Medium:	Dry Denatured Ethanol
Temperature Range:	Ambient to -55°C (-67°F)
Temperature Control Stability:	±0.05°C (±0.09°F)
Dimensions: (l x w x h, in. (cm))	34.25 x 27 x 26 (87 x 69 x 66)
Net Weight:	340 lbs (154 kg)
Shipping Dimensions:	41.5 Cu. ft.
Shipping Weight	415lbs (188kg)

2 Safety Information and Warnings

Safety Considerations. The use of this equipment may involve hazardous materials and operations. This manual does not purport to address all of the safety problems associated with the use of this equipment. It is the responsibility of any user of this equipment to investigate, research, and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Equipment Modifications and Replacement Parts. Any modification or alteration of this equipment from that of factory specifications is not recommended, voids the manufacturer warranty, product safety, performance specifications, and/or certifications whether specified or implied, and may result in personal injury and/or property loss. Replacement parts must be O.E.M. exact replacement equipment.

Unit Design. This equipment is specifically designed for use in accordance with the applicable standard test methods listed in section 1.2 of the operator's manual. The use of this equipment in accordance with any other test procedures, or for any other purpose, is not recommended and may be extremely hazardous.

Chemical Reagents Information: Chemicals and reagents used in performing the test may exhibit potential hazards. Any user must be familiarized with the possible dangers before use. We also recommend consulting the Material Data and Safety Sheet (MSDS) on each chemical reagent for additional information. MSDS information can be easily located on the internet at <http://siri.uvm.edu> or <http://www.sigma-aldrich.com>.

Dry Denatured Ethanol:



WARNING: Flammable Liquid

- Keep away from heat, sparks open flames and other open sources of ignition
- Do not smoke
- Keep container closed
- Use with proper ventilation preferably in a hood
- Irritant: may cause irritation and transient injury; may also cause irritation to skin, digestive system, and respiratory tract
- Avoid inhalation of vapors

3 Unpacking & Installation

The instruction for preparing this equipment assumes that the user is aware of the contents of this document, which lists the warranty conditions and important precautions.

3.1 Packing List

- K34710 / K34711 / K34712 BVS3000 Brookfield Viscosity Liquid Bath System
- Insulating Cover
- Viscometer Mounting / Leveling Assembly

Accessories (Must be purchased separately)

- Brookfield Low Viscosity Rotational Viscometer
 - K34750 Brookfield Digital 115V, 60Hz
 - K34751 Brookfield Digital 220-240V 50Hz
 - K34752 Brookfield Digital 220-240V, 60Hz
 - K34760 Brookfield Programmable 115V 60Hz
 - K34761 Brookfield Programmable 220-240V 50Hz
 - K34763 Brookfield Programmable 220-240V 60Hz
- K34706 Insulated Spindle No. 4B2
- K447-SP-L4 L4 Spindle (Non-insulated)
- K2893-2 Cell Stopper (For K34706 Only)
- K34707 Cell Stopper
- K34779 Spindle Support Clips
- K34709 Test Cell - Round Bottom (pk/12)
- K34770 Test Cell - Flat Bottom (pk/12)
- 250-000-122C ASTM 122C/IP94C Thermometer
Range: -45 to -35°C
- 250-000-123C ASTM 123C/IP95C Thermometer
Range: 35 to -25°C
- 250-000-124C ASTM 124C/IP96C Thermometer
Range: -25 to -15°C
- 250-000-125C ASTM 125C/IP97C Thermometer
Range: -15 to -5°C
- 355-005-027 Viscosity Standard N27B
Viscosities in cP at -40, -30, -20, -15, -10 and 0°F
- 355-005-115 Viscosity Standard
Viscosities in cP at -20, -15, -10, 0, +10 and +20°F

3.2 Unpacking

Carefully unpack and place the instrument and accessories in a secure location. Use extra care while unpacking the Borosilicate glass cylinders. Ensure that all parts listed in the previous section are present. Inspect the unit and all accessories for damage. If you find any damage, keep all packing materials and immediately report the damage to the carrier. We will assist you with your claim, if requested. When submitting a claim for shipping damage, request that the carrier inspect the shipping container and equipment. Do not return goods to Koehler without written authorization.

3.3 Instrument Installation

The instructions for preparing the equipment assume that the user is aware of the contents of this document which lists the warranty conditions and important precautions.

Equipment Placement and Ventilation: Place that bath on a firm, level table in an area with adequate ventilation and environmental control. The room temperature should not exceed 25°C (77 °F). Please allow at least 12" (30cm) of open space around each side of the unit in order for the refrigeration system to work properly. The unit may be leveled by making minor turning adjustments to the feet located at the base of the unit.

Leveling: For proper operation, the unit should be leveled. The use of a spirit level will ensure proper adjustment. To adjust the leveling feet, use a 13mm open end wrench to loosen the locknut (upper nut). Adjust the leveling feet (lower nut) with a 13 mm wrench. When level, tighten the lock nut.

Filling the Bath: The bath should be filled with moisture-free 200 proof ethanol. Please refer to sections 6.1 and 6.2 for filling and operation instructions.

Mounting the Brookfield Viscometer: Attach the threaded support rod to the support bridge with the supplied bolt and washer. The threads should face the back of the unit. Loosen the screw at the back of the rack and pinion on the Brookfield Viscometer, and then mount the viscometer onto the support rod. Tighten the screw and then adjust the height of the viscometer using the right thumb screw.

Leveling the Brookfield Viscometer: It is essential that the viscometer be level for proper operation. A level is located at the top of the viscometer. Loosening the left thumb screw allows the viscometer to be leveled, or the use of the leveling feet attached to the stand. Be sure to re-tighten the left thumb screw in order to secure the viscometer.

Power: Connect the line cords for both the Digital Programmable Brookfield Viscosity Liquid Bath (K34715/K34716) and the Koehler or Brookfield Rotational Viscometer (please see section 3.1 for part numbers) to a properly fused and grounded receptacle with the correct voltage as indicated in section 3 or on the information plate at the back of the unit.



NOTE: It is important that the electrical power supply not vary more than 10% of the apparatus specified voltage. The unit will not function properly and/or may be damaged.



WARNING: For user safety, please disconnect the line cords whenever performing any maintenance operations and/or cleaning of the unit.



WARNING: Do NOT turn the power on unless the bath is filled with the proper medium. Low liquid level exposes the heater which may ignite the vapors above the fluid of the test bath. Damage may occur to the unit and the warranty would be void.

4 Instrument Descriptions



Figure 1. Instrument Descriptions

1. **Line Switch:** This switch controls the power to the entire unit. When the Line Switch is in the ON position, the digital temperature display is on and the bath back light is on.
2. **Motor Switch:** This switch controls the power to the motor and can be turned on only if the Line Switch is ON.
3. **Programmable Temperature Controller:** This unit allows for full temperature and profile control of the bath (please refer to sections 4.1 and 4.2 below)
4. **Rotational Viscometer:** Mounts on programmable liquid bath for direct measurement of test samples in cooling medium.
5. **Height Adjustment Knob:** Turn knob to raise and lower Rotational Viscometer between test and change positions.
6. **Mounting Rod:** Mounts direct to support bridge.
7. **Level Adjustment Knobs:** Turn knobs to properly level viscometer for testing.

4.1 Temperature Controller Operation

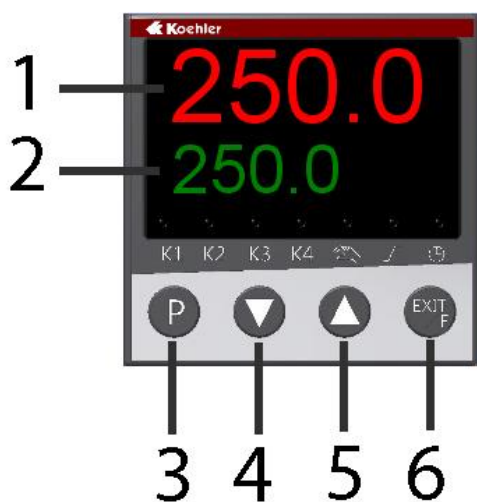


Figure 4. Temperature Controller

1. **Process Temperature Display.** The upper red LED display shows the process temperature as read from the RTD probe.
2. **Set Point Temperature Display.** The lower green LED display shows the set point temperature of the controller.
3. **Programming Key.** Permits scrolling through controller menu parameters. One Level Forward
4. **Down Key.** Used to decrease the set point temperature and to decrease or change parameter values when programming the temperature controller.
5. **Up Key.** Used to increase the set point temperature and to increase or change parameter values when programming the temperature controller.
6. **Exit / Function Key.** This key is used to exit or leave a level. One level backward

IMPORTANT NOTE: The digital temperature controller for the unit comes pre-programmed from the Koehler factory. Please do NOT attempt to re-program the digital temperature controller as this will void the product warranty. If assistance is required, please do not hesitate to contact the Koehler technical service department.

Setting the Temperature. Set the desired operating temperature by adjusting the set point with the up and down keys. The set point will be displayed in the lower green Set Point LED display and the actual temperature will be displayed in the upper red Process LED display. Please allow the instrument to fully equilibrate before proceeding with any testing.

Temperature Calibration. This routine allows the digital temperature controller to be calibrated to a certified thermometer. In the calibration mode, the display will always give 2 decimal places.

- a. Use a certified calibrated measuring device to acquire the temperature. Calculate the difference between the measuring device and the Process value displayed on the controller.
- b. Press the program key two times until **Pct** is displayed in the lower green LED display. Press the DOWN key. CAL will display on the lower green display. If there is a value observed in the upper red LED display, add it to the calculated difference obtained in the previous step. This is the offset value.
- c. Press the Program Key. The lower green display will flash. Use the up or down keys to adjust to the new calibration offset value on the upper red display calculated in the previous step. When the value has been entered, the controller will automatically store the value. The lower green display will stop flashing. If further adjustments are necessary, press the Program Key again. Resume regular operations by pressing the Exit / Function key two times. Verify if the new calibration is correct by observing the upper red display and comparing the value with the calibrated reference device.

Auto Tune. This routine allows the digital temperature control to learn the heating parameters needed for any particular set point temperature. This operation should be done when installing a new unit, after replacing or changing the bath medium type, or utilizing a different temperature set point 20% different from the previously used set point temperature.

- a. Set the operating temperature to the desired setting.
- b. Press the up and down arrow buttons simultaneously for about 5 seconds. When Auto Tune is active, the lower green LED display will blink **TUNE**. Auto Tune will automatically toggle off when the set point temperature is reached. Auto tune can be terminated by pressing the up & down buttons simultaneously again.

5 Operation

5.1 Viscosity Bath

The viscosity bath can maintain temperatures of ambient to -55°C (-67°F) within $\pm 0.05^\circ\text{C}$ (0.09°F).

1. Fill the bath either with moisture free and pure ethanol $\frac{1}{4}$ to $\frac{1}{2}$ " from the top of the bath. This will provide the proper depth for immersing the test cells
2. Turn **ON** the line and motor switches
3. Proceed with performing the desired Brookfield Viscosity tests according the following standard test methods:
ASTM D2983, IP 267, ISO 2962

5.2 Testing Procedure

Proceed with performing the desired Brookfield viscosity tests in accordance to the desired standard test method.

6 Safety Features

The Koehler Programmable Liquid Bath equipped with several safety and protection features, which are described in the following sections.

6.1 Over Power Protection

The Koehler Programmable Liquid Bath is equipped with Over-power Protection circuitry, which prevents the unit from unsafe electrical conditions. If power to the unit is lost, then turn off the main power and turn it back on again. The main power switch also functions as a circuit breaker.

7 Maintenance



WARNING: Disconnect power to the unit before servicing to avoid exposure to high voltages and/or temperatures which may result in personal injury or death. If you have any questions about maintaining your equipment, then please do not hesitate to contact the Koehler technical service department.

7.1 Routine Maintenance

The K34715 / K34716 series Programmable Brookfield Viscosity Bath requires little routine maintenance to provide many years of continuous service. The bath medium should be replaced if it becomes dirty or absorbs water / moisture. If any other service problems arise, please contact Koehler's technical service department.

7.2 Replacement Parts

When ordering replacement part(s), please provide the model number, serial number, and product shipment date of your equipment so that we can ensure you will receive the proper replacement part(s).

Part Number	Description
091-032-001	Solid State Relay, 4-32V, 20A
275-103-015	Programmable Temperature Controller, 100-240V
278-001-002	Fuse, 1A, Slo-Blo, 5 x 20mm
278-020-004	Fuse, 20A, Time Delay, 600VAC
278-104-002	Fuse, 0.25A, Slo-Blo, 5 x 20mm
279-115-009	Compact Fluorescent Lamp, 120V, 15W
K34700-03030	Stirrer Shaft
K34700-03035	Dewar Flask
265-400-005	PT-100 RTD Probe
103D	Motor Shaft Coupling

8 Service

Under normal operating conditions and with routine maintenance, the Koehler Programmable Brookfield Viscosity Liquid Bath should not require service. Any service problem can be quickly resolved by contacting Koehler's technical service department either by letter, phone, fax, or email. In order to assure the fastest possible service, please provide us with the following information.

Model Number: _____

Serial Number: _____

Date of Shipment: _____

9 Storage

This laboratory test instrument is equipped with electrical components. Storage facilities should be consistent with an indoor laboratory environment. This testing equipment should not be subjected to extremes of temperature and/or moisture.

This equipment was shipped from the factory in a corrugated cardboard container. If long term storage is anticipated, re-packing the instrument in a water-resistant container is recommended to ensure equipment safety and longevity.

11 Returned Goods Policy

To return products for credit or replacement, please contact Koehler Customer Service with your purchase order number, our packing list/invoice number, the item(s) to be returned and the reason for the return. You will be issued a Returned Authorization (RA) number, which must be prominently displayed on the shipping container when you return the material to our plant. Shipping containers without an RA number prominently displayed will be returned to the sender. Goods must be returned freight prepaid. Returns will be subject to a restocking charge, the application of which will depend upon the circumstances necessitating the return. Some returns cannot be authorized, including certain products purchased from outside vendors for the convenience of the customer, products manufactured on special order, products shipped from the factory past ninety (90) days, and products which have been used or modified in such a way that they cannot be returned to stock for future sale.

10 Warranty

We, at Koehler, would like to thank you for your equipment purchase, which is protected by the following warranty. If within one (1) year from the date of receipt, but no longer than fifteen (15) months from the date of shipment, Koehler equipment fails to perform properly because of defects in materials or workmanship, Koehler Instrument Company, Inc. will repair or, at its sole discretion, replace the equipment without charge F.O.B. its plant, provided the equipment has been properly installed, operated, and maintained. Koehler Instrument Company must be advised in writing of the malfunction and authorize the return of the product to the factory. The sole responsibility of Koehler Instrument Company and the purchaser's exclusive remedy for any claim arising out of the purchase of any product is the repair or replacement of the product. In no event shall the cost of the purchaser's remedy exceed the purchase price, nor shall Koehler Instrument Company be liable for any special, indirect, incidental, consequential, or exemplary damages. KOEHLER INSTRUMENT COMPANY, INC. DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF FITNESS FOR A



Notes

[illegible]



Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.