Lab 01: Introduction to the Materials Tester

Introduction

The PASCO Materials Testing Machine is a device for measuring force and displacement for various materials as they are stretched, compressed, sheared, or bent. The Materials Tester has a built-in load cell (strain gauge transducer) capable of measuring up to 7100 N (1600 lbs) of force, and an optical encoder that measures displacement of the cross-head load bar. A crank-and-gear system (see Fig. 1) raises or lowers the cross-head on two leadscrews. Force data from the load cell and displacement data from the encoder can be recorded, displayed, and analyzed using a PASCO Interface with PASCO Capstone Software.

The ME-8236 includes the Materials Testing Machine, knurled cap nut, safety shields (which should be used at all times when testing samples), and the Calibration Rod used to create a compliance calibration. This calibration automatically adjusts for the unwanted stretching of the Materials Tester, and is easily performed using the Calibration Wizard in the Tools Palette at left.

Optional accessories include metal and plastic Tensile Samples, ME-8237 Three-Point Bending Accessory, ME-8239 Shear Accessory, and the ME-8241 Photoelasticity Accessory.

Written by Jon Hanks

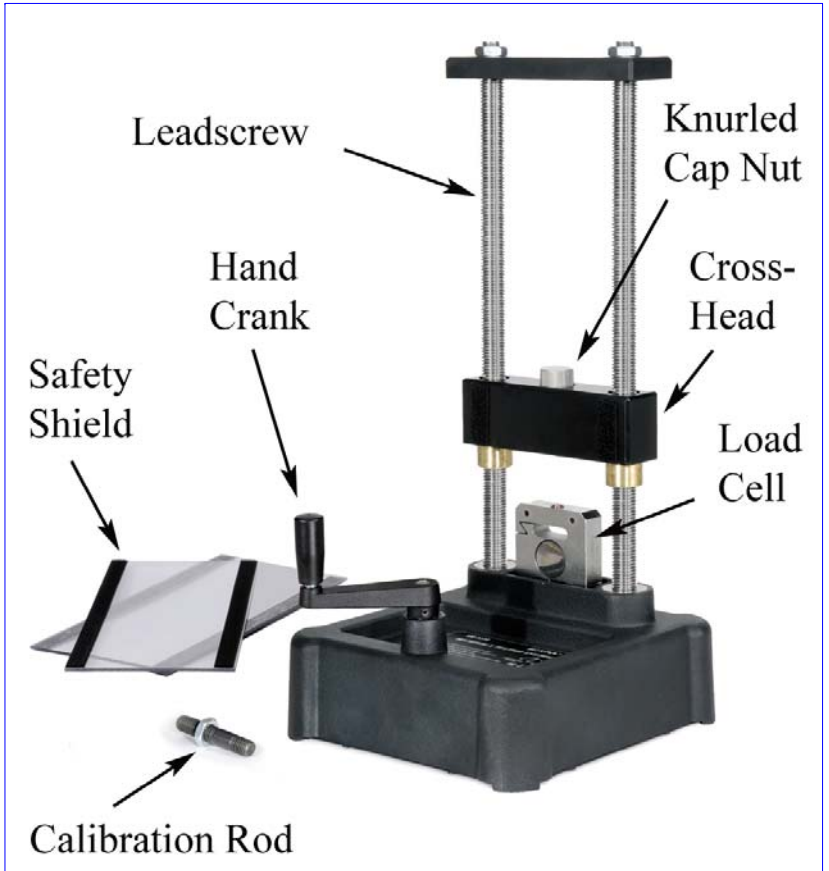


Figure 1. PASCO Materials Tester.

Making Measurements

1. Connect the tester to the interface. Open the Hardware Setup window in the Tools Palette at left and click on Properties. Note that the "Zero Sensor at Start" box is checked.

2. Click on Record. Push down several times on the Load Cell. Turn the crank counter-clockwise, then clockwise. Click on Stop.

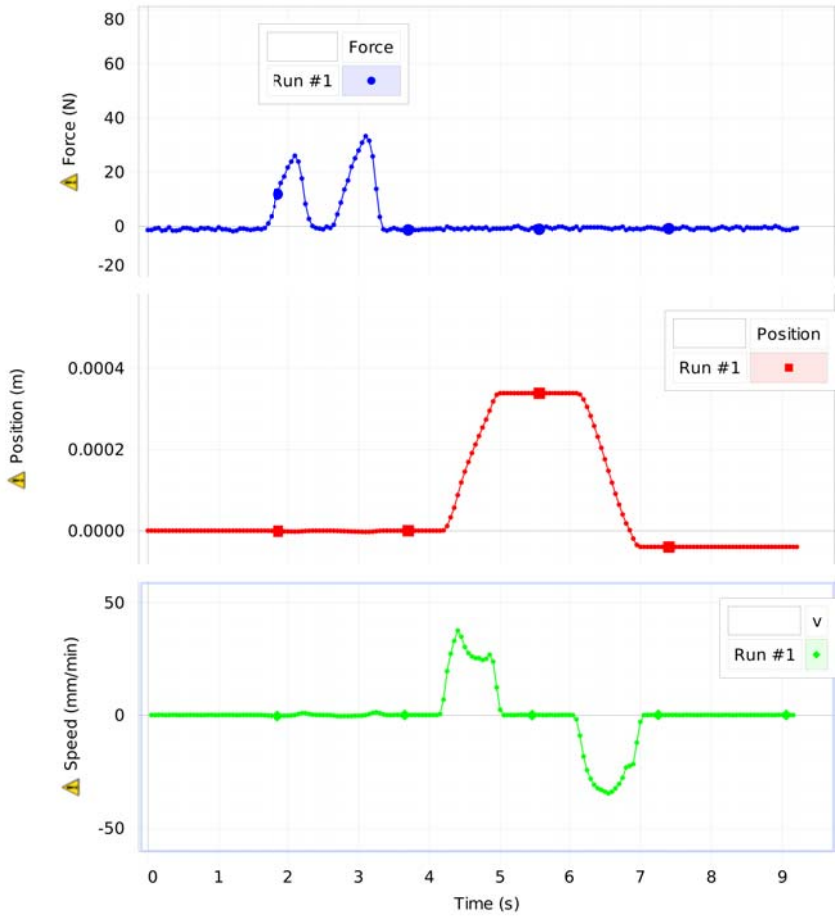
3. Examine your graph data. What is the sign convention for pushing down on the load cell? This corresponds to compressing a sample. Turning the crank counter-clockwise lowers the cross-head, and gives a positive displacement.

4. Open the Hardware Setup window and click on Properties. If you check the Change Sign box, the sign convention will be switched for both force and displacement. To have only positive data, leave the box un-checked for compression, and check the box when doing a tensile experiment.

5. Was the force and position data zero at the start? You can un-check the "Zero Sensor at Start" box, and you can manually zero the system (both position and force) by clicking on the "Zero Sensor Now" icon in the Controls Palette below.

6. Note that the Materials Tester also measures the cross-head speed in millimeters of displacement per minute. In some experiments, you are directed to change the length of the sample at a specific rate. Try moving the cross-head at a steady 50 mm/min.

7. The default sample rate is 20 Hz, but you can change this as needed. In general, slower rates give smoother data (less noise) due to oversampling (averaging) of data.



Using Accessories

1. Some of the accessories (such as the Tensile Samples shown in Figure 2) thread directly into the top of the Load Cell. The end with the longer threads should be screwed into the knurled cap nut, as shown in Figure 3. Lower the sample through the hole in the cross-head, and screw the other end of the sample into the top of the Load Cell.

2. Other accessories, such as Three-point Bending Accessory use the through-holes in the Load Cell, as shown in Figure 4. The upper load Anvil attaches to the Cross-head using the knurled cap nut, as before.

3. When you are actually testing a sample, it is important that you use the plastic safety shields as shown in Figure 5. They attach with Velcro directly to the cross-head, and are easily installed and removed. Never touch the test sample when it is under load!

4. Use the PS-2343 USB Camera Microscope (as shown in Figure 6) to take close-up video (synched to data) and photos.

Figure 2. Center Threads

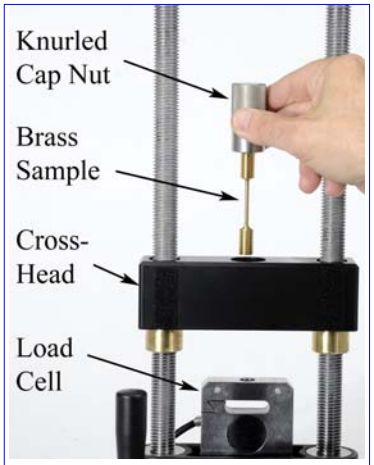


Figure 3. Installing Sample


Figure 6. USB Camera Microscope

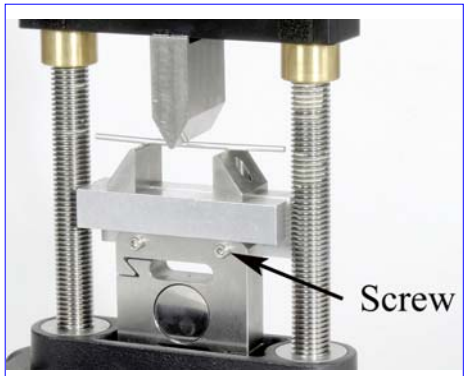


Figure 4. Three-point Bending

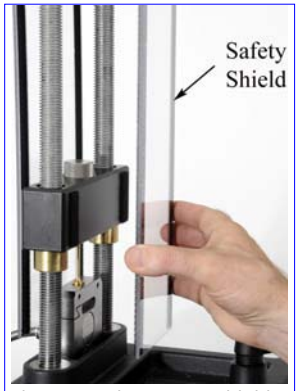


Figure 5. Always use Shields!