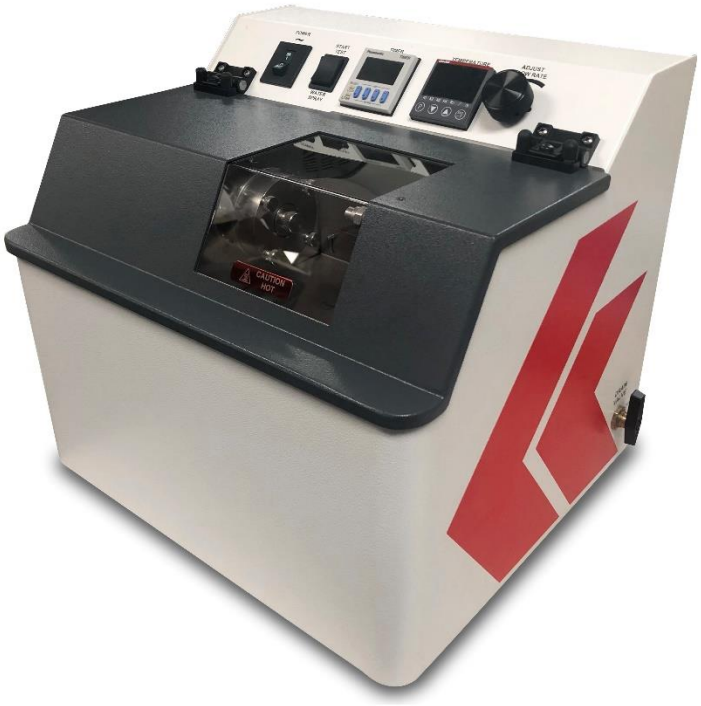

K19201
Water Washout Tester

Operation and Instruction Manual

REV C

Koehler Instrument Company, Inc.
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Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing

CE

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: **Water Washout Tester**

Model Number(s): ***K19201***

Qualifications:

This product may only to 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
EN 55011:2007	Conducted Emissions Test for Group 1 Class A as detailed in the product's technical documentation.

James R. Ball
Dir. Research & Development

1595 Sycamore Av.
Bohemia, NY 11716
United States of America
February 7th, 2020

www.koehlerinstrument.com 631-589-3800

CERTIFICATE OF CONFORMANCE

Water Washout Tester
K19201

This certificate verifies that part number K19201, Water Washout Tester, was manufactured in conformance with the applicable standards set forth in this certification.

Specifications:

ASTM D1264
ASTM D4950
IP 215
FTM 791-3252

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.

Vincent Colantuoni
Product Manager
Koehler Instrument Company

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).

Table of Contents

1 Introduction

The Koehler Water Washout Tester K19201 rotates a lubricated ASTM ball bearing at 600 rpm while impinging the bearing with a stream of water at the specified flow rate and temperature.

This manual provides operating instructions for the K19201 Water Washout Tester, and should be used in conjunction with applicable standard test methods.

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.

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Tel: +1 631 589 3800
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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

   ASTM Publication:
   - ASTM D1264: Standard Test Method for Determining the Water Washout Characteristics of Lubricating Greases
   - ASTM D4950: Standard Classification and Specification for Automotive Service Greases

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 215: Determination of Water Washout Characteristics of Lubricating Grease

3. Federal Test Method (FTM)

   FTM Publication:
   - FTM 791-3252

1.3 Instrument Specifications

Model:	K19201
Electrical Requirements:	115-230V, 50/60Hz
Test Temperature:	38°C and 79°C
Temperature Control Stability:	± 1°F (±0.5°C)

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.

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.

n-Heptane:

WARNING: Flammable. Harmful if inhaled.

- Keep away from heat, sparks, open flames and any other source of ignition.
- Keep container closed.
- Use with adequate ventilation.
- Avoid prolonged breathing of vapor or spray mist.
- Avoid prolonged or repeated skin contact.
- Wash thoroughly after each use.

Stoddard Solvent:

WARNING: Combustible.

- Keep away from heat, sparks, open flames and any other source of ignition.
- Keep container closed.
- Use with adequate ventilation.
- Avoid prolonged breathing of vapor or spray mist.
- Avoid prolonged or repeated skin contact.
- Wash thoroughly after each use.

3 Getting Started

3.1 Packing List

- K19201 Water Washout Tester
- 289-001-006 Test Bearing
- 22G-100-04S Additional Thumb Screws for Test Bearing Housing (2)
- 22J-304-16S Additional Thumb Screw for Test Bearing Housing
- 020-304-00P Additional Shaft Connector
- 332-002-020 50 mL Graduated Cylinder
- AS568-130 O-Ring for Secondary Bearing Assembly (2)
- 414-104-3108 Tool to Disassemble the Secondary Bearing Assembly
- 463-964-001 Tool to Disassemble the Secondary Bearing Assembly
- K19201-Manual Operation and Instruction Manual

Accessories (purchased separately):

- 289-001-006 Test Bearing
- K19201-23004 Test Bearing Assembly
- K19201-T-CAL-KIT Temp. Calibration Kit
- K19201-RPM-CAL-KIT Testing Bearing Rotating Speed Calibration Kit
- K19201-03006 Special Gauge to Locate the Spray Target

NOTE: *The difference between the test bearing and the secondary bearing is that the test bearing contains the grease to be tested and the secondary bearing allows the entire bearing shaft to rotate. Do not interchange these bearings.*

3.2 Installation Instructions

1. Check Shock Watch Label on Cardboard Box for indication of rough handling and possible damage.

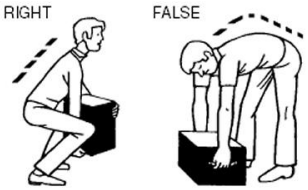
2. Check labeling for correct orientation of instrument. (e.g. This Side Up)

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.

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 Set Up

Equipment Placement: Make sure the instrument in placed on a firm, level table in an area with adequate ventilation or in a hood.

Fill Reservoir: Close the drain valve and fill the reservoir with water. A pan rests in the reservoir with markings for minimum and maximum water level limits. Then connect the drain valve to a suitable waste receptacle.

Power: The instrument can operate at both 115V and 230V, and can switch between the two voltages with a switch located on the back of the instrument, along the right side. This voltage switch is shown in Figure 1. When unpacking the instrument, the voltage switch will be covered with a warning sign label, which is also shown in Figure 1. Ensure that the voltage shown on the voltage switch matches the input voltage of the power supply. Connect the line cords to properly fused and grounded receptacles with the correct voltage as indicated on the back of the unit.

Figure 1. Voltage Switch and Warning Label

WARNING: Ensure that the voltage switch is in the correct position that correlates to the input voltage of the power supply **BEFORE** connecting the power supply and powering on the instrument. If the input voltage does not match the voltage on the switch, significant damage may be done to the instrument.

WARNING: For safety, disconnect the power when performing any maintenance and/or cleaning. Do **NOT** turn the power on unless the bath is filled with the proper medium; otherwise, damage may occur to the unit and the warranty will be void.

NOTE: Before plugging in this unit, be sure all switches are in the off position.

4 Descriptions

4.1 Instrument Controls

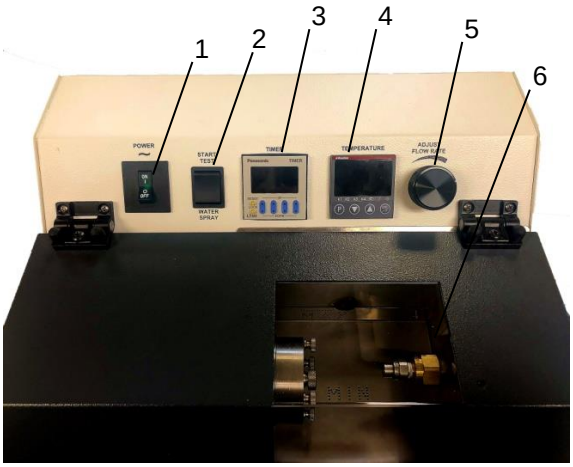


Figure 2. Instrument Descriptions - Front

1. **Line Switch**. For powering On and Off the apparatus.

2. **Spray Switch.** This is a three-position switch. The middle position is the **OFF** or standby position. Pressing the switch down to the **Water Spray** position activate the water spray function. The switch should be in this position when the water jet is needed without the integrated timer. Pressing the switch up to the **Start Test** position will direct the pump flow to the spray nozzle and will start the timer and motor, performing a test.

3. **Timer Controller.** For controlling and displaying the test time.

4. **Temperature Controller.** For controlling the bath reservoir temperature.

5. **Flow Rate Control.** The flow rate is controlled by an analog dial. As per ASTM D1264, the water speed at the time it leaves the nozzle must be 5 ± 0.5 mL/s. See Section 5.1 to adjust the flow rate.

6. **Reservoir Cover / Thermometer Port.** Pull open the cover to expose the test bearing / motor assembly. The cover is designed to provide protection to the user from heated water while allowing one to visually see inside the test chamber during testing. The cover is also equipped with a small hole for insertion of an ASTM certified thermometer or other direct contact thermometer.

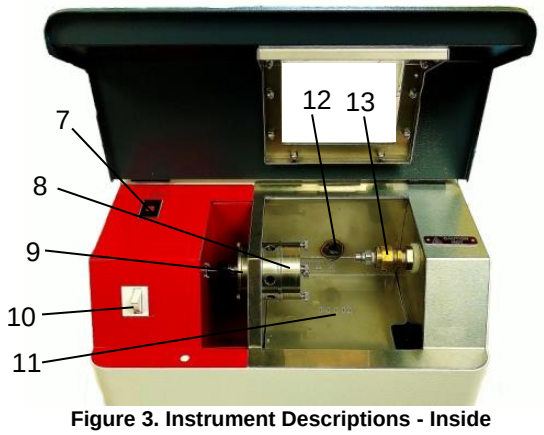


Figure 3. Instrument Descriptions - Inside

7. **Motor Switch.** When turned on, the motor will rotate the test bearing assembly. This switch should be used if rotation needs to be supplied to the bearing without using the integrated timer during a test.

8. **Test Bearing Housing Assembly.** The test bearing housing assembly holds the test bearing. It is easily removed by loosening the five thumb screws that hold it in place. See Section 5.2 for instructions to assemble and disassembly the bearing housing.

9. **Secondary Bearing Housing Assembly.** The secondary bearing housing assembly holds the secondary bearing. It can be removed and replaced as per Section 6.3.

10. **Emergency Stop Switch**. Prevents the test from running (or terminates a currently running test) while the cover is open. This switch will not stop the motor if the motor switch is turned on.

11. **Water Level Pan.** The pan is marked with maximum and minimum water level limits when filling the bath. The pan will also catch any grease that falls off during the test

12. **Overflow Drain.** Water will flow out to the back of the instrument if the water level rises above this.

13. **Water Jet Nozzle.** When the spray switch is turned to the **Start Test** or **Water Spray** position, water will flow out of the nozzle and will strike the test bearing. See Section 7.1 to adjust the angle of the water jet.

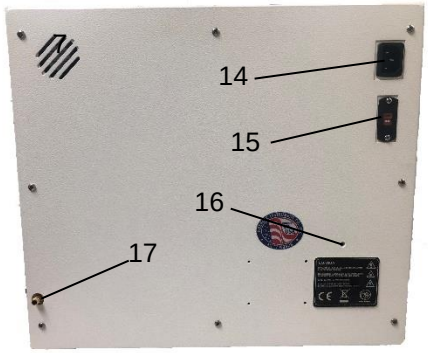


Figure 4. Instrument Descriptions - Back

14. **Power Input**. For connecting the power cord.

15. **Voltage Switch.** Used to switch between 115V and 230V operation. Ensure that the voltage shown on the voltage switch matches the input voltage of the power supply. See Section 3.3 for further information.

16. **RPM Calibration Port**. Used when adjusting the motor rpm speed. This does not need to be adjusted under normal circumstances, since the motor is factory calibrated.

17. **Overflow and Drain Outlet**. Water will flow out of this adaptor if the water level in the bath is too high. To prevent spillage, connect tubing from this outlet to a water drain. This drain outlet is also used to empty the water out of the instrument after testing is completed.

4.2 Temperature Controller Operation

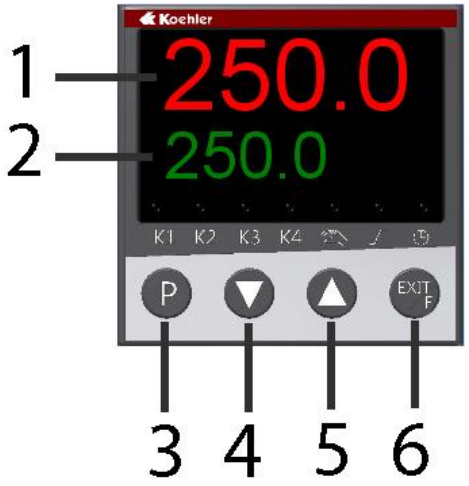


Figure 5. Temperature Controller

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.

4.3 Timer Controller Operation

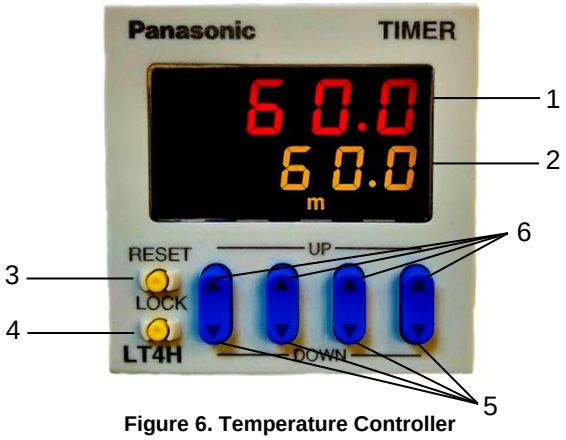


Figure 6. Temperature Controller

1. **Timer Countdown Display.** The upper red LED display shows the time remaining for the test.

2. **Set Point Timer Display.** The lower orange LED display shows the set point time of the controller.

3. **Reset Key.** Resets the elapsed time on the countdown timer.

4. **Lock Key.** Locks all other buttons on the timer unit.

5. **Down Keys.** Decreases each corresponding digit of the set point timer.

6. **Up Keys.** Increases each corresponding digit of the set point timer.

5 Operation

WARNING: Ensure that the voltage switch is in the correct position that matches the input voltage of the power supply **BEFORE** connecting the power supply and powering on the instrument. If the input voltage does not match the voltage on the switch, significant damage may be done to the instrument. See Section 3.3 for more information on the voltage switch.

5.1 Verification of Flow Rate

The pump speed is controlled by an analog dial. As per ASTM D1264, the water speed at the time it leaves the nozzle must be 5 ± 0.5 mL/s. It is required for the operator to verify the water flow rate as per Section 8.3 of ASTM D1264 and requires the use of the supplied piece of Tygon tubing and borosilicate glass graduated cylinder. This procedure is illustrated in Figure 7 and is described below:

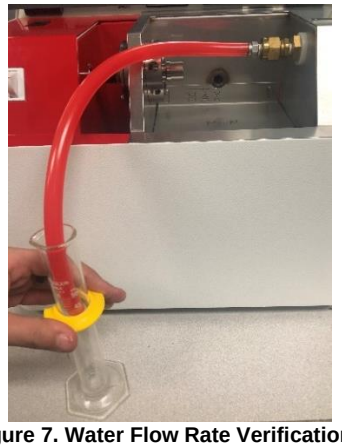


Figure 7. Water Flow Rate Verification Setup

1. Connect the Tygon tubing to the nozzle outlet. Place the other end of the Tygon tubing into the graduated cylinder. This setup is shown in Figure 7.

2. Turn the spray switch to the “Water Spray” position. Water will then begin to spray out of the nozzle and through the Tygon tubing, into the graduated cylinder.

3. Start a timer or stop watch as soon as the water enters the graduated cylinder. After 5 – 10 seconds pass, turn the spray switch back to the off position. Stop the timer or stop watch once the water no longer enters the graduated cylinder

4. Measure the volume of water in the graduated cylinder.

5. To determine the flow rate, divide the volume of water (in mL) by the measured time on the timer or stop watch (in seconds).

6. The calculated flow rate should be 5 ± 0.5 mL/s as per ASTM D1264. If the flow rate falls outside of this range, adjust the Flow Rate Control (Section 4.1, Item 5) accordingly.

7. Repeat the flow rate verification process until the flow rate is within the ASTM D1264 5 ± 0.5 mL/s range.

5.2 Instrument Operation

⚠ **NOTE:** Be sure to read the safety and hazard warnings, the installation procedure and any of the standard test methods mentioned in the Introduction of this manual before operating this instrument.

1. Remove the bearing housing by removing the five thumb screws holding the bearing housing to the bath. See Figure 8 below:

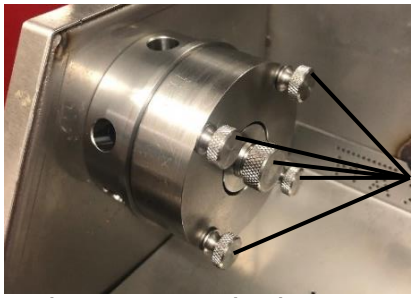


Figure 8. Remove Thumb Screws

2. The central, larger thumbscrew secures the bearing shaft and small bearing plate in place through the center of the bearing housing. Once the five thumb screws are removed, pull the bearing housing and bearing shaft out of the instrument.

3. Disassemble the bearing housing and bearing shaft by removing the thumb screws from the bearing housing, and by taking out the thumb screw in the middle of the housing. Figure 9 shows the components of the test bearing housing and Figure 10 shows the components of the bearing shaft.

Figure 9. Left to Right: Bearing Plate, Test Bearing (packed), Bearing Shield

Figure 10. Left to Right: Shaft Connector, Bearing Shaft, Small Bearing Plat w/ Large Thumb Screw

4. Clean the bearing housing. If the housing holds a used test bearing, replace it with a new test bearing. Pack the new test bearing with grease as per the standard test method.

5. Reassemble the test bearing housing. To do so, place the grease packed test bearing into the bearing shield. Then place the bearing plate over the open end of the bearing shield. Insert the four smaller thumb screws into the bearing housing from the side of the bearing shield. See Figure 11 for an assembled bearing housing:

Figure 11. Assembled Bearing Housing

6. Screw the bearing housing into the assembly in the instrument.

7. Insert the bearing shaft assembly into the bearing assembly. The shaft connector attaches the motor shaft to the bearing shaft. The bearing shaft is inserted through the center of the bearing assembly. The bearing shaft is secured in place with the small bearing plate, which is screwed into the bearing assembly with the one large thumb screw. After screwing the shaft assembly into the instrument, ensure that the four smaller thumb screws are properly secured.

   NOTE: Do not run the test bearing without greasing it first.

   The ball bearing located in the secondary bearing housing on the motor side is greased prior to shipment. Under normal operating conditions, the ball bearing should be replaced and greased every two years or as needed. Refer to the Maintenance Procedure for these instructions.

8. Fill the water bath distilled water. The pan in the bath has markings to indicate the minimum and maximum water level. Be sure the drain valve (located on the side of the instrument) is closed before adding water to the bath. This water level must be maintained to avoid the heater burning out.

   NOTE: Always double check the water level before beginning a test

9. Turn on the instrument and adjust the temperature controller (Figure 5) to the desired temperature as stated in the standardized test method.

10. When the water has reached the specified temperature, adjust the Flow Rate Control Knob to the prescribed speed and verify using the procedure outlined in Section 5.1.

11. To start a test, turn the spray switch to the **Start Test** position to start the timer and the motor.

NOTE: Make sure the cover is closed before running a test. The test will not run if the cover is open.

12. Proceed in accordance with the test methods listed in Section 1.2.

13. Remove the water from the water bath by placing a waste container under the drain valve. Open the valve. Allow the water to fully drain before closing. Be sure the drain valve is closed when the knob is perpendicular to the spout.

6 Maintenance

WARNING: Disconnect power to the unit before servicing and accessing any internal portion of the instrument 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 K19201 Water Washout Tester requires little routine maintenance to provide many years of continuous service. However, over the course of time, some instrument parts may need to be replaced. 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).

6.2 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.

6.3 Inner Ball Bearing Replacement

K19201 has two ball bearing assemblies. The test bearing is replaced after every test, since grease sample must be packed into it, as described in Section 5.2. The secondary ball bearing does not need to be replaced after every test. The secondary ball bearing is located next to the motor (see Section 4.1, Item 9). The secondary ball bearing is recommended to be replaced after 1 - 2 years of operation. To replace the secondary ball bearing:

1. Remove the test bearing assembly as per Section 5.2 by removing the 5 thumbscrews.

2. Using the supplied tool to remove the secondary bearing assembly (part numbers 414-104-3108 and 463-964-001), unscrew the four screws that hold the secondary bearing assembly in place. The screws are located on the side of the assembly that faces the motor shaft.

3. Once the screws are removed, carefully remove the secondary ball bearing assembly out of the instrument.

4. Disassemble the bearing assembly. Figure 12 shows each component of the assembly.

Figure 12. Secondary Ball Bearing Assembly

5. Replace the secondary ball bearing with a new, unused secondary bearing. Do not use a test bearing in this assembly.

6. Replace the O-ring of the secondary bearing assembly with a new, unused O-ring.

7. Reassemble the secondary bearing assembly.

8. Insert the secondary bearing assembly into the instrument, in the same position and orientation in which it was removed.

9. Screw the four screws into the secondary bearing assembly using the supplied tool to hold the assembly in place.

7 Calibration

7.1 Nozzle Position Calibration

The angle of the water jet can be adjusted and locked in place so that it strikes the same position of the test bearing for each test. The K19201-03006 special gauge is used to adjust the angle of the water jet, which is purchased separately from the instrument. This proper position of the water jet is shown in Figure 13, and the procedure to adjust this position is described below.

Figure 13. Calibration of Water Jet Position

1. Attach the test bearing assembly to the test position using the thumbscrews.

2. Place the K19201-03006 gauge on the bearing assembly. The gauge should rest with the two upper thumb screws of the bearing assembly inside the two outer grooves of the gauge tool. See Figure 13 for reference.

3. Turn the spray switch to the “Water Spray” position. Water will then begin to spray out of the nozzle.

4. The water jet should strike the bearing assembly directly in the corner of the middle groove of the gauge tool. This is shown in Figure 13.

5. If the water jet does not strike this position, the angle of the nozzle can be adjusted. To adjust the nozzle, loosen the brass coupling that holds the nozzle in place. Once the coupling is loosened, the direction of the nozzle can be adjusted by hand, so that it strikes the correct position of the bearing, as shown in Figure 13. Hold the nozzle in the correct position, then hand-tighten the brass coupling to lock the nozzle's position in place.

WARNING: DO NOT use any tools to tighten the brass coupling. Overtightening can severely damage the equipment on this instrument.

7.2 Temperature Calibration

See Section 4.2 for information regarding calibration of the temperature controller. Temperature calibration requires use of a calibrated temperature measuring device. This device is a part of the K19201-T-CAL-KIT Temperature Calibration Kit that can be purchased separately with the instrument. The procedure to measure the bath temperature with this device is as follows:

1. Fill the bath, as described in Section 5.2.

2. Turn the spray switch to the "Water Spray" position. Water will then begin to spray out of the nozzle and will circulate through the bath.

3. With the lid of the instrument closed, place the probe of the temperature measuring device in the small hole in the instrument's lid next to the viewing window (as shown in Figure 14).

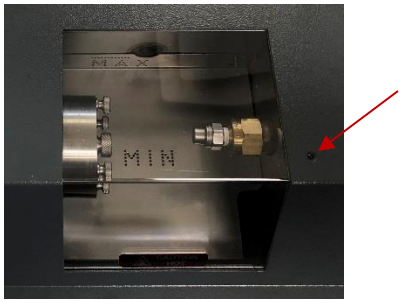


Figure 14. Temperature Calibration Hole

4. Push the probe into the hole, until the end of the probe reaches the bottom of the bath.

5. Raise the probe by an inch, so the end of the probe is in the ideal position for temperature measurement of the bath.

6. Read the measured temperature on the display of the calibrated temperature measuring device.

7.3 Rotation Calibration

As per ASTM D1264, the test bearing must rotate at 600 ± 30 rpm during the test. The motor is factory calibrated, so that the bearing rotates at 600 rpm as per ASTM D1264. To check the rpm speed of the motor and to adjust it if necessary, the K19201-RPM-CAL-KIT Rotation Calibration Kit is used, which is purchased separately with the instrument. The procedure to measure and adjust the rpm of the bearing with this calibration device is as follows:

1. Attach the shaft with the shaft connector to the motor.

2. Turn the motor switch (Section 4.1, Item 7) to the on position. The motor will then rotate the bearing assembly.

3. Point the calibration rpm meter at the end of the motor that connects to the shaft connector. The end of the motor is black, and has a portion that is painted white. Ensure the laser of the rpm meter is pointed at the end of the motor, so it can detect the white portion to measure the rpm.

4. The meter should read 600 ± 30 rpm.

5. If the rpm does not fall in this range, the motor speed can be adjusted. To do so, a second operator may be needed. There is a small hole located on the back of the instrument (Section 4.1, Item 16). Insert the screwdriver into this hole, and slowly turn the screw to adjust the motor speed. Monitor the rpm as the screw is adjusted until the rpm is properly calibrated.

6. Once the calibration meter reads 600 ± 30 rpm, turn off the motor witch.

7. Calibrate the temperature controller as per Section 4.2 if needed.

8 Service

Under normal operating conditions and with routine maintenance, the K19201 Water Washout 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: _____

9 Replacement Parts

Part Number	Replacement Part
289-001-033	Secondary Bearing
289-001-006	Test Bearing
K19201-23004	Test Bearing Assembly
AS568-130	O-ring for Secondary Bearing
020-304-00P	Shaft Connector
332-002-020	50 mL Graduated Cylinder
K19201-03006	Gauge to Locate Spray Target
414-104-3108	Tool for Secondary Bearing
463-964-001	Tool for Secondary Bearing
22G-100-04S	Thumb Screws for Test Bearing
22J-304-16S	Thumb Screw for Test Bearing

10 Storage

This laboratory test instrument consists of Electrical & Mechanical Components. Storage facilities should not be subject to extremes of high and low temperatures or extremes of high and low moisture conditions. Storage facilities should be consistent with indoor laboratory environment.

⚠ **NOTE:** Unit is shipped in corrugated cartons and if long term storage is anticipated, repacking with water resistant packing is recommended to insure a safe condition for the equipment.

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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