

**K80050
SEMI-AUTOMATIC STANDARD
DUCTILITY TESTING MACHINE**

OPERATION AND INSTRUCTION MANUAL

REV A

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Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing

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1 Introduction

The K80050 Semi-Automatic Standard Ductility Testing Machine is the latest design for determining the ductility of a bituminous material as measured by the distance a briquet specimen of material will elongate before breaking when the two ends are pulled apart at a specified speed and at ambient temperature according to the user's test method. The K80050 Semi-Automatic Standard Ductility Testing Machine is also capable of determining the Elastic Recovery of bituminous materials at a specified speed and at ambient temperature according to the user's test method.

This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the Ductility Testing Machine.

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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1.2 Instrument Specifications

Model: K80050

Electrical Requirements: 115V/220-240V,
50/60 Hz

Travel Length: 150 cm

Standard Traction Speed: 5 cm/min

Variable Traction

Speed: 0.25 cm/min – 7 cm/min

Timer: 1 – 999 min

Test Positions: 3

Dimensions: 88 ¼ x 19 x 16
(l x w x h, in.(cm)) (224.2 x 48.3 x 40.6)

Shipping Dimensions: 92 ¾ x 25 ¼ x 23 ¼
(l x w x h, in.(cm)) (235.6 x 64.1 x 59.1)

Net Weight: 217 lbs (98.5kg)

Shipping Weight: 368 lbs (167kg)

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.

- **STAY ALERT!** Do not operate this unit while under the influence of medication, alcohol, or drugs.
- Keep hands away from machine while carriage is in motion.

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>.

3 Getting Started

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

3.1 Packing List

- K80050 Semi-Automatic Standard Ductility Testing Machine
- K80050-Manual K80050 Semi-Automatic Standard Ductility Testing Machine Operation and Instruction Manual
- K80012 Standard Mold (3)
- K80013 Base Plate

Accessories (purchased separately, see Section 4.2 for more information):

- K80041 Force / Recovery Mold
- 250-000-63F ASTM Thermometer
Range: 18 to 89°F
- 250-000-63C ASTM Thermometer
Range: -8 to +32°C

3.2 Unpacking

Carefully unpack and place the instrument and accessories in a secure location. Inspect the unit 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 Installation

Equipment Placement: Place the instrument on a firm, level table in a secure area. The unit may be leveled by making minor turning adjustments to the feet located at the base of the unit. Please note that Koehler does not supply a level with this equipment.

Power. Connect the line cords to properly fused and grounded receptacles with the correct voltage as indicated in section 1.3 or on the back of the unit.

WARNING: For safety, disconnect the power when performing any maintenance and/or cleaning. Do **NOT** turn the power on unless the Refrigerated Constant Temperature Circulation Bath is filled with

water; otherwise, damage may occur to the unit and the warranty will be void.

4 Descriptions

4.1 Instrument Descriptions

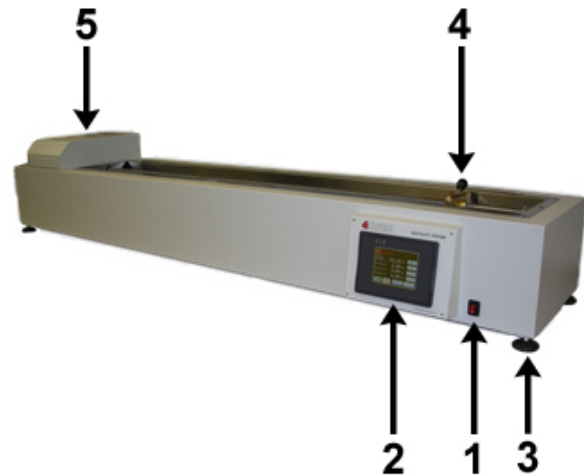


Figure 1. Instrument Descriptions (Front)

1. **Line Switch.** This switch controls the power to the entire unit. When the Line switch is in the **ON** position, the operation touch screen control panel is powered on.
2. **Operation Touch Screen Control Panel.** Integrated Touch Screen for selecting a preprogrammed test method. Custom test method options are also available for user defined traction speed and test durations.
3. **Isolator Feet.** For leveling of the Ductility Testing Machine.
4. **Carriage Release Lever.** Pushing and Pulling of this lever allows for the locking and releasing of the Ductility Carriage respectively. Refer to section 5 for operation procedure.
5. **Gear Box Cover.** Provides protection for the user from the internal motor and gears that power the Ductility Machine.

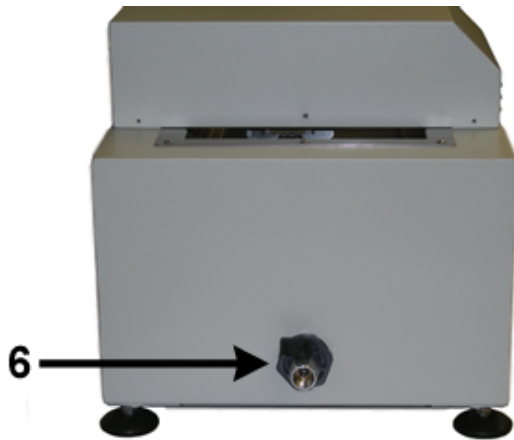


Figure 2. Instrument Descriptions (Side)

- 6. Drain Valve.** To drain the liquid from the tank or to lower the liquid level if the tank is overfilled.

4.2 Accessories for Running Tests

4.2.1 Standard Mold



Figure 3. Standard Ductility Mold

The K80012 Standard mold is made of brass and is used for the preparation of the bitumen briquet test specimens. The Standard Mold is machined in direct accordance to ASTM D113 Standard Test Method for Ductility of Bituminous Materials and related test specifications. Refer to section 5.1 for further detail on using the standard mold for sample preparation.

4.2.2 Force / Recovery Mold



Figure 4. Force / Recovery Mold

The K80041 Force / Recovery mold is made of brass and is used for the preparation of the bitumen briquet test specimens. The Standard Mold is machined in direct accordance to ASTM D6084 Standard Test method for Elastic Recovery of Bituminous Materials by Ductilometer. Refer to section 5.1 for further detail on using the Force / Recovery mold for sample preparation.

5 Operation

5.1 Sample Preparation

1. Assemble the mold on the brass plate. To prevent the material under test from sticking, it is suggested that the surface of the plate and interior side surfaces of the mold be thoroughly coated. Make sure the plate is perfectly flat and level so that the bottom surface of the mold makes full contact with the surface of the plate.
2. Completely melt the bituminous material to be tested until thoroughly fluid by heating it in an oil bath maintained at the minimum temperature needed to properly liquefy the sample. When paving asphalt cements are to be tested, the oil bath should be maintained at a temperature of 150 to 160°C (302 to 320°F).
3. Strain the melted sample through a No. 50 sieve. After stirring thoroughly, pour into the mold, taking care not to disarrange the parts of the mold. Pour the material back and forth in a thin stream from end to end of the mold until the mold is more than level full.
4. Allow the mold containing the material to cool to room temperature for a period of 30 to 40 minutes. Then place the mold in the water bath maintained at ambient temperature for 30 \pm 5min minutes. Remove the specimen and immediately cut off excess bitumen with a hot straight edged knife or spatula to make the mold level full.
5. Place the brass plate and mold, with the briquet specimen, on the shelf in the water bath and allow it to remain there at ambient temperature for a period of 90 \pm 5 min. After the elapsed period of time, remove the briquet from the plate, detach the side pieces, and immediately test the briquette as outlined in the following section.

5.2 Ductility Machine Test Procedure

1. Turn on the Main Line Switch to the unit (see Figure 1, item 1). The splash screen will display on the touch screen control panel (see Figure 7).



Figure 7. Splash Screen

The yellow PWR LED will illuminate to indicate power is on. The red COM LED will illuminate to indicate successful communication between the screen and the ductility machine's internal PLC. Splash screen then prompts the user to press any key to continue.

2. Simply pressing the touch screen will display the main screen. The main screen is illustrated in Figure 8 below:

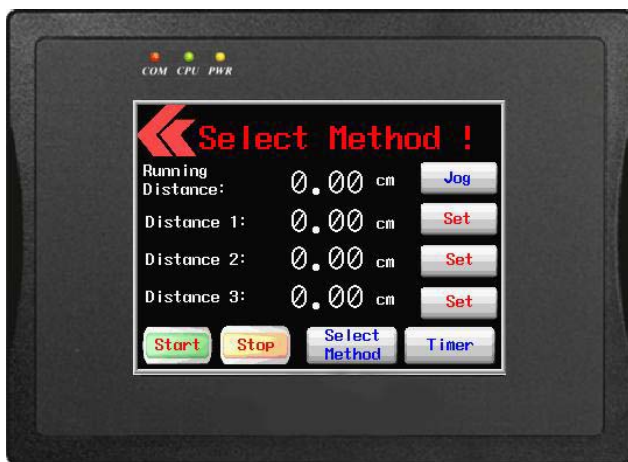


Figure 8. Main Screen

3. Jog Function:

The K80050 Standard Constant Temperature Ductility Testing Machine features a unique jogging function. This allows the user to align the threads of the threaded lead screw with the ductility carriage without moving the carriage

thus greatly simplifying the sample placement process.

4. Jogging Procedure and Sample Placement

- a. After the sample briquet has been soaked at ambient temperature for approximately 90 minutes and removed from the brass plate and side pieces, the sample must be placed in the ductility trough.
- b. Place the specimen in position by setting one end of the specimen mold onto one of the three mounting pins on the end plate. Set the other end of the mold onto the corresponding pin on the ductility carriage.

NOTE: The ductility carriage may need to be adjusted manually to properly place mold onto mounting pins. To do this, the carriage release lever must be in the open position (see Figure 9 below).

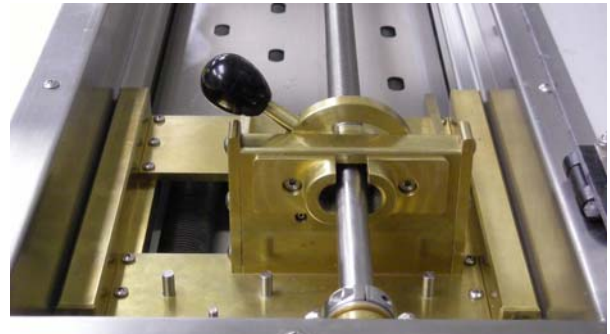


Figure 9. Carriage Release Lever (Open Position)

- c. Once mold is properly in place by both mounting pins, the carriage must be locked in place.
- d. To lock the carriage in place with further movement of the carriage, the jog function must be utilized.
- e. To initiate the jogging feature of the ductility machine simply press and hold the **Jog** button located at the top right-hand corner of the Main Screen (see Figure 8). The threaded lead screw will begin to rotate.
- f. As the threaded lead screw rotates, slowly and carefully push the release lever from the open position (Figure 9) to the closed position (Figure 10). When the threads of the threaded shaft are properly in line with

the carriage the release lever should easily slide into the closed position.

WARNING: Do not forcefully push lever into the closed position as this may damage the carriage, threaded lead screw, or both.

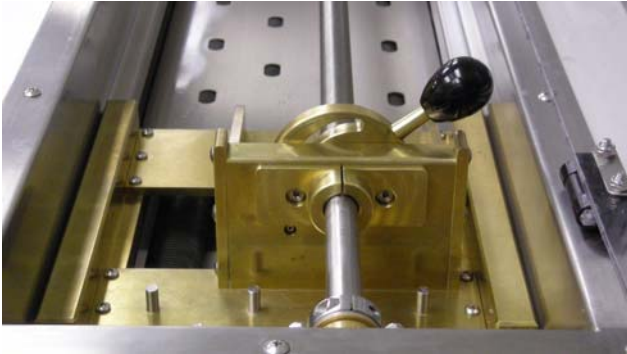


Figure 10. Carriage Release Lever (Closed Position)

- g. As soon as the carriage release lever is moved to the closed position release the Jog button.
- h. In the current state, the carriage will only be mobile by use of the ductility machine control panel. Select the test method to continue with operation.

5. Select Method:

The control panel will then prompt the user to select a method. Press the **Select Method** button to open the **Select Method** screen (see Figure 9 below):



Figure 9. Select Method Screen

The Select Method screen gives the user the option of choosing between three testing options:

- ASTM D113: Ductility

- T 301 (ASTM D6084): Recovery
- Custom

6. ASTM D113:

- a. When selecting the ASTM D113 test method, the user is brought to the ASTM D113 testing screen. This screen is identical to that of the Main Screen except that the title of the screen now displays **Ready**. The speed is preset in accordance to ASTM D113. See Figure 10:



Figure 10. ASTM D113 Test Screen

- b. Be sure test specimen is properly in place and carriage release lever is in the closed position before starting the test.
 - c. To begin the test, simply press the start button located at the bottom left-hand corner of the screen. The Running Distance will reset to zero. The threaded lead screw will traverse to the left elongating the test specimen.
 - d. Upon rupture of the test specimen press the red **Set** button on the right-hand side of the screen. The distance the specimen has elongated will be locked on the screen. The recorded distance is the ductility of the sample.
- NOTE:** There are three distance display lines and Set buttons for the three test specimens the ductility machine is capable of testing simultaneously.
- e. To stop the carriage from moving after the test is complete, press the **Stop** button located at the bottom left-hand side of the screen.

- f. Move the “Carriage Release Lever” to the open position and manually move the carriage to the right to the starting position of the test.

7. T 301 (ASTM D6084):

- a. When selecting the T 301 test method from the Select Method screen (see Figure 9), the user is brought to the Recovery Setting screen (see Figure 11).



Figure 11. Recovery Setting Screen

- b. The Recovery Setting screen displays the Speed (cm/min), Hold Time (min) and Travel Distance (cm) for the Recovery Test to be run. These parameters are preset to the required settings for running the recovery test in accordance to AASHTO T 301 (ASTM D6084). However, these settings can be altered to the user's preference by pressing the (-) or (+) buttons to the right of each parameter. Settings can also be changed by pressing the “Speed”, “Hold”, or “Travel” buttons causing a keyboard screen to open so the user can input the parameters directly.
- c. After choosing the desired parameter values press the **Next** button located at the bottom right-hand corner of the screen. Pressing the **Next** button will bring the user to the Recovery Test screen (see Figure 12).



Figure 12. Recovery Test Screen

- d. The Recovery Test Screen will display the Running Distance, the Hold Time and Recovery Distance during the test.
- e. The Recovery Test Screen will prompt the user to Press Start to begin test. The start button is located at the bottom left-hand side of the screen. Be sure test specimen is properly in place and carriage release lever is in the closed position before starting the test.
- f. Pressing the start button will cause the carriage to begin moving at the speed specified until it reaches the distance specified in the Recovery Setting screen.
- g. At that time the carriage will stop for the designated hold time and the beeper will sound prompting the user to cut the specimen.
- h. After the designated hold time has elapsed, the beeper will sound continuously prompting the user to press the **Reverse** button. When the **Reverse** button is pressed the beeper will stop and the carriage will begin to move in the reverse direction bringing the two halves of the specimen together.
- i. When the two halves of the specimen come in contact press the **Stop** button at the bottom of the screen.
- j. Record the Running Distance, Hold Time and Recovery Distances displayed on the screen.
- k. After pressing the **Stop** button, the Reset Recovery Test Screen will be displayed

and the user will be prompted to either **Reset Test** or **Exit** (see Figure 13 below).



Figure 13. Reset Recovery Test Screen

- i. Pressing the **Reset Test** button will bring the user back to the Recovery Setting screen and pressing the **Exit** button will bring the user back to the Main Screen.

8. Custom:

- a. When selecting the **Custom** test method from the Select Method screen (see Figure 9), the user is brought to the Enter Speed screen (see Figure 14).



Figure 14. Enter Speed Screen (Custom Test Method)

- b. The user has the option of choosing preset speeds of 0.25, 1.00 and 5.00 cm/min by touching the corresponding buttons. The user may also choose any speed in the range of 0.25 to 7.00 cm/min by pressing the (-) or (+) buttons to the right of the display. The Speed can also be changed by pressing the "Speed" display causing a

keyboard screen to open so the user can input the speed directly.

- c. Pressing the **Main** button located at the bottom right-hand corner of the screen will bring the user to the Main screen.
- d. If desired the user can choose to input a test duration time. After entering a speed and returning to the Main Screen, the user may press the **Timer** button located at the bottom right-hand corner of the screen.
- e. The Timer screen allows the user to input a test time using the (-) or (+) located on the right of the display in the range of 1 to 999 minutes (see Figure 15).



Figure 14. Timer Screen (Custom Test Method)

- f. The **Start** and **Stop** buttons located at the bottom left-hand corner of the screen corner turn the Timer on and off.
- g. Press the **Main** button located at the bottom right-hand corner to return to the Main screen to begin the test run.
- h. Be sure test specimen is properly in place and carriage release lever is in the closed position before starting the test.

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

- Clean the unit after each test. The threaded lead screw should be kept clean and properly greased to insure proper carriage level travel.
- When not in use, remove line cord from the outlet to prevent misuse or improper handling.
- **ALWAYS** check moving parts, both mechanical and electrical, for wear and stress. Replace if necessary.

6.2 Replacement Parts

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).

Part Number	Description
275-000-002	5.6" Digital Display Interface
K80050-03030	Threaded Lead Screw
K80050-23000	Carriage Assembly
K80050-23003	Main Drive Assembly
288-075-001	Drive Controller, 75VDC
425-200-001	Power Supply Switch, 48V, 4.2A
425-264-002	Power Supply, 90-264VAC, 12VDC

7 Troubleshooting

7.1 The motor stalls or will not come up to speed properly

- Check Fuses

7.2 The Running Distance does not display 0.00 cm

- Running Distance should be set to 0.00 cm before the start of the test. If the running distance does not display 0.00 cm, the control panel may need to be rebooted. To reboot the system, press the line switch to the off position (see Figure 1, item 1), wait 10 seconds then press the line switch to the on position. Return to the ASTM D113 test method screen. The Running Distance will now display 0.00 cm.

8 Service

Under normal operating conditions and with routine maintenance, the K80050 Semi-Automatic Standard Ductility Testing Machine should not require service. Any service problem can be quickly resolved by contacting Koehler's technical service department either by letter, phone, fax, or email. In order to assure the fastest possible service, please provide us with the following information.

Model Number: _____

Serial Number: _____

Date of Shipment: _____

9 Storage

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

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

10 Warranty

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

11 Returned Goods Policy

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

Notes

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Notes

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