



## K10901, K10991 LUBRICATING GREASE OXIDATION BATH

### *OPERATION AND INSTRUCTION MANUAL*

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*PETROLEUM TESTING & ANALYSIS INSTRUMENTATION • CUSTOM DESIGN & MANUFACTURING*



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## **CERTIFICATE OF CONFORMANCE**

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### **Grease Oxidation Bath K109X1**

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This certificate verifies that part number K109X1, Grease Oxidation Bath, was manufactured in conformance with the applicable standards set forth in this certification.

**Specifications:** **ASTM D942**

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**



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## 1 Introduction

The Koehler Grease Oxidation Bath coupled with the Oxidata® Data Acquisition Software is the latest design for performing the ASTM D942 test method and related test specifications.

The sample is oxidized in a bomb initially charged with oxygen at 110psi (758kPa) and maintained at elevated temperature for a specified aging period. The pressure drop inside the bomb is measured by means of a pressure gauge or transducer interfaced to the Oxidata® software.

This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the Grease Oxidation Bath. This manual should also be used in conjunction with applicable published laboratory procedures. Information on these procedures is given 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)**  
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**Email: [info@koehlerinstrument.com](mailto:info@koehlerinstrument.com)**  
**<http://www.koehlerinstrument.com>**

## 1.2 Recommended 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](mailto:service@astm.org)

### ASTM Publication:

- ASTM D942: Oxidation Stability of Lubricating Greases by the Oxygen Bomb Method

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 142: Oxidation Stability of Lubricating Greases: Oxygen Bomb Method

3. Deutsche International Norm (DIN)  
<http://www.din.de>

### DIN Publication:

- DIN 51808

4. Federal Test Method (FTM)

### FTM Publication:

- FTM 791-3453

### 1.3 Instrument Specifications

**Models:** K10901  
K10991

**Electrical Requirements:** 115V 60Hz 13.0A  
230V 50/60Hz 6.8A

**Plug Type:** NEMA L5-20  
NEMA L6-20

**Temperature Range:** Ambient to 135°C (275°F)

**Capacity:** Four (4) Oxidation Pressure Vessels

**Bath Medium:** 12.5 gal (47.3L) white technical oil

### 1.4 Software Specifications

**PC System Requirements:** Intel® Pentium II Processor or similar (minimum)

**Operating System:** Windows® 98 SE, 2000, XP, 7 (32-bit)

**Memory Requirements:** 32Mb RAM (64Mb RAM recommended)  
15 Mb Hard Disk Space (minimum)

**Other:** One or two RS-232 communication ports  
Microsoft® Excel (97 or above)

## 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 and 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.

**Over Temperature Protection.** This unit is equipped with Over Temperature Protection (OTP) circuitry to prevent overheating. The unit will automatically interrupt power whether equipment malfunction or operator error causes the temperature to exceed either 20 °C above the set point or the maximum recommended temperature range. The power can only then be restored by identifying and correcting the problem, allowing the unit to return to normal operating temperatures, and resetting the power to the unit.

**Unit Design.** This equipment is specifically designed for use in accordance with the applicable standard test methods listed in section 1.2 of this 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>.

## 3 Getting Started

### 3.1 Packing List

**Instrument:**

- K10901/ K10991 Grease Oxidation Bath

**Accessories (purchased separately)**

- K11000 Oxidation Bomb
- K11040 Pyrex Dish
- K10551 Pressure Line
- K10556 Oxygen Manifold Pressure Relief System
- K11029 PTFE Gasket
- 250-000-22F ASTM 22F Thermometer Range: 204 to 218°F
- 250-000-22C ASTM 22C Thermometer Range: 95 to 103°C
- 355-001-001 With Technical Bath Oil
- 311-160-003 Pressure Gauge

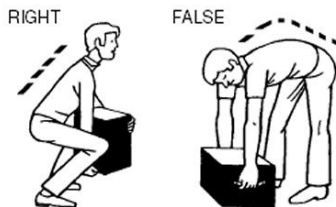
- K11005-XP/K11095-XP Oxidata® Pressure Measurement System

### 3.2 Unpacking

1. This unit comes packed in a crate with the rust test specimens packed in a separate carton inside the main crate.
2. Extract instrument and place on suitable cart for transportation to work area / lab bench.



**WARNING:** Be sure two or more individuals are available for extracting and lifting instrument from box to cart and from cart to bench. Individuals must lift in accordance to proper technique. See Figure below.



3. Lift instrument from cart and place on bench.
4. Unpack the rust test specimens from the separate carton and place in a safe location.
5. Ensure that all parts listed on the packing list are present. Inspect the unit and all accessories for damage. If any damage is found, 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

1. **Equipment Placement.** Place the main unit on a firm, level table in an area with adequate ventilation or in a hood. Remove the tape holding the tee handle on the overflow pipe and clean the bath of all packing material. Connect the drain located in the back of the bath to a proper waste disposal. Make sure the overflow pipe is tightened or else the oxidation bath will leak oil.

2. **Power.** Connect the line cords to properly fused and grounded receptacles with the correct voltage as indicated in section 1.3 or on the information plate at the back of the individual units.



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

3. **Thermometer.** Insert the thermistor probe into the cork holder on the left hand side on top of the bath. Insert a calibrated thermometer into the thermometer holder on the left hand side on top of the bath.
4. **Bath Medium.** Fill the bath with a suitable heat transfer fluid to 2 inches below the top of the overflow pipe. A suitable oil is the White Technical Oil available from Koehler as part number 355-001-001.
5. **Communication Port Cables.** Using the Communication Port Cable supplied with the Oxidata® software for the Grease Oxidation Bath, connect the RS-232 port located on the unit to a communication port on the PC.

### 3.4 Software Installation

Please refer to the Oxidata® software manual for full details. Insert the CD-ROM into the CD tray of the PC. The CD should automatically display the setup screen. If this does not happen within 10 seconds, then browse the files on the CD-ROM and double click on the setup file (setup.exe) to start the installation. Follow the instructions on the screen to setup the software. Once the installation has been completed, then you are ready to run the software.



## 4 Descriptions

### 4.1 Temperature Controller Operation

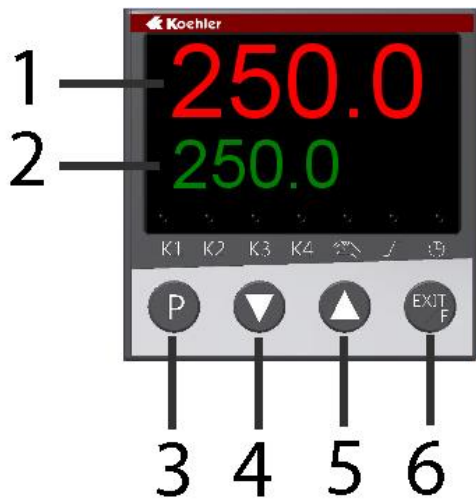


Figure 4. Temperature Controller

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.

- 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

The Koehler Lubricating Grease Oxidation Bath is designed for acquiring test data in accordance with the ASTM D942 and related test procedures. Please be sure to read the safety and hazard warnings, the installation procedure, and the standard test method before operating this software and instrument.

1. **Power.** Before turning on the power to the Grease Oxidation Bath, ensure that the bath has been filled with the proper heat transfer fluid and that it is at the correct level.



**NOTE:** Never turn the power ON without any bath medium present in the bath.

2. Turn on the main power switch. Also turn on the motor switch.
3. **Settings.** Set the digital temperature controller to the desired test temperature as prescribed by the test method.
4. **Test Sample.** Prepare the test sample in the K11000 Oxidation Bomb as prescribed by the test method.
5. **Starting the Test.** Place up to four (4) prepared oxidation pressure vessels with samples into the bath and begin the test.

## 6 Safety Features

The Koehler Lubricating Grease Oxidation Bath is equipped with several safety and protection features, which are described in the following sections.



**WARNING:** The bath is **NOT** Explosion Proof.

### 6.1 Over-Temperature Protection

The Koehler Lubricating Grease Oxidation Bath is equipped with Over-temperature Protection (OTP) circuitry, which prevents the unit from exceeding unsafe operating temperatures. If the unit cannot maintain the set point temperature and begins to decline, the OTP circuitry may have been activated. Please follow these steps.

1. Turn off the unit power switch and disconnect the line cord.
2. Determine the source of the problem and correct the situation.
3. Restart the unit. Monitor the operations to ensure that the unit is operating properly. If you are still experiencing trouble, please contact Koehler technical service for assistance.

### 6.2 Over-Power Protection

The Koehler Lubricating Grease Oxidation 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 Procedure



**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 Koehler Grease Oxidation Bath requires little routine maintenance to provide many years of continuous service. Replace the oil in the bath when the oil becomes medium to dark brown. Be sure to attach the drain pipe to a proper waste disposal and then remove the overflow pipe by

twisting counterclockwise. Clean out the bath and replace with new oil. Over the course of time, some instrument parts may need to be replaced.

## 7.2 Bath Cleaning

- To clean the instrument's exterior, which includes all painted surfaces and glass, either a solution of soap and water or laboratory grade detergent may be used.
- Apply cleaner to clean wipe or cloth, not to the instrument directly. Wipe surface clean.
- **Do Not** clean bath exterior with organic chemicals such as Acetone, Toluene, Hexane, etc.
- For more difficult cleaning of finished surfaces, a dilute solution or isopropanol in water may be used.
- It is not recommended that more aggressive solvents be used on painted surfaces since paint color will tarnish or be stripped from the instrument.
- Glass surfaces may be cleaned using a more aggressive solvent such as acetone, if necessary.



**SHOCK AND BURN HAZARD:** Only clean inside the bath when equipment is de-energized and unplugged from the mains power supply. Allow adequate time for heating coils to completely cool before cleaning.

## 8 Replacement Parts

Part Number	Replacement Part
050-001-028	Switch
265-600-001	RTD Temperature Probe
288-115-002	Motor, 115V
288-230-002	Motor, 230V
275-103-044	Digital Temperature Controller
K26400-1-5	Control Heater
K26400-1-5A	Heater, 1000W 115V
250-000-22F	ASTM 22F Thermometer
250-000-22C	ASTM 22C Thermometer

## 9 Service

Under normal operating conditions and with routine maintenance, the Rust Preventing Characteristics 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: \_\_\_\_\_

## 10 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 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

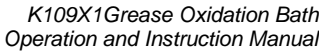
IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. Please save the shipping carton in the event the equipment needs to be returned to the factory for warranty repair. If the carton is discarded, it will be the purchaser's responsibility to provide an appropriate shipping carton.

## **12 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 with 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.

## Notes

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