

OPERATING INSTRUCTIONS

Instron Model 4400 Series Load Frames

THE COMPRESSION 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.

Compression Test Set Up



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

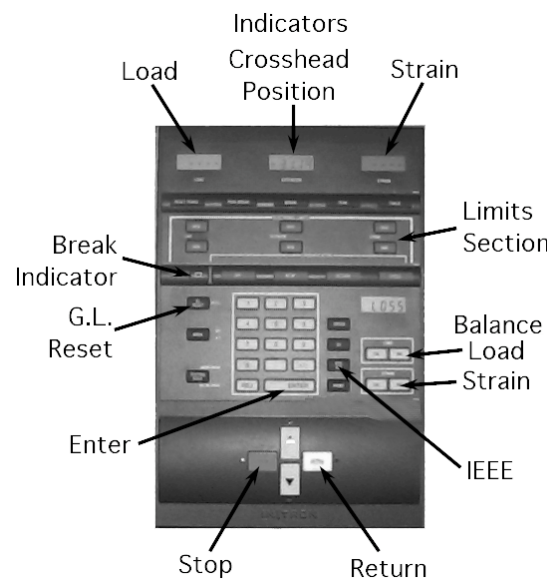


Figure 2. Control Console.

Hardness Measurement

Measure the hardness of the specimen in the Rockwell hardness-testing machine. The machine displays HRB for the Rockwell B scale. Test on the cylindrical surface of the specimen (Figure 3).

The specimen must firmly contact the bottom of the V-anvil. Turn the wheel to raise the anvil. When the specimen contacts the indenter, 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.

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.



Figure 3. Compression specimen in a Rockwell hardness tester.

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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.

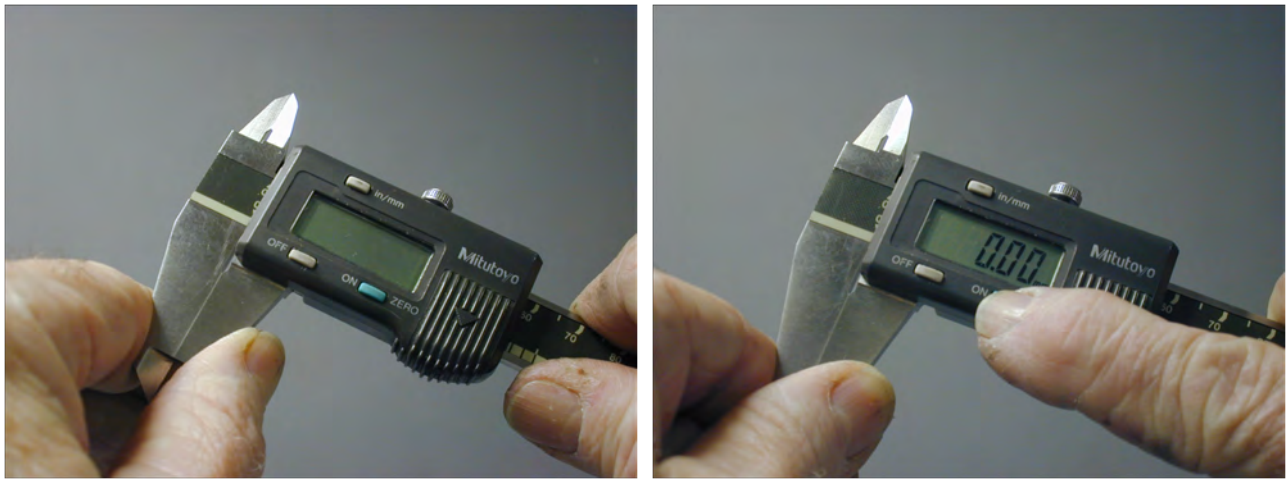


Figure 4. Zero Calipers.

For right-handed operation, hold the specimen in your left hand and the calipers in your 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 3 times (Figure 5) and average. Measure the gage length 3 times and average.

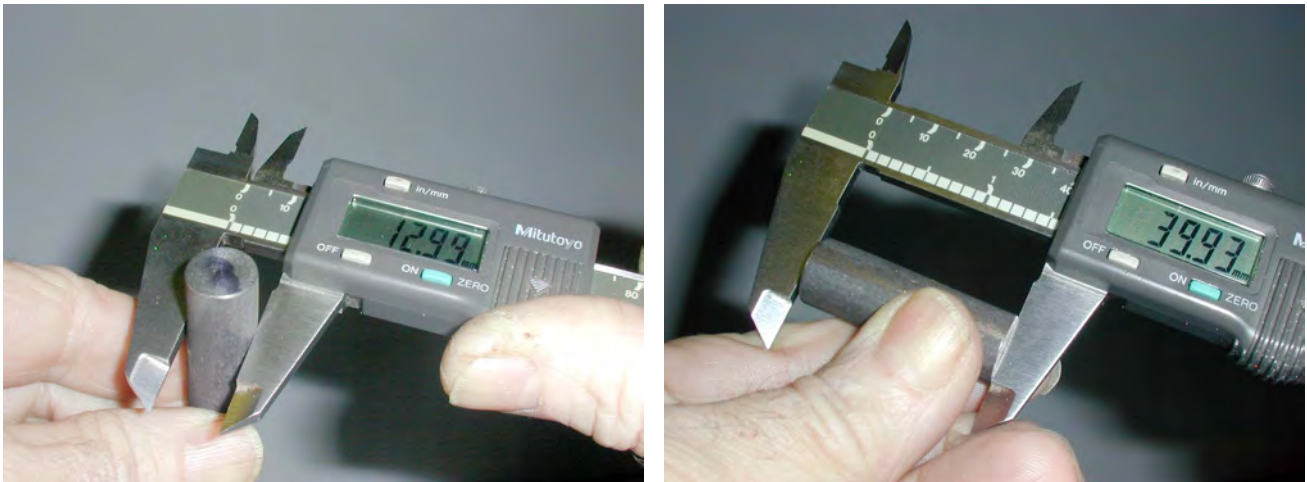


Figure 5. Measure the gage diameter and gage length three times each.

Center the compression fixture on the machine platen. Open the front shield of the fixture. Raise the fixture piston (Figure 6). Check that there is clearance for the specimen in the fixture. If necessary, jog the crosshead up (Figure 7).

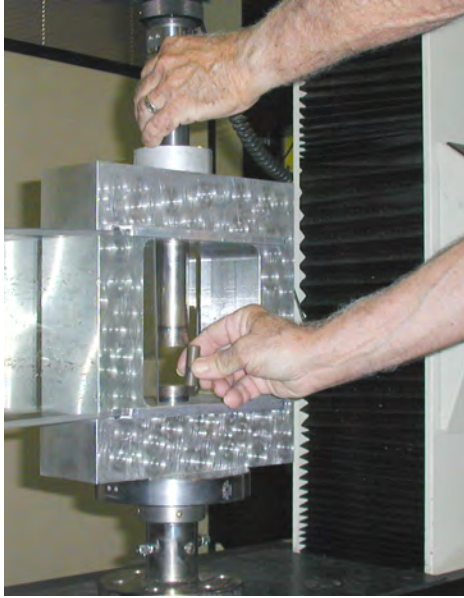


Figure 6. Check for clearance from front.



Figure 7. Jog for clearance.

Metal Specimen Installation

The rest of the installation is performed from the *back* of the machine for metal specimens. Open the shields on the rear of the fixture. The extensometer will be installed on the specimen *before* insertion into the compression fixture. 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]. Be sure the wire hangs down. Press the buttons to engage the cup-cone mechanism (Figure 8a). Be sure that you *see* the engagement (Figure 8b). Continue to hold the buttons during the following procedures until the specimen is installed in the fixture.

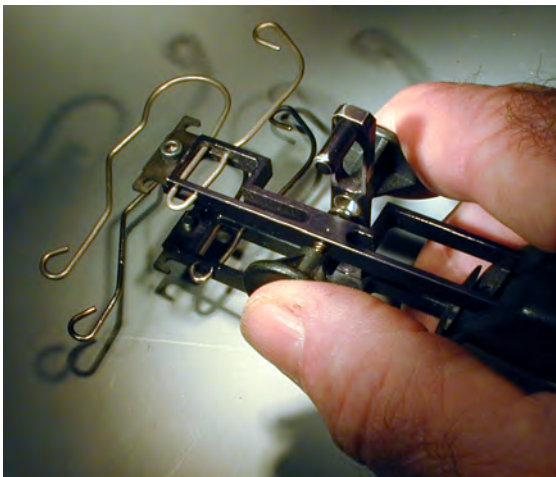


Figure 8a. Cup-Cone mechanism.

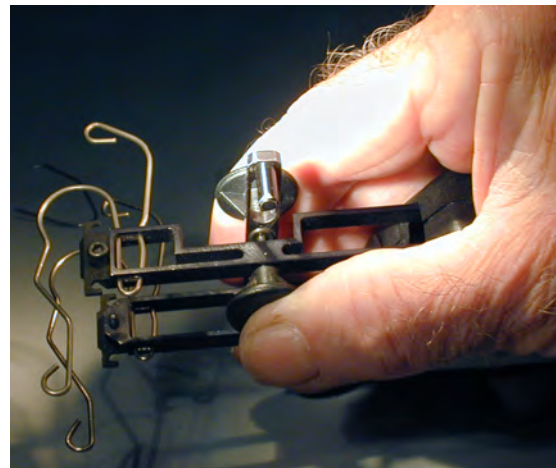


Figure 8b. Press buttons to engage cup and cone. Be sure you see the alignment.

Continue to hold the buttons and press the specimen into the spring clips (Figure 9). Ascertain that the specimen is centered in the clips. Have a friend at the front of the machine raise the piston (Figure 10).

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Figure 9. Center the specimen in the clips.



Figure 10. Have a friend raise the piston.

Position the specimen on the center of the bottom platen (Figure 11). The axis of the extensometer should be perpendicular to the fixture. Check for vertical alignment. Have your friend slowly lower the piston until it contacts the specimen (Figure 12).

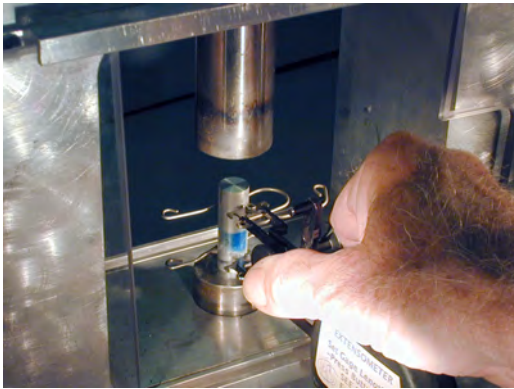


Figure 11. Center the specimen on the bottom platen.



Figure 12. Lower the piston to contact the specimen.

Carefully release the buttons on the extensometer (Figure 13). Check that both ends of the specimen are in complete contact with the fixture surfaces (Figure 14).



Figure 13. Carefully release the extensometer buttons.

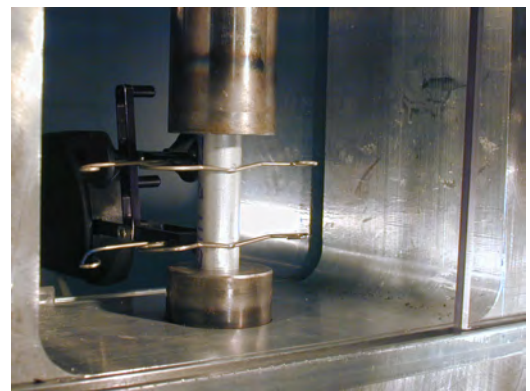


Figure 14. View from front showing alignment of the specimen in fixture.

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Carefully slide the plastic shields to enclose the rear of the fixture (Figure 15). Leave a clearance of a few millimeters. DO NOT CONTACT THE EXTENSOMETER WITH A SHIELD. Check that the fixture is centered on the Instron machine (Figure 16).

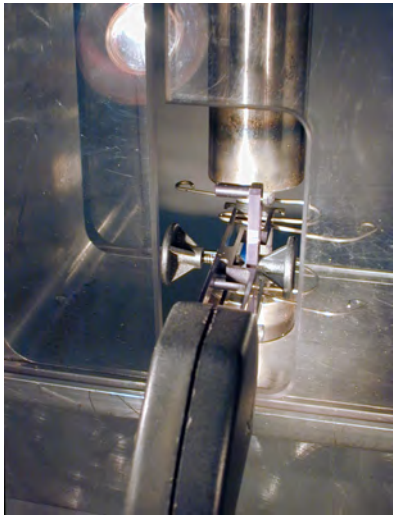


Figure 15. Do not contact the extensometer with the shields.



Figure 16. Center the Fixture on the Instron machine platen.

Move to the front of the machine. The strain indicator at the top of the control console should display a small value. If not, check the extensometer installation. Zero the extensometer. 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.)

Slide the front shield to cover the opening in the fixture. The displayed load and strain values should be zero. Useable test data are recorded when the machine crosshead platen contacts the piston to apply a load. To minimize the number of lines of zero data, carefully jog the crosshead down until a small gap remains between the platen and the piston (Figure 17). Press **GL Reset** to zero the crosshead position (Figure 18).



Figure 17. Jog down. Leave a small gap between the platen and the piston.



Figure 18. Press **GL Reset**.

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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

Many tests on metals end when the capacity of the machine (100 kN) is exceeded. DO NOT open the shields until the load has been reduced to zero.

- Press the IEEE button to return control to the test frame panel control. The red LED goes out.
- Jog Up until the load is zero.
- Move to the rear of the machine.
- Slide the shields back to the sides.
- Support the extensometer to prevent damage.
- Have a friend at the front of the machine raise the piston.
- Remove the extensometer and specimen.
- Pull the specimen out of the extensometer clips.
- Hang the extensometer on the pin using the hole in the body of the extensometer.
- Measure final dimensions and enter in the computer.
- Clear debris from the fixture.
- EXIT the plot screen on the computer.

The frame is ready for another test.

Compression of Plastic Specimens

Plastic specimens are much larger than metal specimens. DO NOT use the extensometer. Crosshead displacement data may be used to determine strain.

All installation may be performed from the front of the machine.

Be sure that the rear of the test fixture opening is completely covered by the unnotched shield.

A higher crosshead rate is used than for metal specimens.

PROCEDURE:

- Measure and record specimen dimensions.
- Jog up for clearance to the piston.
- Center the specimen on the fixture platen.
- Close the shield.
- Jog the crosshead down to get a small gap between the machine platen and the piston.
- Press GL Rest.
- Press IEEE.

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- Run the LabVIEW program.
- After the test, remove the specimen and press IEEE.
- EXIT the program.