

**CHEMINSTRUMENTS**  
**MICROMETER**  
**MODEL MI-1000**  
**OPERATING INSTRUCTIONS**

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## PRODUCT DESCRIPTION

Congratulations on your the purchase of the ChemInstruments MI-1000 Micrometer. This versatile, user-friendly, carefully designed instrument allows you to determine thickness of various substrates from 0 to 50 mil. The standard unit meets or exceeds numerous test methods including ASTM D645, D374, and TLMI T-411.

The unit has the following features:

- Continuous mode of operation.
- Standby capability keeping the unit active without cycling the presser foot.
- Batch mode with selectable quantity from 1 to 50.
- Measures in Mils or Millimeters.
- Test data can be downloaded to optional printer.
- A .040 mil NIST traceable gauge block included for calibration.
- Built in calibration sequence.
- Manual or automatic print feature.
- Compact design with carrying handle.
- Measurements are accurate to .05 mils.
- Automatic zeroing feature.

## UNPACKING

ChemInstruments made every effort to ensure that the MI-1000 arrives at your location without damage. Carefully unpack the instrument and check for any damage that might have occurred during shipment. If any damage did occur during transit, notify the **carrier** immediately.

The ChemInstruments MI-1000 consists of the following parts:

- The testing platform including the motor/drive mechanism and the data acquisition system.
- An envelope with this manual.
- A 40-mil gauge block for calibration.
- Power cord.

**Make sure all of these components are present before discarding the packaging material.**



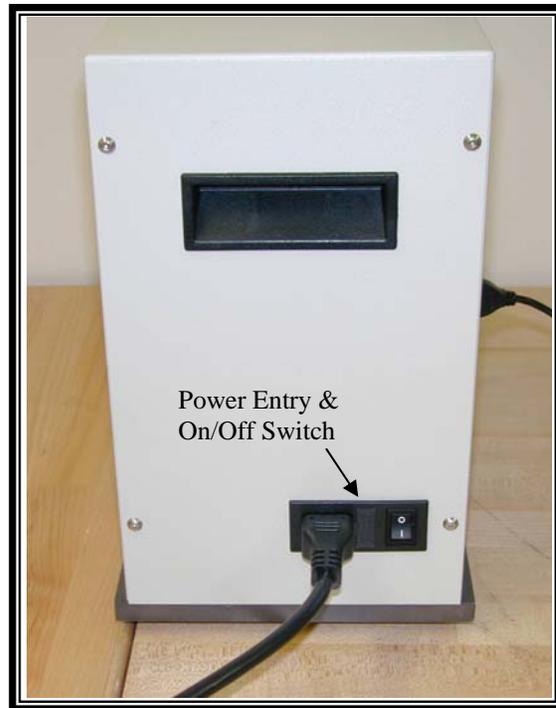
*Photo 1 – MI-1000 Micrometer with optional Printer and Calibration Gage Block Set.*

# ASSEMBLY

Carefully remove the test platform with data acquisition system from the packaging and set it on a sturdy bench top. The space required for the unit is approximately 7.5" wide x 10" deep x 12" high. As with any precision piece of test equipment, it is preferable to locate the MI-1000 in an area where temperature and humidity are controlled to standard conditions ( $72 \pm 2^{\circ}\text{F}$ ,  $50 \pm 5\%$  relative humidity). Remove the packaging materials holding the presser foot in place.

Connect the power cord to its receptacle on the backside of the control cabinet at the far right side when viewed from the rear. Complete the connection by inserting the male end of the power cord into a convenient properly grounded and surge protected, AC outlet. Notice that the on/off power switch is located directly beside the power cord receptacle on the backside of the test frame. (See Photo 2 – MI-1000 Back Panel)

The ChemInstruments MI-1000 is now ready for calibration and use. Before proceeding with calibrating the MI-1000, it is advisable to become familiar with the Key Components of the MI-1000. These Key Components and a brief description of their function follow in the next section.



*Photo 2 – MI-1000 Back Panel*

## KEY COMPONENTS (See Photos 2 and 3)

- **POWER SWITCH** is located on the back panel of the control cabinet directly above the power cord connection.
- **PRESSER FOOT** This reverse cone shaped piece travels vertically and rests on the specimen to be measured.
- **ANVIL** is located opposite to the Presser Foot and is an optically flat testing surface.
- **DIGITAL DATA DISPLAY** provides test data results and system status information.
- **PROGRAM STATUS INDICATOR** these three LED lights identify the operating status, either RUN, BATCH, or SETUP Menus are active when LED light is on.
- **UNITS INDICATOR** there are 2 LED lights indicating the units of measure for the data collected.
- **CONTROL KEYS** control the various features of the data acquisition and operating system. There are 5 keys consisting of Select, Enter, Start, Print, and Up  $\Delta$ .
- **DATA DOWNLOAD CONNECTION** data output port for Mitutoyo DP-1HS mini-processor and printer.
- **GAUGE BLOCK** a precision ground steel block measuring 40 mils thick and used to calibrate the LVDT.



*Photo 3 – Key Components*

# OPERATION

## THEORY OF OPERATION

A presser foot and anvil are situated opposite each other. The presser foot travels by mechanical means upward away from the anvil allowing a sample to be placed on the anvil. The presser foot will then travel downward until coming in contact with the sample and dwell for 2 seconds. During this dwell time an internal mounted LVDT measures the distance between the bottom of the presser foot and the anvil. This measurement is the same as the thickness of the sample and is then posted on the digital data display. The cycle is then repeated and additional samples can be measured in the same manner.

## POWER UP

Turn on the master power switch, which is located on the back panel of the control cabinet directly beside the power line receptacle. The onboard computer will go through a self-test, and then default to the RUN Menu in the continuous mode.



**" Warning! Operating temperature for this equipment is 0 to 70 Celsius. The equipment needs to be completely free of condensation inside and out, before applying power."**

## MENU FORMAT

There are three distinct program Menus for the MI-1000. They are the RUN menu, BATCH menu, and SETUP menu. Each menu has a Program Status Indicator light that will be lit when that menu is active. Within each menu there are a series of modes providing for collecting data, a calibration sequence, and control of the print and beep functions.

Each of the three menus uses the Up  $\Delta$  key to select the mode within the menu. When the desired mode is selected, the ENTER key is used to access the parameter settings for that mode. Once a parameter setting is made, the ENTER key is used to record the setting and return to the RUN menu.

The following is an outline of the three menus and the modes contained within each menu. Use this chart to quickly identify the location and proper path to access any of the settings.

## RUN MENU

Modes

**S** Single cycle  
**C** Continuous cycle  
**B** Batch testing  
**Δ** Toggles between  
mils and millimeters.

## BATCH MENU

Modes

**1 - 50** Multiple batch  
testing.

## SETUP MENU

Modes

**Lt** LVDT calibration  
**LC** Low calibration  
**HC** High calibration  
**bE** Beep on/off  
**Pr** Print on/off

## **SETUP MENU**

### LVDT CALIBRATION MODE

It is important to calibrate the LVDT to ensure that reliable data will be gathered. A calibration procedure is built into the software of the MI-1000. The following procedure should be performed upon first use of the MI-1000 and whenever necessary thereafter.

**MAKE SURE THE MI-1000 MICROMETER HAS BEEN ON AND RUNNING FOR 10 MINUTES BEFORE PROCEEDING WITH CALIBRATION.** To avoid this warm-up period, leave the MI-1000 on and use the BATCH mode for an idle position when not in use.

### CALIBRATION PROCEDURE

1. Access the SETUP menu by simultaneously pressing and holding the SELECT and ENTER keys for 3 seconds. The display will show the “**Lt**” symbol indicating calibration mode.
2. Press the ENTER key to access the calibration mode. The display will change to, “**LC 00.00**”. At this point the Presser Foot will be in the up position. Make sure that the Presser Foot and Anvil are clean and that there is no material between them.

3. Press the START key to activate the low calibration sequence. The Presser Foot will travel downward until it comes in contact with the Anvil and stops for 2 seconds while the LVDT measures the position of the Presser Foot. This value is recorded and used as the “0” value. The Presser Foot will then travel upward and stop. The display will change to “**HC 40.00**”.
4. Place the 0.040 calibration gauge block on the center of the Anvil.
5. Press the START key to activate the high calibration sequence. The Presser Foot will travel downward until it comes in contact with the gauge block resting on the Anvil. It will stay in this position for 2 seconds while the LVDT measures the position of the Presser Foot. This value is recorded and used as the 40-mil value reference for future measurements.
6. The Presser Foot will then travel upward and the MI-1000 will enter the RUN menu, Single cycle mode. The MI-1000 micrometer is now calibrated.
7. Verifying the calibration can be accomplished by measuring a gauge block other than the 40-mil gauge block.

## BEEP MODE

The MI-1000 micrometer is programmed with an audible beep for every key action. This feature can be turned on and off in the SETUP menu. The following is the procedure for turning the Beep mode on or off.

1. Access the SETUP menu by simultaneously pressing and holding the SELECT and ENTER keys for 3 seconds. The display will show the “**Lt**” symbol indicating calibration mode.
2. Press the  $\Delta$  arrow key to select the Beep mode. The display will show “**bE**”.
3. Press the ENTER key to access the Beep mode. The display will show “**bE\_oN**” or “**bE\_oFF**”.
4. Pressing the  $\Delta$  arrow key will toggle between the on and off setting.
5. Pressing the ENTER key will activate the selection being displayed.

## PRINT MODE

The measurements collected from each cycle of the Presser Foot can be automatically downloaded to the optional Mitutoyo printer. To set the MI-1000 micrometer to automatically download to the printer, perform the following procedure.

1. Access the SETUP menu by simultaneously pressing and holding the SELECT and ENTER keys for 3 seconds. The display will show the “**Lt**” symbol indicating calibration mode
2. Press the  $\Delta$  arrow key to select the PRINT mode. The display will show “**Pr**”.
3. Press the ENTER key to access the PRINT mode. The display will show “**Pr\_oN**” or “**Pr\_oFF**”.
6. Pressing the  $\Delta$  arrow key will toggle between the on and off setting.
7. Pressing the ENTER key will activate the selection being displayed.

Note: The MI-1000 micrometer will not download data automatically when the PRINT mode is in the off position. However, you can download and print individual test data by pressing the PRINT key at the end of each measuring cycle of the Presser Foot. This action will only download data for printing the current active measurement. Should you want the data to be downloaded and printed automatically after each cycle, perform the PRINT mode setup procedure above.

## RUN MENU

### PERFORMING A TEST IN SINGLE CYCLE MODE

Before conducting any measurement with the MI-1000 micrometer, it is advised that the system be calibrated. See “LVDT Calibration” on page 7.

The MI-1000 micrometer will default to the Single Cycle mode of the RUN menu. In this mode you must first place your sample on the Anvil below the Presser Foot to measure the sample properly. A single push of the Start button begins the test cycle. The Presser Foot will travel downward coming to rest on the sample and Anvil. The measurement of the sample is made and then visible on the Digital Data Display

## PERFORMING A TEST IN CONTINUOUS MODE

Before conducting any measurement with the MI-1000 micrometer, it is advised that the system be calibrated. See “LVDT Calibration” on page 7.

The MI-1000 micrometer will operate continuously when the Select key is pushed one time while in the Run menu. This continuous mode of operation has an approximate cycle time of 12 seconds. The Presser Foot continuously cycles, measuring the distance between the Anvil and the Presser Foot during the 2-second dwell time at the bottom of the cycle. Should the PRINT mode be turned on, the data from each measurement is automatically downloaded to the optional Mitutoyo printer. If the PRINT mode is turned off, then the operator must press the PRINT key at the end of each cycle to download/print the current measurement. The following procedure describes a standard method for conducting measurements on the MI-1000 micrometer.

1. Allow the Presser Foot to complete one cycle without material on the Anvil. This will engage the automatic zero feature.
2. As the Presser Foot travels to the upward position, place the sample to be measured on the Anvil.
3. Allow the Presser Foot to travel downward and contact the sample. After the measured results are shown on the Digital Data Display you can press the PRINT key and have the results downloaded to the optional Mitutoyo printer. The print function can be set to automatically download each reading. (See PRINT MODE on page 9.)
4. With the Presser Foot in the upper position you can place a new sample on the Anvil for measurement and continue the process until you are finished.

**Note: You can place the MI-1000 micrometer in the idle mode by pressing the SELECT key so that the BATCH mode is active. This will stop the movement of the Presser Foot and hold the MI-1000 micrometer in an idle position until either the BATCH mode is activated or the SELECT key is pressed, returning the system to the RUN mode.**

## PERFORMING A TEST IN BATCH MODE

The BATCH mode allows up to 50 consecutive measurements to be taken and the data collected as a group. Normal operation of the BATCH mode would include having the PRINT mode turned on and the optional Mitutoyo printer connected to the download port of the MI-1000 micrometer. The following procedure should be performed to use the BATCH mode.

1. Press the Select key to access the BATCH menu. The Display will show “01 0.000” and the Batch Program Status Indicator light will be on.
2. Press the  $\Delta$  arrow key to increment the number of cycles that will be included in this batch. Always add one additional test number for the purpose of engaging the Automatic Zero feature. Holding the  $\Delta$  arrow key in will cause the display to increment the batch number quicker than individual presses of the key.
3. Press the ENTER key to record the number of cycles. The display will change to, “YY 0.000” where “YY” equals the number of cycles selected.
4. Press the START key to run the first cycle without a sample present. This will engage the Automatic Zero feature. The reading should be “0.000”.
5. Place the first sample to be measured on the Anvil below the center of the Presser Foot.
6. Press the START key to activate the measuring cycle. The Presser Foot will travel downward until it is in contact with the sample. The measurement will be taken during the 2-second dwell time and downloaded to the printer. The Presser Foot will then travel upward and stop in the up position.
7. Place your next sample on the Anvil in place of the previous sample.
8. Repeat steps 6 and 7 until the batch has been completed.
9. Press the “STAT” key on the optional Mitutoyo printer to obtain the summation and statistical analysis of all the measurements in the batch.
10. The MI-1000 micrometer will return to the RUN Continuous mode upon completing the number of measuring cycles that were selected in the BATCH mode.

# MAINTENANCE

As with any precision equipment it is important to provide care and maintenance to ensure proper performance and long life. The following section will address certain procedures for making changes in the MI-1000 and providing care for proper operation.

## MECHANICAL MAINTENANCE SCHEDULE

The MI-1000 Micrometer is a durable and well-designed piece of testing equipment requiring only minimal maintenance. In addition to normal and weekly general cleaning, ChemInstruments recommends that the following additional steps be performed on a scheduled basis or as required.

Daily:

Clean, with a soft lint free cloth, the surface of the Presser Foot and the Anvil.

Periodically:

Check and adjust if necessary the parallelism of the Anvil to the Presser Foot.

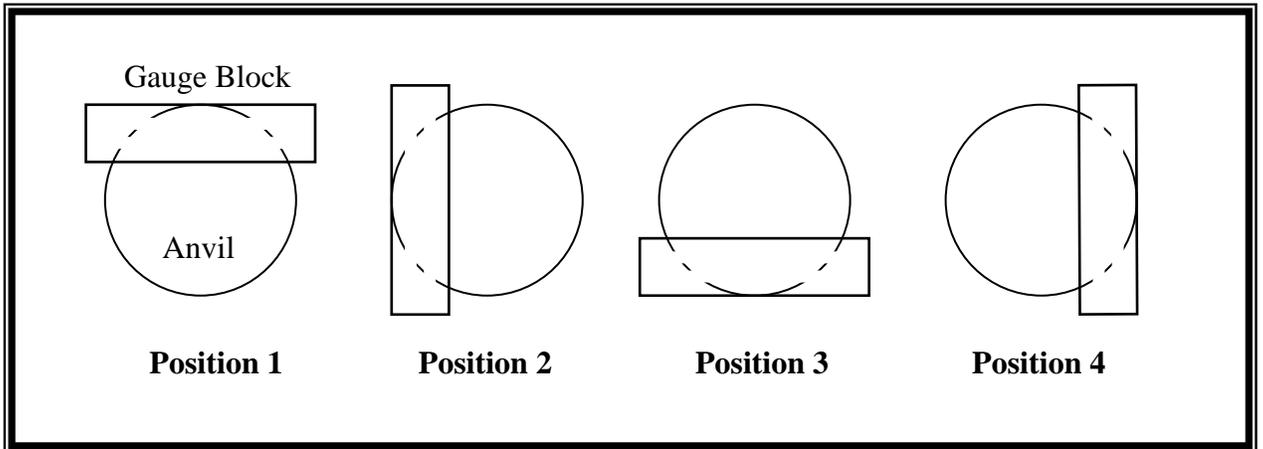
These simple steps, if performed regularly, can ensure the continued reliable performance of your MI-1000 Micrometer.

## ANVIL PARALLEL VERIFICATION

The MI-1000 micrometer has been calibrated and checked for parallelism prior to shipment, but the unit must be checked periodically. To verify or to adjust the Anvil, perform the following procedure.

1. Turn the MI-1000 micrometer on.
2. Select the BATCH menu by pressing the Select key.
3. Press the  $\Delta$  key to select 4 measuring cycles.
4. Press the Enter key to record the number of cycles
5. Place the 40-mil gauge block on the Anvil in position 1. (See Figure 4)
6. Press the Start key to activate the Presser Foot and the measuring sequence.
7. Note the reading when the Presser Foot returns to the up position.

8. Repeat steps 5, 6, and 7, making sure to move the 40 mil gauge block to the next sequence position as shown in Figure 4.
9. Compare the readings from each of the 4 positions to determine if the Anvil is parallel to the Presser Foot.
10. Use an Allen wrench to adjust the support leveling bolts on the bottom of the base plate until the Anvil is parallel to the Presser Foot. (See Figure 4 – Anvil Calibration Positions)



*Figure 4 - Anvil Calibration Positions*