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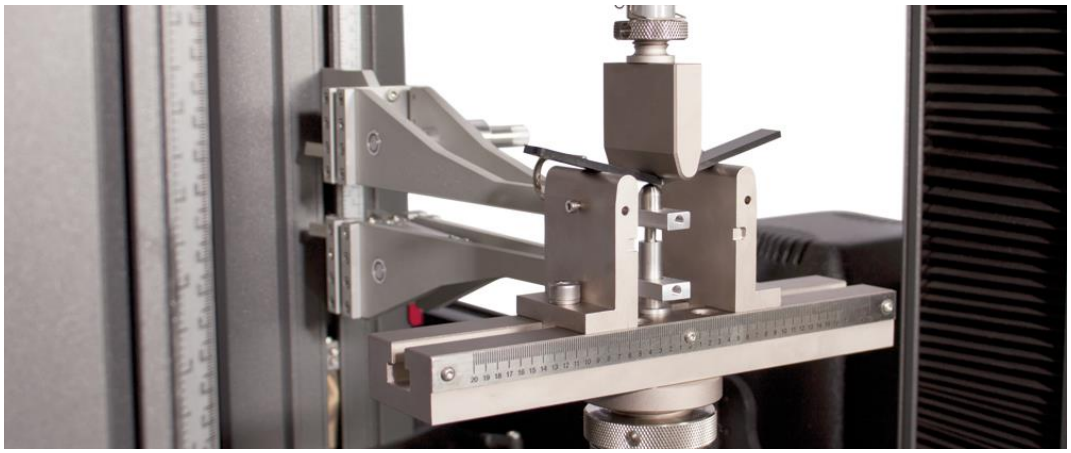
Instron 3365 uniaxial testing machine advanced hints guide

Rev. 25/11/2021	Instron 3365 Advanced functions guide	ISTITUTO ITALIANO DI TECNOLOGIA

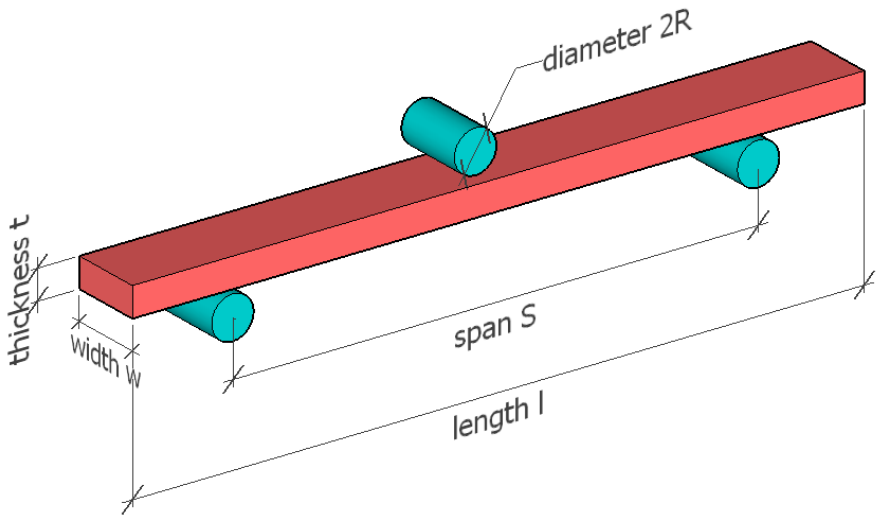
This document is a quick reference guide to assist with testing on the Instron 3365 dynamometer. It does not explains the testing procedures nor replace formal training, but is rather intended as an additional tricks book for advanced users in order to get the most out of mechanical testing. For any doubt or problem contact luca.ceseracciu@iit.it, tel. 241

Testing with 3-point bending clamp



For flexural tests with the 3-point clamp, follow these guidelines:

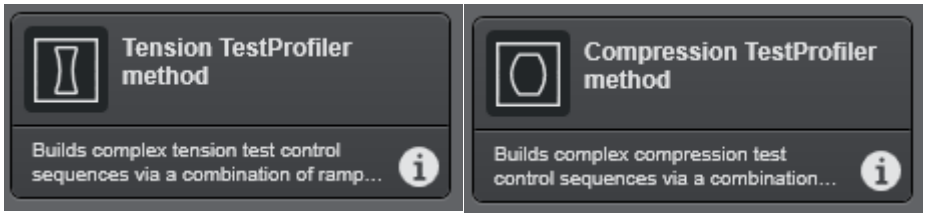
- The span should be decided as a function of the sample size, considering the following aspect ratios: **R/t<4, S/t>16, w/S<4**, with symbols as in the figure below
- The definition of the Zero displacement is not critical. It should be chosen a few mm higher than the sample top, so that upon returning to initial position, the sample switching is quick and easy
- Balancing load before starting the test, on the other hand, is critical, as the contact point is detected as a small load. The methods are designed to move slowly until the contact load is reached.
- The maximum stress depends strongly on the sample thickness, therefore try to fabricate specimens with homogeneous thickness and to measure it accurately



Test profiler

The test profiler function is used to create a method with an arbitrary sequence of steps.

Profiler methods can work in tension or compression and can be recognized by the square frame around the method icon:

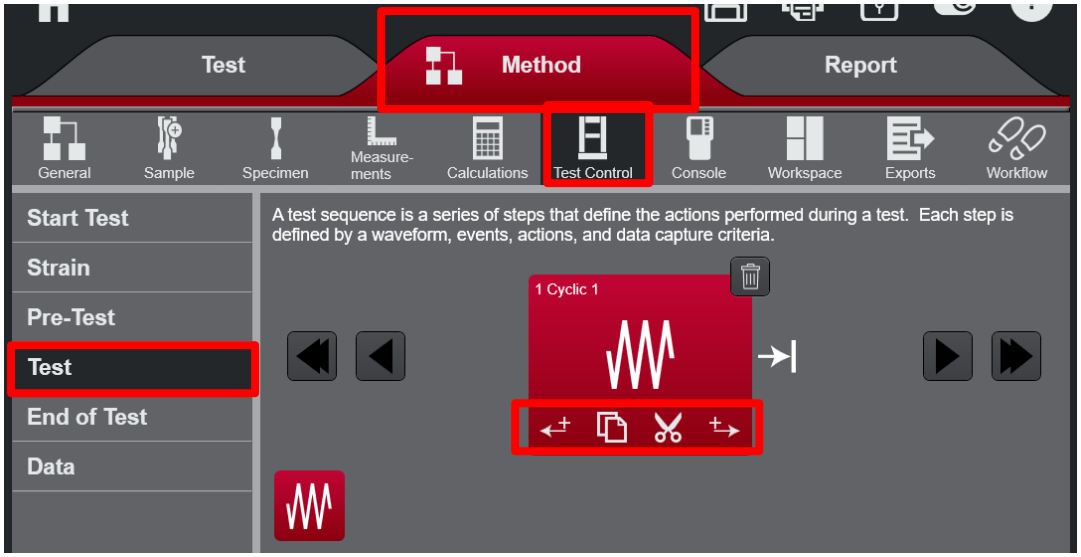


Profiler tests with different clamps (e.g. bending, peel off) can still be performed with these two methods, although some math will be needed to properly calculate the stress and strain from the raw data.

Two basic methods are available: **LC_TensileProfile** and **LC_comprProfile.** Both are designed with a simple layout and the essential measurements and exports.

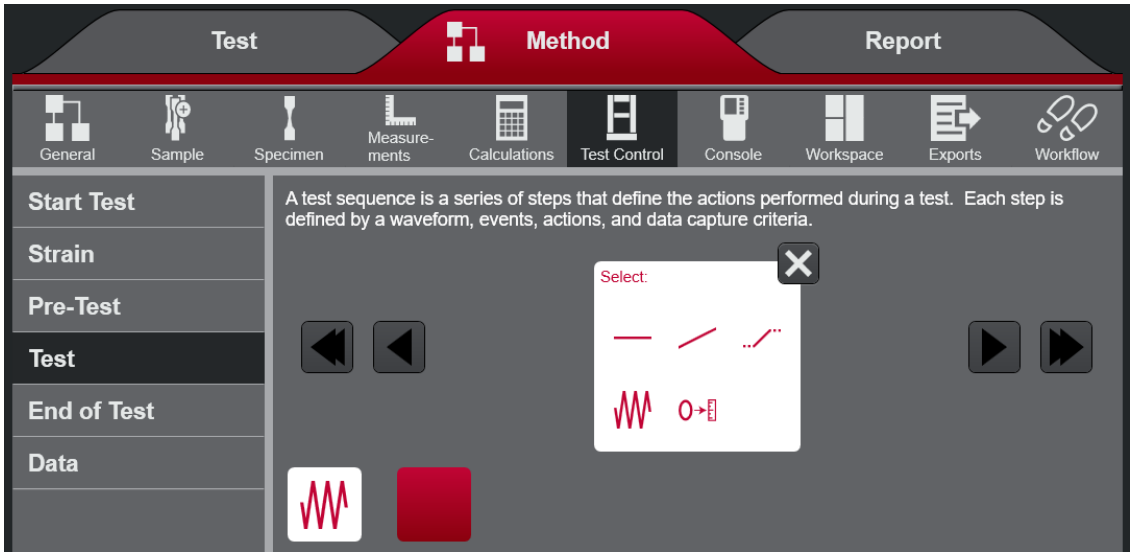
The chosen method can be opened and modified by the users to their specific needs. If the method will be used again, please save it **with a different name**, otherwise do not save any modification!

To modify the method, open the *Method/Test Control/Test tab* as highlighted in red in the figure below:



In the figure above, one step is present, namely a cyclic routine. Notice that if the method is modified starting from the Test environment, the main color is red, whereas if it is modified starting from the home screen, tabs are blue.

To add steps before or after this one, use the buttons at the bottom of the step icon. You can also copy or cut the step with all its parameters.



Steps that can be added include:

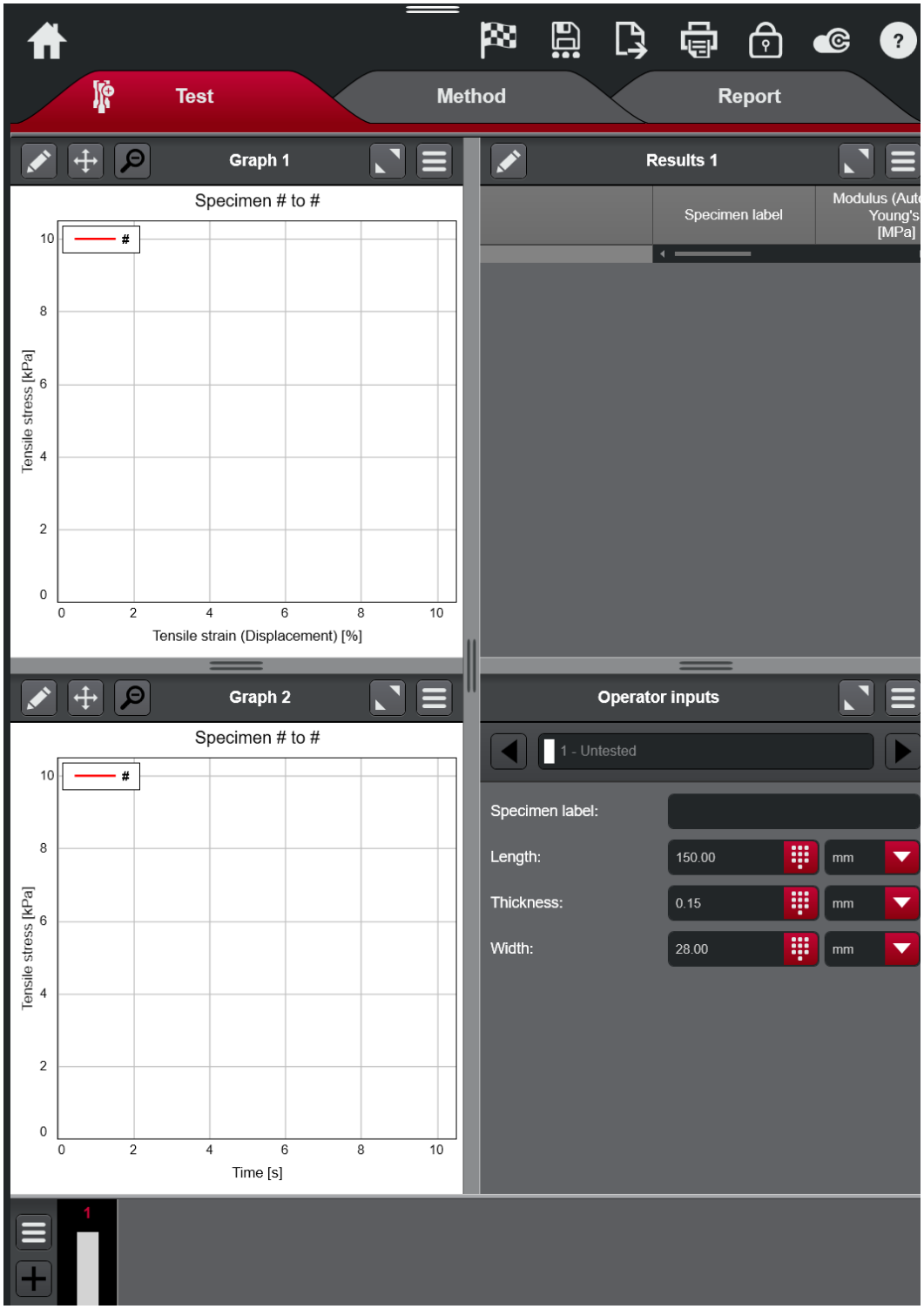
- Absolute ramp
- Relative ramp
- Constant value
- Cyclic routine
- Signal balance

All of them can be set in terms of different signals and limit values, even independently from each other.

As an example, one can set a ramp in load with an end condition in displacement, or vice versa.

Even in cyclic routines, as in the example below, the peaks of each cycle can be defined in displacement, and the valleys in force. This can be useful to avoid that material yield induces a negative load in the sample.

In the test phase, the standard layout is as in the figure below. Two graphs are present, as it can be useful to plot both as a function of time and as a function of deformation. Plot parameters can be tailored in this phase with a right mouse button click/properties

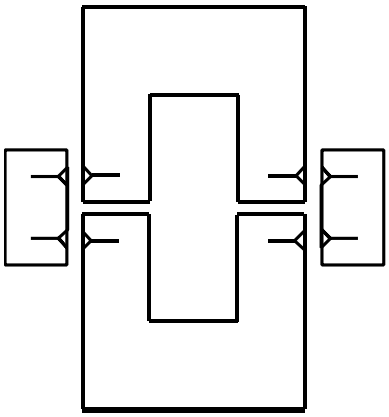


It is recommended to test the method before the actual experiment with a dummy sample

Testing weak samples with the paper frame method

This technique is necessary to test weak samples, which are difficult to handle and mount on the clamp. For better results, this technique should be coupled with the 10 N load cell and the pneumatic tension clamps. The frame dimension is designed for standard-ish samples (25 mm * ≈4 mm)
First, locate the cut frames in the lab workbench. If none is available, or if they are all damaged, look for the printed sheet. If that is also not available, a sheet is available at the end of this document.

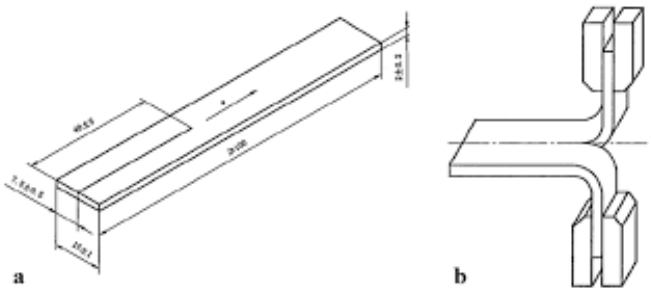
1. Assemble the frame, holding the C-shaped halves by inserting the small parts in the cut notches. Tweezers can help
2. Mount the sample on the paper frame. Fix the ends to the frame with paper tape
3. Set the clamp distance (Zero displacement) at 25 mm instead of the standard 35 mm
4. Ensure that the load is balanced before mounting the sample. To avoid artifacts in the load measurement, fix the upper clamp pipe on the upper bar with the dedicated string, in the back of the bar
5. Place with care your sample within the clamp. Fix it on the top and bottom of the frame with paper tape
6. Remove with caution the lateral holders with the help of tweezers
7. Start the test normally
8. At the end of the test, you can reuse the frame if it is in good condition.



Additional tests: the trouser tear test

Tear resistance can be evaluated following the guidelines of the ASTM D1938 standard procedures, equipping the 2KN load cell and the standard pneumatic tensile clamps.

1. Create a test session opening the method LC_TrouserTest. Insert the sample thickness and the rate of 50 mm/min
2. Cut samples in 100mm*15mm stripes, with a 40mm notch in the short side (see figure below).
3. Clamp the resulting separated ends in the tension clamps as shown below.
4. Start the test as normal, the failure detection algorithm is active, but remember to stop the measurement manually in case fracture is not detected



The graph reports the tear stress (F/t) as a function of displacement. The tear resistance *Ft* is defined as:

$$Ft = \frac{F_{max}}{t}$$