

MILL SOP for Leco LM 248 AT MicroHardness Tester

Introduction

The MicroHardness tester is designed to measure the Vickers and Knoop hardness of a sample on the micro scale.

In the operation procedures numbers in parenthesis refer to the corresponding number on the diagram shown in Figure 1.

Safety of operator and tester

In order to safely operate this machine do not place your hand under the indenter while raising the platform or performing a test.

While raising the platform to focus the objective, do not touch the sample to the lens as this could damage it. While focusing on the sample watch how close the sample gets to the lens.

Like all MILL equipment safety glasses are to be worn at all times while using the machine.

Labeled diagram of LM 248 AT

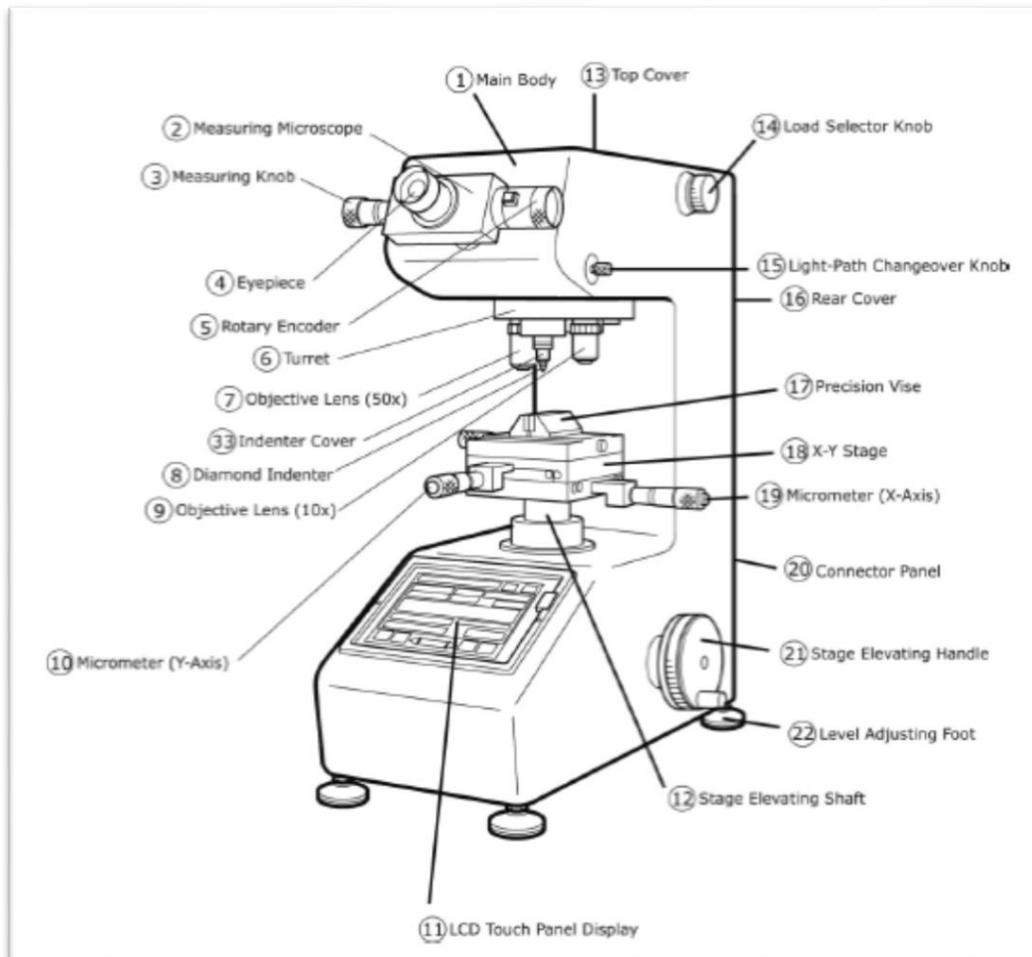


Figure 1. Tester Diagram

Operation

1. Turn on machine using the switch on the back
2. Select Parameters for test
 - a. The screen visible after turning on the machine should look like Figure 2.
 - b. If you plan on exporting your data to a USB drive be sure to clear any previous test results before you start testing by pressing the CLR button on the screen.
 - c. The dwell time can be adjusted by tapping on the screen and adjusting number
 - d. The indentation force can be adjusted by turning the load selector knob (14) on the top right of the machine. This knob is marked in units of grams force, but the screen is set for milli-Newtons. For brittle materials a low test load is recommended since too high of a test load can shatter the sample, making the test data worthless. However a larger test load leads to a more accurate result.
 - e. Each time a test is performed the Rockwell hardness C is also measured in addition to the test performed.

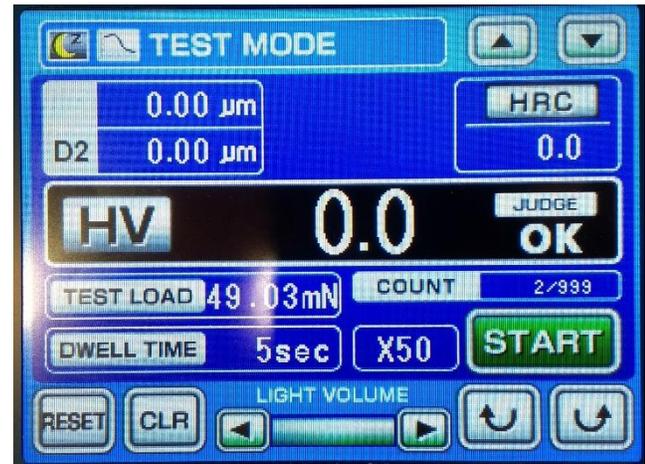


Figure 2. Test Mode Screen

3. Place sample on the platform and slowly raise the platform using the elevation handle on the right side of the tester (21). Be sure that the 50x lens (7) is selected on the screen. If it is not press the arrows on the bottom right of the screen to rotate the turret (6) to select it.
4. Look through the eyepiece (4) and turn the stage elevator until the sample is in focus.
5. The stage can be shifted by using the micrometer knobs on the stage, (10 and 19).
6. Select hardness test that will be performed by changing between the Vickers (HV) or Knoop (HK). If HBS, K_c, and HBW are selected the test will run, but it will use the Vickers indenter.
7. Once all parameters are set up press START.
8. The turret will rotate until the selected test indenter is above where the objective was focused. The indenter will press into the sample and hold for the dwell time.
9. After the test is complete the turret will rotate back to the 50x objective.
10. Look through the eyepiece, there should be diamond visible. If not the dwell time and force may need to be increased in order to deform the sample or the sample may have shifted.
11. To measure the hardness of a sample use the two knobs on the measuring microscope (2) to move the black lines visible when looking through the eyepiece (3 and 5). Note these knobs can fall off if they are rotated too much, take care when using them. The left knob moves both lines, while the left knob moves only one line. In order to ensure an accurate reading be sure that the lines are reset between each test. To do this move the knobs until the lines are on top of each other then hit the reset button on the screen.

- a. For a Vickers test measure the horizontal tip-to-tip distance of the indentation using the black lines, then hit the READ button on the right hand side of the measuring microscope. After this turn the measuring microscope 90 degrees. This will rotate the lines by 90 degrees as well allowing you to measure the vertical tip-to-tip distance of the indentation. Press read again. This will give you a hardness readout.
 - b. For a Knoop measurement measure only the tip-to-tip distance of the longer side. Since only one measurement for Knoop tests are required you will instantly get a read out after hitting the read button.
12. After finishing step 11 there should be a hardness measurement on the screen.
 13. To take another measurement simply put the two black lines visible through the eyepiece back together and hit the reset button. The instrument is now ready to take another measurement, simple follow steps 2 – 12 again.
 14. Once all tests are complete data may be taken from the machine through the USB port on the right of the screen. To do this hit the arrow in the top right corner until the data edit mode screen appears. Then hit the measuring data info button.
 15. Once there be sure that whatever device you want the data on is in the USB port. Hit print, this will transfer all saved data onto the device.

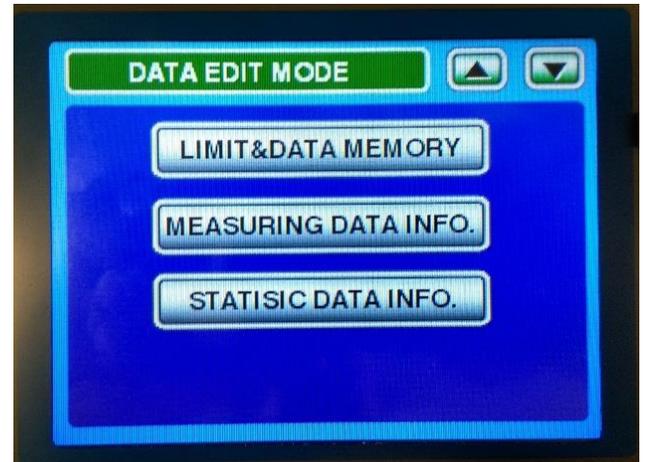


Figure 3. Data Edit Mode Screen