



# K271XX RAMSBOTTOM CARBON RESIDUE APPARATUS

## *OPERATION AND INSTRUCTION MANUAL*

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**Koehler Instrument Company, Inc.**

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Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing



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# **CERTIFICATE OF CONFORMANCE**

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## **Ramsbottom Carbon Residue Apparatus K271XX**

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This certificate verifies that part number K271XX, Ramsbottom Carbon Residue Apparatus, was manufactured in conformance with the applicable standards set forth in this certification.

**Specifications:**

ASTM D524  
ASTM D3074  
IP 14  
ISO 4262  
FTM 791-5002  
NF T 60-117

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**





### EC Declaration of conformity

Koehler Instrument Company, Inc.  
of 1595 Sycamore Av., Bohemia, New York USA

We declare that the product listed below meets all basic requirements in accordance with the following Directive(s) by design, type, and version placed upon the market by us.

2004/108/EC The Electromagnetic Compatibility Directive  
2006/42/EC The Machinery Directive by way of the Low-Voltage directive 2006/95/EC

And hereby declare that:

Equipment : **Ramsbottom Carbon Residue Apparatus**  
Model Number(s): **K27190**

### Qualifications:

This product may only be used in a professional laboratory setting by authorized personnel following the instruction handbook.

**and**

This product declaration is valid for unmodified equipment when installed and operated by authorized personnel following the instruction handbook.

Conforms to the following standards (as applicable):

Safety	Low-Voltage directive 2006/95/EC
EN 61010-1:2010	Safety Requirements for electrical equipment for measurement, control and laboratory use; by engineering design and risk review and by meeting the requirements of Hi-Pot Test (1500 VAC, 60 sec. per table 5) as detailed in the product's technical documentation.
EMC	Meets the essential requirements of EMC Directive 2004/108/EC by engineering design review and by meeting the requirements of Conducted Emissions Test for Group 1 Class A as detailed in the product's technical documentation.
EN 55011:2007	

James R. Ball  
Dir. Research & Development

1595 Sycamore Av.  
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**November 12, 2013**

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631-589-3800



## **WEEE Directive Compliance Statement**

### **Background**

The goal of the WEEE Directive is to encourage design of environment-friendly products that increase reuse, recycling and other forms of recovery to reduce waste streams and applies to listed Electronic and Electrical Equipment (EEE) and Koehler's equipment falls broadly into Appendix 1A; Section 9 Monitoring and Control Equipment: Measuring, weighing or adjusting appliances for household or as laboratory equipment.

Any associated non-embedded equipment such as Lighting (Saybolt Color) and PCs/Printers also fall under WEEE. If provided with an order these ancillary items must be WEEE compliant. For these and other reasons (printer cartridges are regionalized) the equipment must be supplied through a third party supplier in Europe.

The WEEE Directive applies to electrical and electronic equipment falling under the categories set out in Annex IA provided that the equipment concerned is not part of another type of equipment that does not fall within the scope of this Directive. Annex IB contains a list of products which fall under the categories set out in Annex IA.

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:037:0024:0038:en:PDF>

We do not qualify for any of the 10 exemption categories.  
<http://www.dpa-system.dk/en/WEEE/Products/Exemptions>

### **Professional use**

For equipment defined for 'professional use' local authorities have no role to play. Producers and importers are basically responsible for collection of WEEE recyclables from the professional user and for subsequent management. A separate statement is given cataloging the items that require separation from the equipment along with basic information on subsequent processing or recycling prior to disposal of the equipment.

<http://www.dpa-system.dk/en/WEEE/Products/Private-or-professional-use>

### **Responsibility for Registration and Annual Reporting:**

Koehler will not sell directly to end users in the EU and so has no responsibility to register within each EU state and to make annual reports. Koehler declares that this responsibility is born by the importer who is the first level of the distribution chain and is subject to producer responsibility. We will communicate this in writing to our distributor/importers in the EU stating they are responsible to satisfy WEEE registration and reporting requirements in the EU states where they conduct sales activities.

It is illegal to market electrical and electronic equipment covered by producer responsibility without being registered.

<http://www.dpa-system.dk/en/WEEE/Producers/Whoissubjecttoproducerresponsibility>

### **Product Design**

Koehler's designs allow for complete disassembly to a modular level which usually allows for standard recycling. A qualified refrigeration system technician must be consulted when disassembling and de-commissioning any equipment with refrigeration systems.

Koehler's scientific testing equipment is robustly designed to function over a long service life and are typically repaired many times over the course of years rather than being replaced. We believe that re-use and refurbishment is the very best form of re-cycling.

All batteries must be readily removable not soldered in place.

### **Recycling instructions**

In the event that replacement becomes necessary, we will include instructions, particularized to each instrument that informs the customer of their recycling responsibilities and giving them guidance in doing this. All Koehler equipment has been placed on the market since 13th August 2005 and so

Koehler is defined as a "new WEEE producer". As such we must provide information on refurbishment, treatment, and re-use.

Our instrument manual will include this compliance statement and indicate that any collection of materials will be handled by their authorized distributor. In the event that the distributor is unreachable or is no longer a distributor for Koehler Instrument, Co., other arrangements may be made including accepting the materials directly.

Recycling is free of charge. Shipping is the responsibility of the end users. Whether shipping to a distributor or to Koehler directly, safe, properly declared, and labeled packaging and shipping expenses are the sole responsibility of the end user.

### **WEEE Marking**



Since Koehler products are subject to the WEEE Directive we must display the WEEE symbol shown above in accordance with European Standard EN 50419 on the equipment. It must be indelible, at least 5mm in height, and clearly legible. If the equipment is too small the mark must be in the product literature, guarantee certificate, or on the packaging. Rules on marking are established in section 49 of the WEEE Order.

Koehler Instrument Company, Inc.  
c/o RECYCLING  
1595 Sycamore, Ave.  
Bohemia, NY 11716

As a minimum the following substances, preparations and components have to be removed from any separately collected WEEE:

- Mercury containing components, such as switches or backlighting lamps (compact fluorescent lamps, CFL),
- Batteries
- Printed circuit boards if the surface of the printed circuit board is greater than 10 square centimeters (about 4 sq in.),
- Toner cartridges, liquid and pasty, as well as color toner,
- Chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC)
- Liquid crystal displays (together with their casing where appropriate) of a surface greater than 100 square centimeters and all those back-lighted with gas discharge lamps,
- External electric cables
- Components containing refractory ceramic fibers as described in Commission Directive 97/69/EC of 5 December 1997 adapting to technical progress Council Directive 67/548/EEC relating to the classification, packaging and labeling of dangerous substances (2),
- Electrolyte capacitors containing substances of concern (height > 25 mm, diameter > 25 mm or proportionately similar volume)

2. The following components of WEEE that is separately collected have to be treated as indicated:

- Equipment containing gases that are ozone depleting or have a global warming potential (GWP) above 15, such as those contained in foams and refrigeration circuits: the gases must be properly extracted and properly treated. Ozone-depleting gases must be treated in accordance with Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer (4).



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## 1 Introduction

The Koehler Ramsbottom Carbon Residue Tester and Data Acquisition Software is the latest design for performing the ASTM D524 test method and related test specifications. The tester determines the 'carbon residue' left after evaporation and pyrolysis of a sample oil in the Ramsbottom furnace, providing an indication of the deposit forming tendencies of fuels and guidelines for the processing of refinery products.

This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the Ramsbottom Carbon Residue Tester and Data Acquisition Software. 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)**  
**Tel: +1 631 589 3800**  
**Fax: +1 631 589 3815**

**Email: [info@koehlerinstrument.com](mailto: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 D524
- ASTM D6074

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 14

3. Association Française de Normalisation (AFNOR)  
<http://www.afnor.fr>

#### AFNOR Publication:

- NF T 60-117

4. Federal Test Method

#### FTM Publication:

- FTM 791-5002

## 1.3 Instrument Specifications

**Models:** K27100  
K27190

**Electrical Requirements:** 115V 60Hz, 20.8A  
230V 50Hz, 10.9A

**Temperature Range:** Ambient to 650 °C (1200°F)

**Dimensions:** 16x21.5x14.5 (41x55x37)  
(l x w x h)

**Shipping Weight:** 78 lbs (35kg)

**Net Weight:** 64lbs (29 kg)

## 1.4 Software Specifications

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

**Operating System:** Windows 98/XP

**Memory Requirements:** 32 Mb RAM (64 Mb RAM recommended)  
5 Mb hard disk space (minimum)

**Communication Ports:** RS-232 (serial)

## 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.

**Overtemperature Protection.** This unit is equipped with Overtemperature Protection (OTP) circuitry to prevent overheating. The unit will automatically interrupt power whether equipment malfunction or operator error causes the temperature to exceed 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.

**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 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

- K27100/K27190 Ramsbottom Carbon Residue Apparatus 115V 60Hz or 230V 50/60Hz
- Carbon Residue Apparatus Operation and Instruction Manual

**Accessories** (must be purchased separately)

- 332-007-001 Coking Bulb
- K27320 Coking Bulb Filling Device
- 362-010-001 Sample Charging Syringe, 10mL
- 382-018-001 Syringe Needle, 18 gauge, 2"
- K27200 Control Bulb
- K29310/K29319 Digital Thermometer
- K271X0-SFW Ramsbottom Carbon Residue Software and Communication Port Cable
- K885-120-2 Analytical Balance, 120g capacity

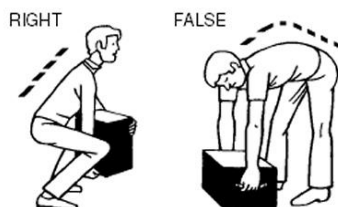
### 3.2 Unpacking

1. Check Shock Watch Label on Cardboard Box for indication of rough handling and possible damage.
2. Check labeling for correct orientation of instrument. (e.g. This Side Up)
3. Carefully open top of box with box cutter and remove packing foam.

4. Make two additional vertical cuts, using box cutter, along length of two sides of the box and remove packing foam.
5. 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.



6. Lift instrument from cart and place on bench.
7. 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

**Equipment Placement:** Place the main unit on a firm, level surface in an area with adequate ventilation or in a hood. Do not place any fixtures or shelves located directly above the unit. Leave approximately one foot of free space around each side of the unit because it generates an enormous amount of heat.

**Ventilation:** A fume hood or exhaust system is required when operating the Ramsbottom Carbon Residue Apparatus. Fumes and hydrocarbon vapors are generated and must not be permitted to accumulate. A canopy style hood may be used if the height from the top of the unit to the canopy is 5 feet or less. The exhaust blower should have a rating of 1000 C.F.M. or greater.



**WARNING:** For user safety, please keep any combustible materials away from the proximity of the unit.

**Environmental Conditions:** The instrument environment must comply with the following conditions for proper setup:

- No / Low Dust
- No direct sunlight
- Not near heating or AC ventilation ducts
- No Vibrations
- Clearance from other instruments
- Temperature Range: 5 to 40°C
- Elevation to 2000 meters
- Relative Humidity: < 80%

**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. The 115V model (K27100) uses a NEMA L5-30 plug and the 230V model (K27190) uses a NEMA L6-15 plug.



**WARNING:** For user safety, please disconnect the line cord whenever performing any maintenance and/or cleaning of the unit. Also, check that the power switch is in the off position before connecting the line cord at any time.

**Coking Bulb Filling Device:** The K27320 Coking Bulb Filling Device is a convenient time saving device that fills up to five coking bulbs at a time. It is ideal for viscous fluids that are difficult to handle at room temperature. The base of the device is pre-drilled with holes so that it can be secured to a benchtop or other suitable surface.

**Digital Thermometer and Control Bulb.** The K27200 Control Bulb is a stainless steel bulb with a built-in IC thermocouple that may be used to verify compliance of the furnace with ASTM performance requirements. The thermocouple leads may be secured to the inputs located on the rear of the K29310/K29319 Digital Thermometer. For example: if the leads are connected to channel 1 inputs, then select channel 1 on the dial located on the front of the

Digital Thermometer to observe the current temperature reading of the thermocouple. Make sure to connect the line cord and turn on the power to the Digital Thermometer for proper operation. If the temperature display on the Digital Thermometer increases in the negative direction when the thermocouple is exposed to heat, then reverse the positive and negative thermocouple lead inputs on the rear of the Digital Thermometer for correct operation.

**Analytical Balance.** An analytical balance is required for conducting this test and can be supplied by Koehler if needed. Place the balance on a firm, level surface. The Koehler balance may be leveled by making minor turning adjustments to the feet located at the base of the unit. A spirit level is included with the balance. Connect the balance main power supply to the appropriate power source. To unlock the clamping screw used for shipping, locate the black knob on the front center of the balance and underneath the display area. Turn the knob counter-clockwise until resistance is felt. Turn the unit power on and zero the balance reading. Refer to the separate user manual of the analytical balance for full operational details.

**Communication Port Cables.** Using the Communication Port Cable supplied for the Ramsbottom Carbon Residue Tester, connect the RS-232 port located on the unit to a communication port on the PC.

### 3.4 Software Installation

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 and the PC has been restarted, then you are ready to run the software.

## 4 Operation

The Koehler Ramsbottom Carbon Residue Apparatus is designed for acquiring test data in accordance with the ASTM D524 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.



**WARNING:** There are exposed hot surfaces on the bath during operation. Please avoid contact with exposed skin by the use of required protective equipment or serious injury could occur.

### 4.1 Instrument Descriptions

**Power Switch.** This switch controls the power to the entire unit. When the power switch is in the ON position, the digital temperature display and digital control panel are on and illuminated.

**Temperature Controller.** The digital temperature controller as shown in Figure 1 provides full temperature control of the apparatus.

### 4.2 Instrument Operation

1. **Power.** Turn on the main power switch to the Ramsbottom Carbon Residue Tester.
2. **Settings.** Set the digital temperature controller as prescribed by the test method. Full details of the digital temperature controller operation can be found in section 4.3. **Note:** The unit will take approximately 1-2 hours to heat and equilibrate the sample chamber to 550 °C.
3. **Calibration.**
  - a. **Digital Temperature Controller.** Once the unit has stabilized at the set temperature, the temperature of each of the test wells can be measured and used to calibrate the digital temperature controller. Use the K27200 Control Bulb connected to the K29310 / K29319 Digital Thermometer to measure this temperature. Allow the temperature reading on the digital thermometer to come to equilibrium before adjusting the calibration setting in the digital temperature controller. Full details



setting the calibration in the digital temperature controller are given in section 4.3.

b. **Ramsbottom Carbon Residue Tester.**

The ASTM D524 test method describes the procedure to verify the compliance of the furnace with the ASTM performance requirements and is summarized as follows. Insert the control bulb into a sample well. Observe the temperature rise in the control bulb in 1 minute intervals for 20 minutes. If the temperature in the control bulb reaches 547 °C in not less than 4 minutes and not more than 6 minutes from the instant of its insertion in the furnace and remains within the range  $550 \pm 3$  °C for the remaining portion of the 20 minute test, then consider that particular coking bulb well is suitable for use as a standard performance well. Allow the control bulb to return to room temperature before inspecting the next well.

4. **Charging the Coking Bulbs.** Please consult with the appropriate test method regarding charging the coking bulbs with the test sample. The two steps below however provide a brief outline.

a. **Direct Method.** Attach a syringe needle to the syringe tip and insert the plunger into the syringe body. Insert the needle into the material to be tested and fill up the syringe by pulling back on the plunger. Insert the needle through the top orifice in the coking bulb and add the necessary amount of material.

b. **Coking Bulb Filling Device.** The K27320 Coking Bulb Filling Device is a device that fills up to five coking bulbs at a time and can be used for viscous fluids that are difficult to handle at room temperature. Place up to 5 coking bulbs in each of the wells in the base of the K27320 Coking Bulb Filling Device. Take a syringe equipped with a needle and pull out the plunger. Place the syringe body and needle on the top support of the filling device by inserting the needle through the top holes all the way down through the orifice of the coking bulb. Pour in the required amount of test sample into the syringe

and then reinsert the plunger. Pull the spring-loaded cap over the top of the plunger and carefully set it down on the plunger. The force of the springs will fill the coking bulb.

5. **Running the Test.** Place the filled coking bulb into a well for a specific time period. After the sample has been heated, carefully remove the coking bulb from the sample well using tongs. Weigh the coking bulb to determine the amount of residue. **WARNING:** There are exposed hot surfaces on the bath during operation. Please avoid contact with exposed skin by the use of required protective equipment or serious injury could occur.

### 4.3 Temperature Controller

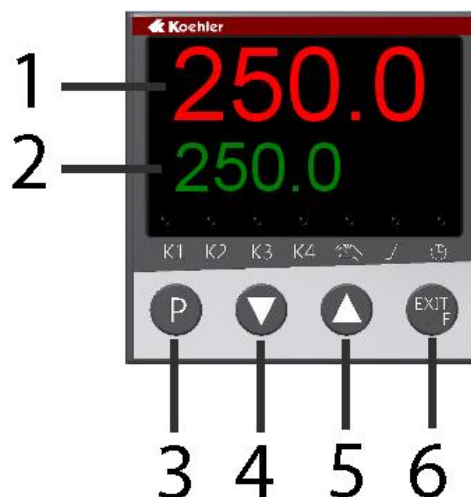


Figure 1. Digital Temperature Controller

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 Safety Features

The Koehler Ramsbottom Carbon Residue Tester is equipped with several safety and protection features, which are described in the following sections.

### 5.1 Over Temperature Protection

The Koehler Ramsbottom Carbon Residue Tester 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.

## 5.2 Over Power Protection

The Koehler Ramsbottom Carbon Residue Tester 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.

## 6 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.

### 6.1 Routine Maintenance

The Koehler Ramsbottom Carbon Residue Tester requires little routine maintenance to provide many years of continuous service.

- Calibration Procedure.** The ASTM D524 test method describes the procedure to verify the compliance of the furnace with the ASTM performance requirements and is summarized as follows. Insert the control bulb into a sample well. Observe the temperature rise in the control bulb in 1 minute intervals for 20 minutes. If the temperature in the control bulb reaches 547 °C in not less than 4 minutes and not more than 6 minutes from the instant of its insertion in the furnace and remains within the range  $550 \pm 3$  °C for the remaining portion of the 20 minute test, then consider that particular coking bulb well suitable for use as a standard performance well. Allow the control bulb to return to room temperature before inspecting the next well.
- Test Well Cleaning Procedure.** It is imperative that the test wells of this unit be kept clean and free of any foreign mater. Failure to do so may result in the coking bulbs becoming stuck within the unit. While the unit is at room temperature, use compressed air to blow any loose matter out

of the test wells and off the top of the unit. Wipe out the interior with a damp cloth and a suitable cleaning solution. Wipe the test wells until no residue is present on the cloth.

- Control Bulb Maintenance.** The control bulb should be kept clean using a cleaning solution on the exterior face. Abrasive cleansers or pads should not be used on the control bulbs. In the event the control bulb becomes stuck in a test well, the bath should be cooled to room temperature before removal is attempted. Please contact our Technical Services Department for assistance regarding this matter.

### 6.2 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
230-115-001	Heater, 2400W <sup>†</sup>
265-203-001	Temperature Probe, Type K
278-203-002	Fuse, 30A <sup>†</sup>
278-001-002	Fuse, 1A
278-104-002	Fuse, 0.25A
275-103-044	Temperature Controller, 100-240V
230-230-002	Heater, 2400W <sup>†</sup>
278-020-004	Fuse, 20A
091-032-001	Solid State Relay, 4-32VDC, 20A <sup>‡</sup>

<sup>†</sup> For 115V model ONLY (K27100)

<sup>‡</sup> For 230V model ONLY (K27190)

## 7 Service

Under normal operating conditions and with routine maintenance, the Koehler Ramsbottom Carbon Residue Tester 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: \_\_\_\_\_



## 8 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.

## 9 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.

## 10 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.

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## Notes

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## Notes

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