

Operating Procedures for the Instron:

Purpose and Scope:

This document describes the procedures and policies for using the MSE Instron Universal Load Frame. The scope of this document is to establish user procedures. Instrument maintenance and repair are outside the scope of this document.

Responsibilities:

This document is maintained by the department Lab manager. The Lab Manager is responsible for general maintenance and for arranging repair when necessary. If you feel that the instrument is in need of repair or is not operating correctly please notify the Lab Manager immediately. The Lab Manager will operate the instruments according to the procedures set down in this document and will provide instruction and training to users within the department. Users are responsible for using the instrument described according to these procedures. These procedures assume that the user has had at least one training session.

Precautions:

Always wear safety glasses and other appropriate safety equipment when operating the instrument. Depending on the material under test, fragments have been known to fly out from the sample and can present a projectile hazard. Please do not operate this instrument until you have been properly trained. This SOP assumes the reader has been through the regular training sessions. This is a very basic procedure and does not cover specific details for the variety of test methods available. The users specific needs will be covered in the training.

Procedure:

Instron 5500R Universal Test Frame

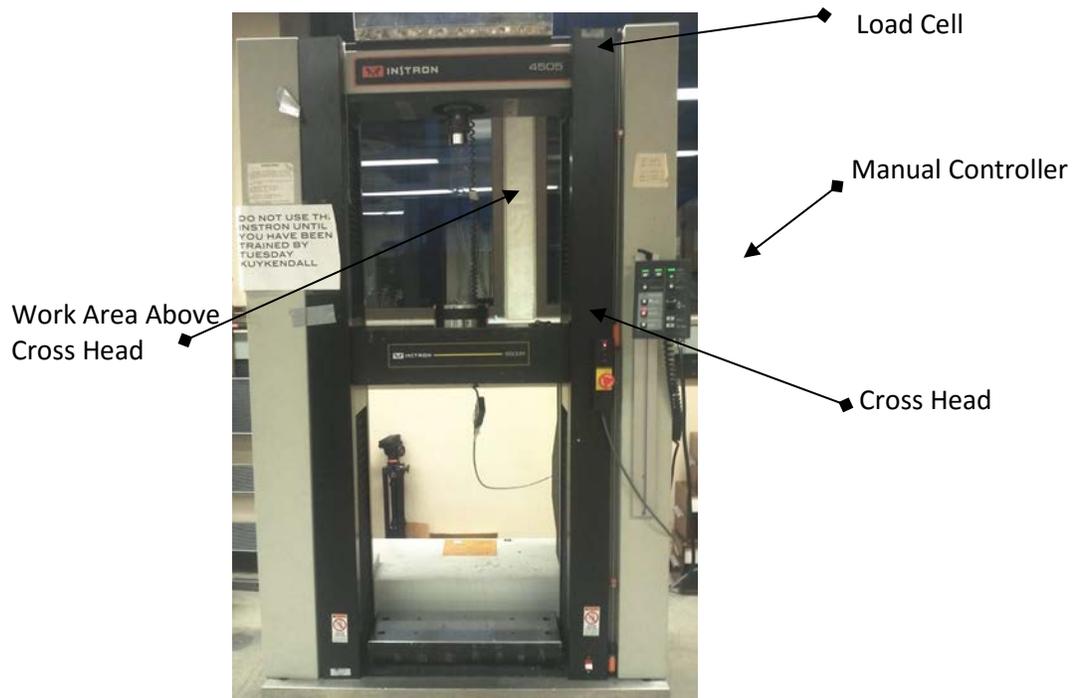
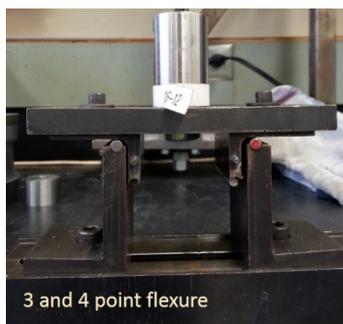


Fig. 1

- The Instron is part of the MSE cost center. Before beginning any test please remember to fill out the log sheet located on the desk top of the control computer. If the user account is logged out, when you log back in the excel spreadsheet should open automatically.
- **Before you do anything else** check that the correct load cell is installed. (see fig. 1) For most measurements it should be the 100kN load cell. If it is the wrong cell, CONTACT THE LAB MANAGER TO REPLACE IT BEFORE PROCEEDING.
- The fixtures described in this SOP are for the 100 KN load cell. If you are using a different load cell your fixtures will be somewhat different, but the principles are the same. 3 and 4 point flexure fixtures are also available.



Small Flexure Fixtures - Special permission required.

Fig. 2 Various Flexure Fixtures

- Make sure there isn't any fixtures attached to the load cell. Open Bluehill. In the upper right hand side is the load cell dialog. Open it and select calibrate. When it has finished calibrating select done.
- Install the appropriate fixtures for your test. If you are using the tensile grips, please remember to **install the adapter first**. (see below) Install the grips and be sure to tighten them up.



Fig. 3 Tensile grips for 100 KN load cell

- Make sure the correct pins are installed. Never install a pin that is too small or force in one that is too large.

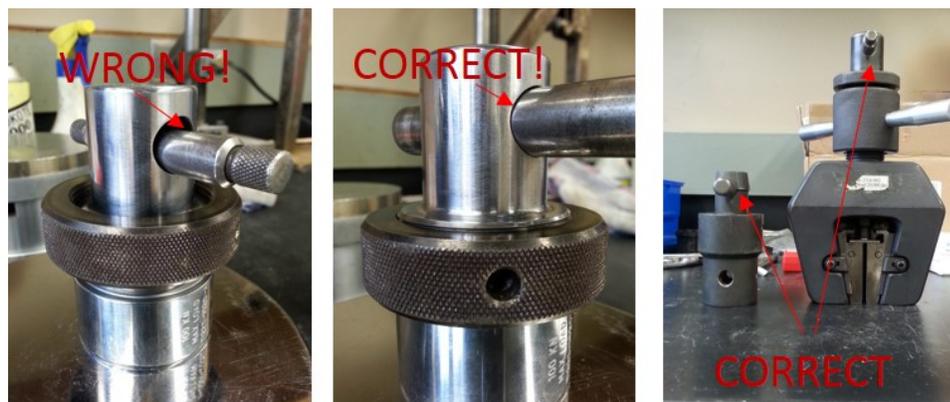


Fig. 4 Correct and incorrect pin insertion

- To tighten the compression fixture, apply a small load (100 N or 0.1 kN is sufficient) and tighten the nut up to the load cell. To tighten the tensile grips, place a random dog-bone specimen in the grips and tighten. Apply a small load and tighten the nut up to the load cell. You may want to apply and release the load a couple of times to remove any slop. You may do this with the specimen under test as well depending on the material.
- You should already have a method programmed, open it in Bluehill Test. (If you are using an extensometer you must have it installed BEFORE opening Bluehill, otherwise the load frame may exhibit unexpected behavior.)
- Verify the parameters in your method and make sure that there is an end condition (Appendix 1) for the test as well as a second end condition to protect the load cell.
- Depending on your method, input the dimensions of your specimen. Before installing the specimen it is recommended that you balance the load programmatically. This indicates a zero load with the fixtures installed.
- Install the specimen. Using the fine adjust, apply a small load to remove any slack. Tighten the grip adjustments if necessary. Then still using the fine adjust, get as close to zero load as you can. You may still apply a small load after this if it seems necessary.
- **You must pay attention at all times to where the crosshead is. Do not raise or lower it while distracted.**
- “Reset gauge” this sets the cross head to zero extension.
- Put down the protective shield and put on your safety glasses.
- Start the test. If the method allows you can adjust the rate during the test.

- When the test completes, load the next sample or select finish. If you are finished with the test method select the second finish button at which time a dialog will come up asking you if you want to start a new test with the same methods. If you do, select yes and you will be prompted to open a new file. If not, select no and exit Bluehill. Remove your data from the workgroup computer to a USB drive. Never insert any kind of media (USB, DVD, etc.) in the Instron computer.
- When you are finished please remember to remove your broken samples. Place them in a trash receptacle. If your material is hazardous, place in a plastic bag, apply a hazardous waste label (filled out) and place with other hazardous waste materials waiting for EH&S. If you are unsure about where to place your hazardous waste, please contact the Lab Manager.
- Please clean up any mess – leave the lab better than you found it!



Always clean up the lab when you have finished. If you are unsure about where an item belongs please ask.

- Safety glasses are required in MUE 165.

Implementation and Training:

This SOP will be available to all users and must be adhered to. The Lab manager will train users in the implementation of this document.

**When you have completed your measurement please make sure to close out the CORAL session!
 Failure to do so may incur extra costs.**

Appendix 1

Setup Control - End of Test (From Bluehill Help File)

You open the Setup Control - End of Test screen in the Method tab by clicking on Control - End of Test in the navigation bar.

This screen lets you set up the End of Test criteria for your test and, if your test type requires it, an End of Hold criteria.

All test types have four End of Test criteria, the following test types require End of Hold in addition:

- Tension Creep Relaxation
- Compression Creep Relaxation
- Flexure Creep Relaxation

End of Test

You can choose up to four separate end of test criteria. These criteria operate independently and the first one that is satisfied will stop the test.

End of Test 1

The criteria available for End of Test 1 are listed in the table below. Rate of load, Load threshold, and Load with delay are always available. These criteria provide different ways of defining a specimen break. There are several factors that affect the number of channels available to you as end of test criteria. Refer to How does the system handle channels? for more information about the channels available.

End of Test Criteria	Associated Fields
Rate of load	Sensitivity (%) The test ends when the load drops by the Sensitivity value within a 100ms time period. The sensitivity is measured as a percentage of the load at the beginning of the 100ms period. The load must first attain a value of 1% of the full-scale of the load cell before the detector becomes active.
Load threshold	Load drops to The test ends when the load falls to the Load drops to value. The load must first attain a value 1.5 times the Load drops to value before the detector becomes active.
Load with delay	Load drops to Delay The detector is inactive for the Delay period that you specify. After this time has elapsed, the test ends when the load falls to the Load drops to value. In this case there is no specific value that the load must attain before the detector becomes active.
% Peak Load	Load drops by (%) Load threshold The detector is inactive until the load specified in the Load threshold field has been exceeded. After that value is attained, the test ends when the detector finds the specified Load drops by (%) from peak load.
Channel name	Value The detector searches for the specified Value of the chosen channel. The test ends when that value is attained.

End of Test 2, 3 and 4

The only criteria available for End of Test 2, 3 and 4 are based on the value of a particular channel (see Channel name in the table above).

There are several factors that affect the number of channels available to you as end of test criteria. Refer to How does the system handle channels? for more information about the channels available.

End of Hold area (creep and relaxation test types only)

You set the condition for the end of the hold in a relaxation test as follows:

1. Select from a list of channels in the Criteria field.
2. Set a value for change in the chosen channel in the Delta field. The change in value is measured from the start of the hold.

For example, if you want to end the hold when the value of load changes by 50N from the start of the hold, set Criteria to Load and Delta to 50N. Similarly, if you want the hold to last for 90 seconds, set Criteria to Time and Duration to 90 secs.

There are several factors that affect the number of channels available to you. Refer to How does the system handle channels? for more information about the channels available.

How does the End of Test Action field work?

You choose an End of Test action that defines the behavior of the crosshead/actuator when either:

- the End of Hold criteria are satisfied (creep and relaxation test types only), or
- one of the End of Test criteria are satisfied, whichever occurs first.

The End of Test actions are:

- Stop - the crosshead/actuator stops.
- Return - the crosshead/actuator stops and returns to the gauge length position (i.e. the point at which extension equals zero).
- Stop, then return - the crosshead/actuator stops. A message box appears prompting you to remove the specimen. When you have removed the specimen, clicking on the OK button in the message box returns the crosshead/actuator to the gauge length position. Alternatively, you can remove the specimen and return the crosshead/actuator to the gauge length position using the hardware Control Panel, dismissing the message box.