

OPERATING INSTRUCTIONS

Instron Model 4400 Series Load Frames

THE TENSILE TEST

Introduction

Read General Operating Instructions to familiarize yourself with the Instron 4400.

SAFETY FIRST

Safety glasses must be worn at all times in the area.

STAY CLEAR OF MOVING PARTS. In particular, keep your hands away from the test fixtures when the crosshead is moving.

Tensile Test Set Up

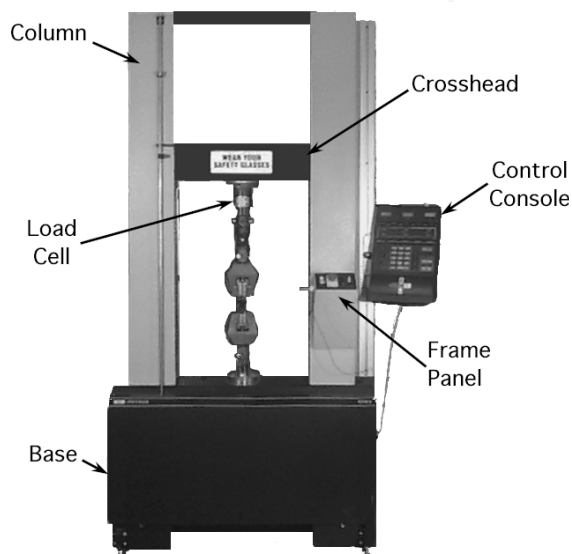


Figure 1. Instron 4400 Series Load Frame. Tensile Configuration.

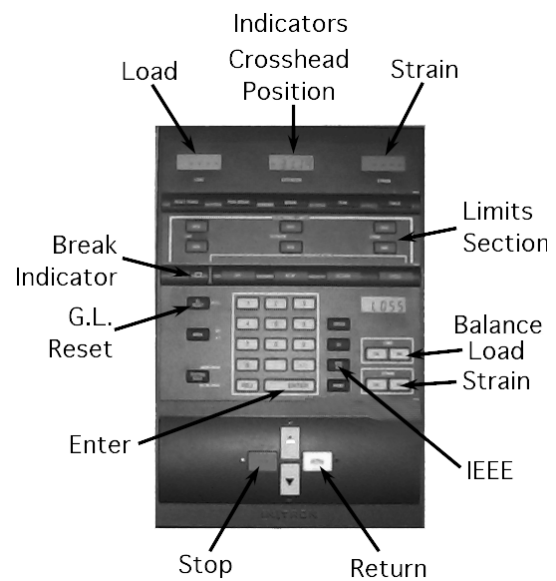


Figure 2. Control Console.

Hardness Measurement

Measure the hardness of the specimen in the Rockwell hardness-testing machine. The machine displays HRB for the Rockwell B scale. Test in the grip end of the specimen (Figure 3). Testing in the gage length portion damages the specimen and causes premature failure.

The specimen must firmly contact the bottom of the V-anvil. Orient the specimen horizontally. Turn the wheel to raise the anvil. When the specimen contacts the indenter, release your support of the specimen. Continue to turn the wheel. A series of LEDs fills horizontally to indicate application of the minor load. The clutch clicks and the machine automatically runs the test. Rotate the specimen to test three (3) times in different locations. The results should vary no more than 2.0.



Figure 3. Tensile specimen in a Rockwell hardness tester.

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OVERSET indicates that the wheel was turned too hurriedly. REV ERROR means the indenter moved down during initial loading. Unload the specimen and press RESET.

Measure the specimen dimensions. First, slide the blades of the digital calipers together firmly and then press ON/ZERO to zero the display (Figure 4). Check that the dimensions are mm. If not, press the mm/inch button above the display. For right-handed operation, hold the specimen in the left hand and

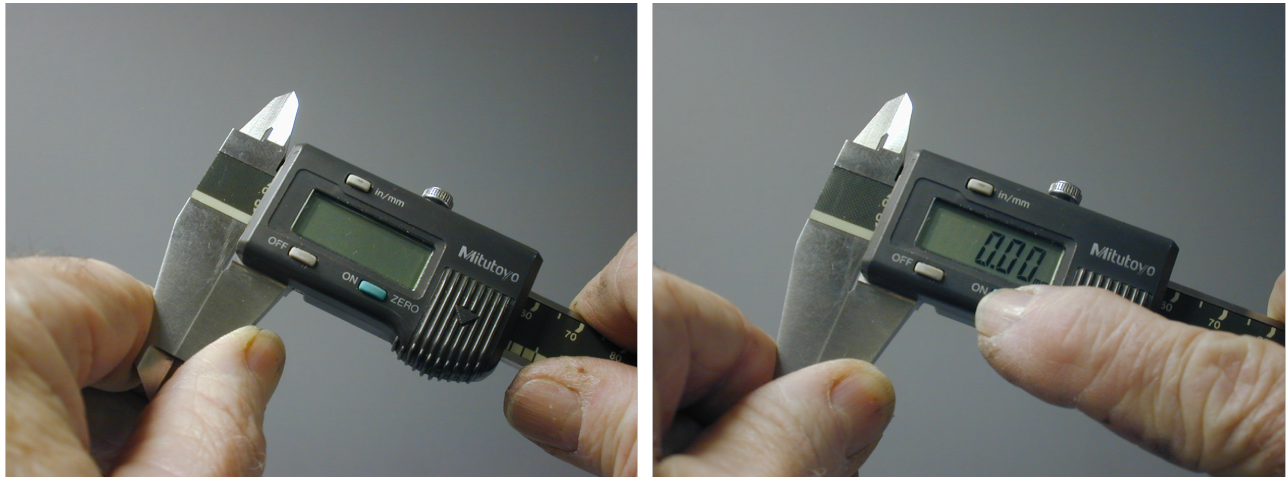


Figure 4. Zero Calipers.

the calipers in the right hand. Use your right thumb to slide the blades to contact the specimen. NOTE: This is a precision instrument, not a C-clamp. The blades should contact the specimen with a “light” touch. Measure the gage diameter three times (Figure 5) and average. One measurement in the grip is sufficient to establish a hardness correction.

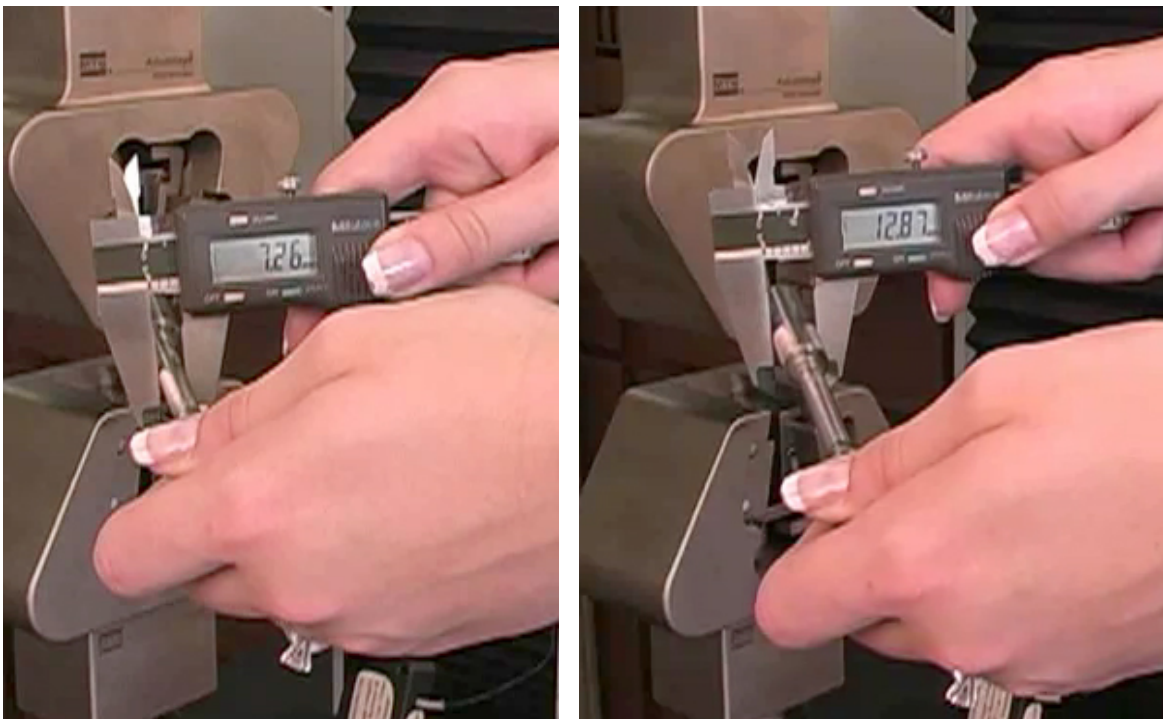


Figure 5. Measure the gage diameter three times and the grip diameter once.

Open both grips so that the specimen can be inserted from the front (Figure 6). Align the specimen in the V-notches of the lower grip and turn the grip handle for a *snug* fit. A few millimeters of the grip end should extend out of the grip face (Figure 7).

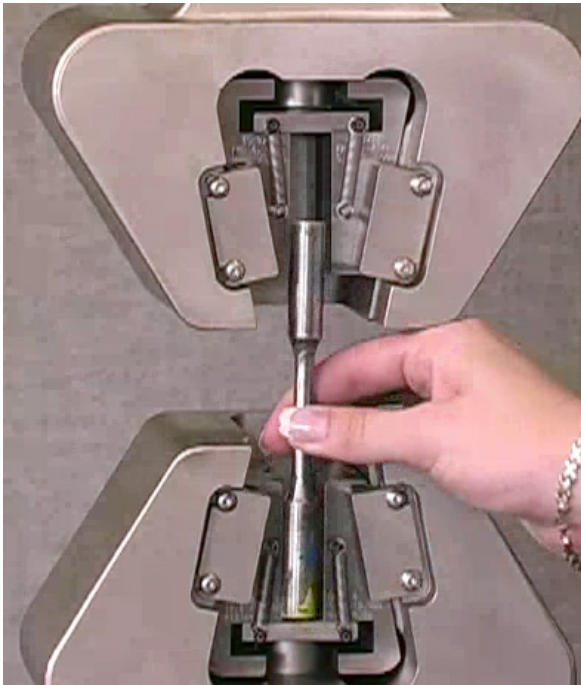


Figure 6. Insert specimen from front.



Figure 7. Install in lower grip.

Jog the crosshead so that the same length of the specimen grip is in the upper grip face (Figure 8). Check that the specimen is in the V-grooves. Turn the grip handle to *snugly* grasp the specimen. A small load (0.2 kN) might result. Press GL Reset (Figure 9) to zero the crosshead position. (Labeled “Extension” on the console.)



Figure 8. Jog crosshead.



Figure 9. GL Reset.

Extensometer Installation

The extensometer is a precision instrument used to measure the extension of the gage length directly. The gage length is a standard 25.4 mm [1.00 in]. Press the buttons to engage the cup-cone mechanism (Figure 10). Be sure that you *see* the engagement. Continue to hold the buttons during the following procedures until the extensometer is firmly attached to the specimen.

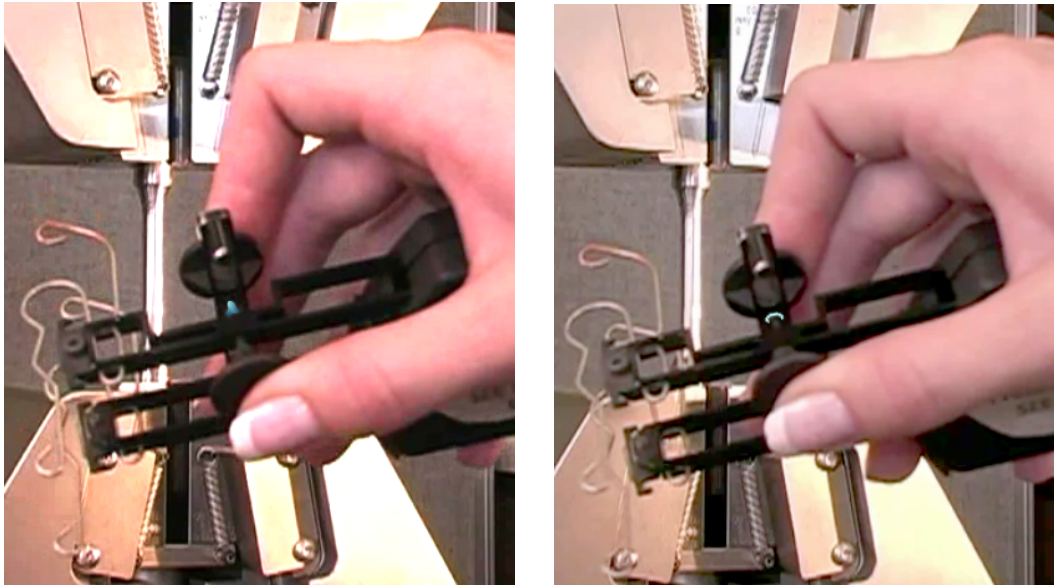


Figure 10. Note the extensometer cup-cone mechanism. Press the buttons to set gage length.

The body of the extensometer is toward the *front* of the machine with the wire *down*. The wire clips hold the knife-edges in contact with the specimen. Center the extensometer in the gage length of the specimen. Slide the clips around the specimen (Figure 10). Press both arms into the specimen to be sure that both knife-edges are in firm contact with it. Carefully release the buttons. The extensometer wire is routed through the slot in the extensometer hanger.

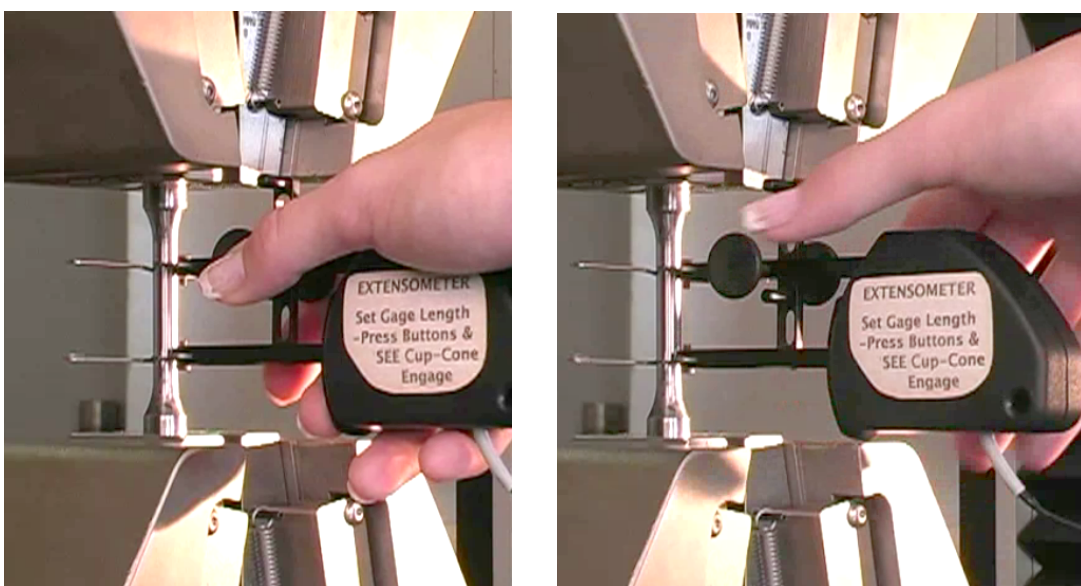


Figure 11. Center the extensometer on the specimen and then carefully release the buttons.

All of the physical set up is now complete. On the right side of the Control Console (Figure 2), press BAL under STRAIN, then press ENTER. The Strain indicator should display nearly zero. (NOTE: The *displayed* strain is usually not a constant zero. The extensometer is extremely sensitive and even very small changes, including those caused by vibrations, are detected.)

Machines A and B have a newer control system. The locations of the buttons may be slightly different. Load, Position and Strain are displayed on the computer screen. There is no IEEE button. Strain Balance is performed with the LabVIEW program.

Final Check

Perform a final check of the entire set up.

- Check the Load, Extension and Strain displays.
- Fixtures and specimen properly installed.
- Test section clear of tools, cables, body parts, etc.

The Instron 4400 is ready to run the test. Press the IEEE button; the LED illuminates to indicate computer control is enabled. Proceed to operate the LabVIEW® program.

After the Test

The appearance of the fracture surfaces is important for the analysis of test results. Be careful to protect them. (So, do NOT put the specimen back together!)

- Be certain that the machine has stopped. If not, press the SQUARE red STOP button on the Control Console.
- Press the IEEE button to return control to test frame panel control. The red LED goes out.
- Push the extensometer to the right to remove it from the specimen (Figure 12).
- Hang the extensometer on the pin using the hole in the body of the extensometer (Figure 13).

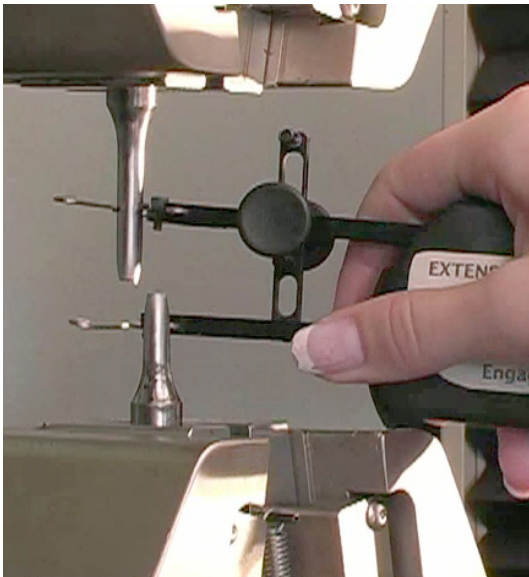


Figure 12. Push the extensometer to the right to remove.



Figure 13. Place the extensometer on its hanger.

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Figure 14. Remove the bottom part of the specimen first.

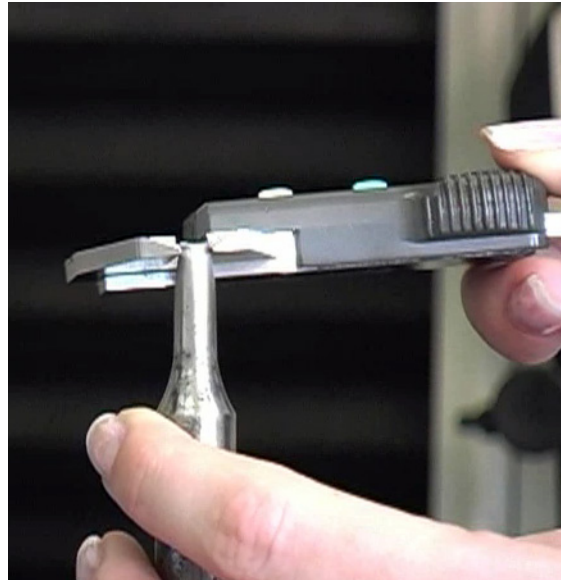


Figure 15. Use knife-edge part of calipers to measure the final diameter.

- Loosen the lower grip and remove the bottom part of the specimen out the front of the fixture (Figure 14).
- In a similar manner, remove the part of the specimen from the upper grip.
- Resist the temptation to press the fracture surfaces together.
- Measure the final diameter using the knife-edges of the calipers and enter on the computer.
- EXIT the plot screen on the computer.
- Press RTN to move the crosshead to its initial position. Keep clear of the grips during machine movement.

The frame is ready for another test.