

UTS Electromechanical Test System (United)

Model: STM-50 KN

Location of Machine: Advanced Composites Lab, INGRAM 1202F

Location of SOP and Machine Operating & Safety Manual: Composites Lab website under resources; Composites Lab TRACS site; and Hardcopy near machine.

Emergency Contact:

- Call 911
- Call EHS & Risk Management at 512-245-3616
- Call Head Lab Technician, Dr. Ray Cook (office 512-245-2050)
- Call Dr. Jitendra S Tate (office 512-245-4872)

Before using this machine:

- You must have permission from Dr. Tate.
- You must have received formal training from technician or, trained research student (designated by Dr. Tate) related to machine safety and operation.
- You must read and understand **SOP and Machine Operating & Safety Manual.**
- You must use this machine under direct supervision of Dr. Tate or, Dr. Cook or, trained research student (designated by Dr. Tate).
- You must have signed “Lab Rules” document with Dr. Tate. This document must be signed every semester fall, spring, and summer (as applicable).
- If you do NOT follow above instructions, you will be held responsible for your own safety and damages.

Safety Precautions:

Protective Equipment: Prior to performing this procedure, the following personal protective equipment must be obtained and ready for use: **Gloves, Safety Goggles, Lab Coat.** Wear eye protection when working with the UTS and follow all safety practices.

General information

The UTS machine is an electromechanical system capable of static mechanical testing. It can be used for different types of Mechanical testing such as tension, compression, flexure etc. UTS machine is controlled by advanced test design application software, **Datum 5i.** Different types of materials can be tested on this machine such as composites, plastics, and metals. This Safety guide outlines general safety practices for operating the United Testing System (UTS)..

Specifications:

- Loading Capacity-50KN (11 kips)

Accessories:

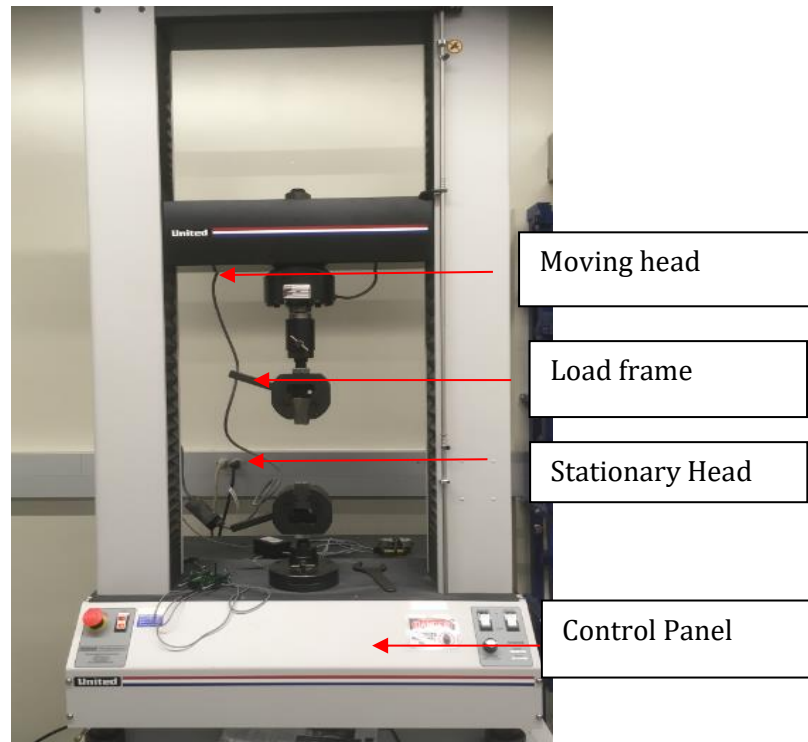
- **Fixtures:** ASTM Test Fixtures: Tension D3039; 1. Compression D6641; 2. Flexure D790;
- **Extensometers:**
 - Model 3542 with 2" (50mm) gauge length and +/- 10% measuring range

Important Safeguard:**Locate Emergency Stop Buttons**

Machine power can be killed at any time by pressing the Emergency Stop button on the machine! This can prevent serious operator injury and equipment damage.



Emergency Stop Button



UTS Machine

Know the controls

Before you operate the system for the first time, make a trial run through the operating procedures with the drive power off. Locate all hardware and software controls and know their functions and required adjustments. The upper Jaw of the machine is the moving part and the Lower Jaw is the stationary part. Use the Jog controls to move the upper jaw accordingly. If any control function or operating adjustment is unclear, review the applicable information until you understand it thoroughly.



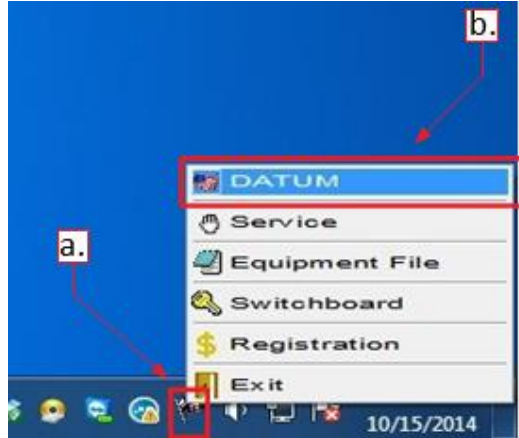
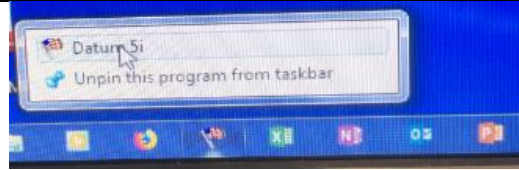
Turning and preparing the UTS for instrumentation

1. **On UTS control panel:**
 - Locate the emergency stop and start switch. It is on the left side of the control panel
 - Pull up the emergency knob and then press the start button.
 - Verify that the switch light comes on



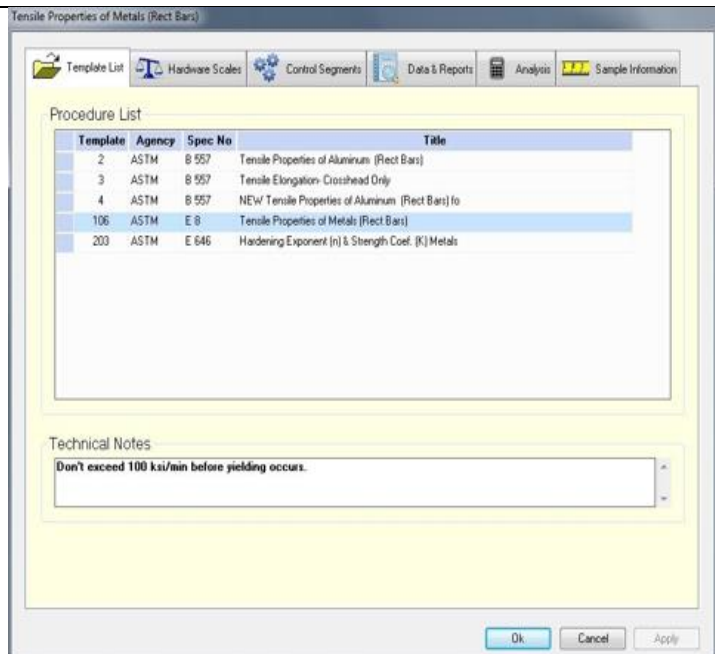
2. On the computer

- Turn on the machine.
- Locate the Datum 5i software on the taskbar, which is represented by a US Flag.
- Right click on the US Flag icon, scroll to Datum 5i and left click
- Locate the same Flag (a) at the right end of the task bar, Right click on the US Flag icon, scroll up to Datum 5i (b) and left click.
- Wait for the testing interface to pop up



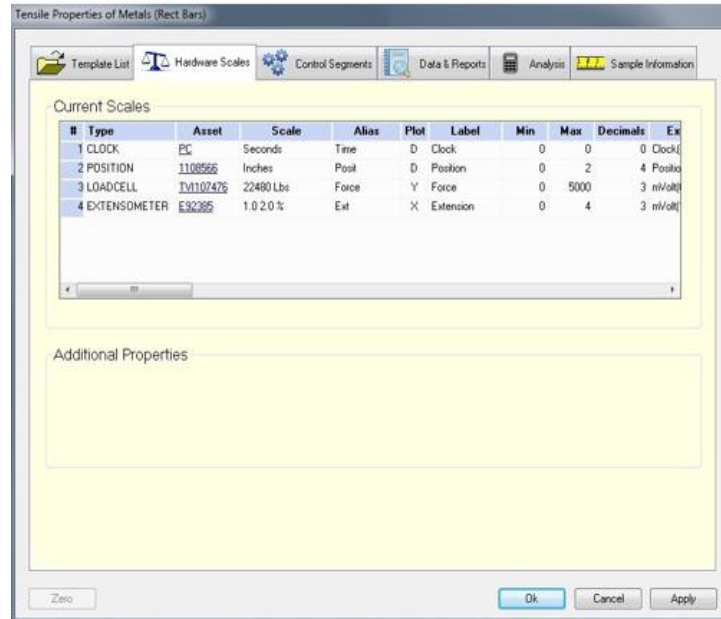
3. On the Datum 5i interface, Click New to run new test. A new window of testing details pops up

- On the template Tab, scroll to the required template for the intending testing.

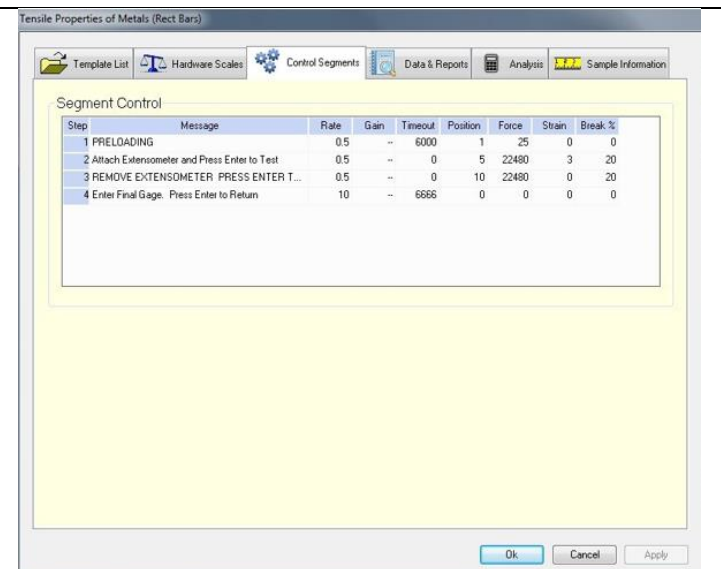


4. On the hardware scales

- There is information on the type of load cell and extensometer.
Do not adjust values, it has been preset



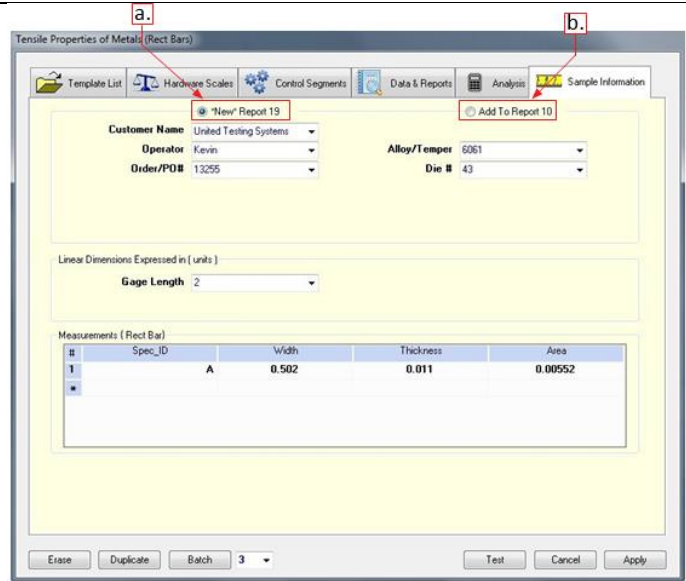
5. On the control Segment tab, input the required rate of loading on the testing to failure row according to the ASTM standard of your testing



6. On the sample information tab, check new report, fill the test details and input the test piece dimensions i.e. width and thickness. The area will be computed automatically by the computer. Please verify this with your manual calculation. After inputting the necessary dimensions, click apply.

- Before running the test, ensure you zero out your position, force and extension by clicking F10, F11 and F12 respectively on the keyboard

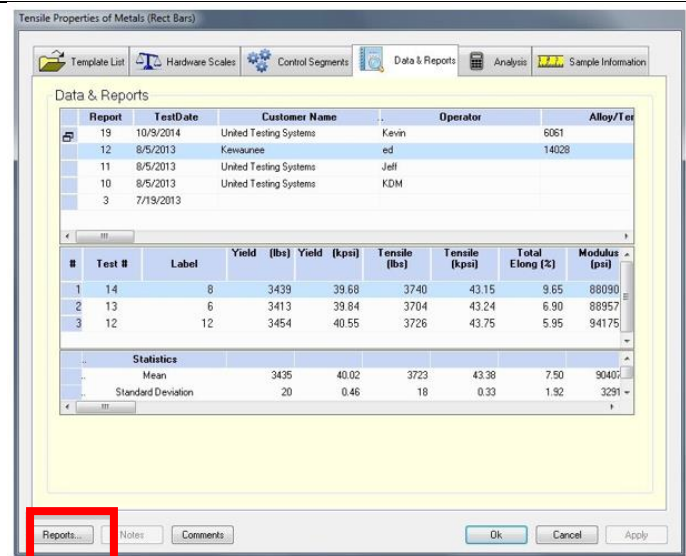
After Zeroing out, Click test to run the experiment.



7. After the test is completed, you will be returned to the Data and Reports tab where you can view your test results.

To view test results, select the report number, and click **“Reports”**. A new window will pop up where you can report curves, or export data.

Note: The statistics for a given report are displayed near the bottom of the form.



On this new window, you can view your test reports, test curve and export curve.

When you click the “export curve”, a new window will pop up showing the file path on your computer screen

Follow this “file path” on the screen to obtain your raw data in form of Excel sheet.

Test Results

Warnings On

Template No 102 Tensile Properties of Plastics

Find

Reports

Specimen Prep

Exclude - Include

Delete Record

Export Curve

Graph

Test No	Report No
314	307
313	306
268	266
267	265
266	264
265	263
264	262
261	261
262	261
263	261
257	259
255	257
238	240

Force vs Extension

Exit

Yield (lbs)	Yield Str. (psi)	Tensile (lbs)	Modulus of Elasticity (psi)	Break Elong (in)	Yield Elong (in)	Tensile Elong (in)	Tensile Str. (psi)
4.77	72.22	280.50	3,049	1.84	0.01	1.84	4,250.02



Jul 28, 2019

Tensile Properties of Plastics

Report No. 307

Test Date 28-Jul-19 Testing Machine STM-50KN 0618527

Customer Name Texas State

Operator Oluwasola
Material Nylon 6-NGP

Load Cell S/N (TV117988), Units (LBS) 11240 Crosshead Speed (Inches / min) or Rate 0.08
Displacement Sensor EZ-2-2 (E101171) Preload Value (Lbs) 1

Test No	Specimen ID	Yield (lbs)	Yield Str. (psi)	Tensile (lbs)	Modulus of Elasticity (psi)	Break Elong (in)	Yield Elong (in)	Tensile Elong (in)	Tensile Str. (psi)
314	2	4.77	72.22	280.50	3,049	1.84	0.01	1.84	4,250.02

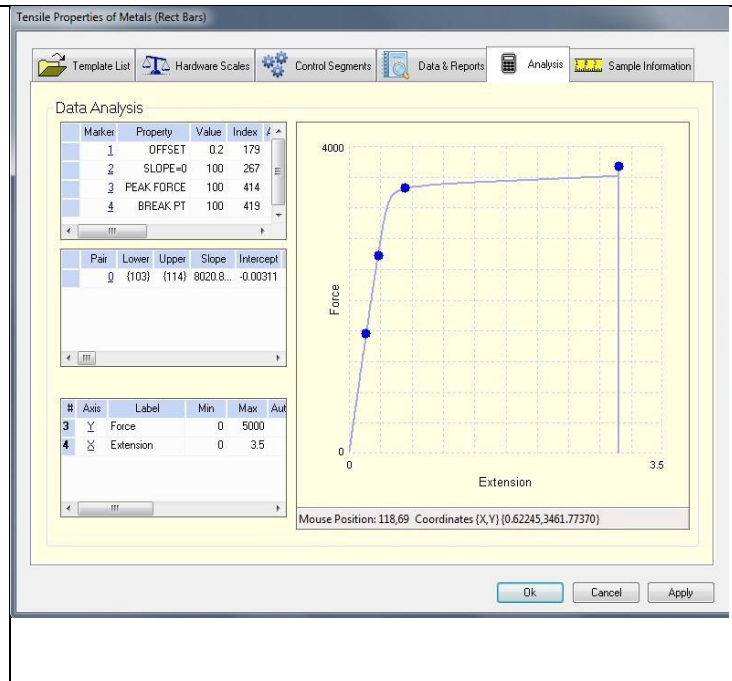
0.90 Trial

Microsoft Access

Curve for Test Number 314 has been exported to file
C:\DATUM5\dfw\ExpPlots\T314.xls

OK

8. To use the analysis tab, you must select a particular test record on the Data & Reports tab. The Analysis tool allows you to verify/modify Marker and Pair placement on your data and/or view any other available axes. Markers/Pairs are displayed by clicking the blue underlined Marker/Pair numbers in the tables on the left.



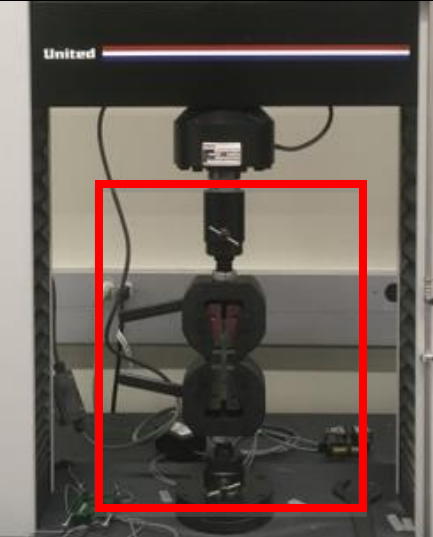
IMPORTANT: Make sure the position reads zero on the testing screen (unless your template is configured to start from non-zero, such as templates run after Zero-Set Platen). If position is not zero, press F10 key to tare position. If necessary, tare Force with F11 key, Extension with F12 key. Click <Operate> to toggle display of selectable function keys.



The test may be stopped at any time by clicking the <Stop> button on the Main Screen; data processing may be forced on a partial dataset by subsequently clicking the <Review> button.



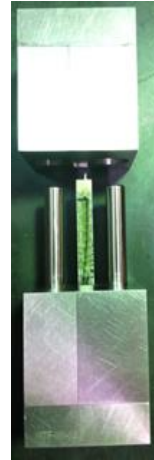
SAFETY: Machine power can be killed at any time by pressing the Emergency Stop button on the machine! This can prevent serious operator injury and equipment damage.

TENSION TEST																																																					
<p>9. Identify your tensile test grips and clamp it to the jaw of the UTS.</p> <p>Load your tensile sample into the grips</p>																																																					
<p>10. On the template Tab, select the required tension template according to the appropriate ASTM procedure for your testing and follow step 3 to step 8.</p> <p>These procedures are labeled as follows:</p> <ul style="list-style-type: none"> 'ASTM D638 Tension Plastics' 'ASTM D General Tension 1 in/min' 'ASTM E8 Tension Metallic' 'ASTM D3039 Tension Composite' 'ASTM D3039 Tension Composite (Biaxial Ext)' 	<p>General Tension 1 in/min</p> <div style="border: 1px solid #ccc; padding: 5px;"> <p>Template List Hardware Scales Control Segments Data & Reports</p> <p>Procedure List</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Template</th> <th>Agency</th> <th>Spec No</th> <th>Title</th> </tr> </thead> <tbody> <tr><td>1</td><td>ASTM</td><td>D</td><td>General Tension 1 in/min</td></tr> <tr><td>2</td><td>ASTM</td><td>D</td><td>General Compression 1 in/min</td></tr> <tr><td>3</td><td>ASTM</td><td>D3039</td><td>Composite material Tension 0.08 in/min</td></tr> <tr><td>5</td><td>ASTM</td><td>D3039</td><td>Tensile Properties of Composites (Biaxial Ext)</td></tr> <tr><td>102</td><td>ASTM</td><td>D 638</td><td>Tensile Properties of Plastics</td></tr> <tr><td>103</td><td>ASTM</td><td>D 695</td><td>Compressive Properties of Rigid Plastics</td></tr> <tr><td>104</td><td>ASTM</td><td>D 790</td><td>Flexural Properties (3 Point)</td></tr> <tr><td>105</td><td>ASTM</td><td>D 1002</td><td>Lap Shear Strength Properties of Adhesives in</td></tr> <tr><td>106</td><td>ASTM</td><td>E 8</td><td>Tensile Properties of Metals (Rect Bars)</td></tr> <tr><td>107</td><td>ASTM</td><td>D 790</td><td>NEW Flexural Properties (3 Point)</td></tr> <tr><td>108</td><td>ASTM</td><td>E10</td><td>Brinell 10 / 1500</td></tr> <tr><td>901</td><td>UNITED</td><td>Cyclic</td><td>NEW Cyclic Burn-in</td></tr> </tbody> </table> </div>	Template	Agency	Spec No	Title	1	ASTM	D	General Tension 1 in/min	2	ASTM	D	General Compression 1 in/min	3	ASTM	D3039	Composite material Tension 0.08 in/min	5	ASTM	D3039	Tensile Properties of Composites (Biaxial Ext)	102	ASTM	D 638	Tensile Properties of Plastics	103	ASTM	D 695	Compressive Properties of Rigid Plastics	104	ASTM	D 790	Flexural Properties (3 Point)	105	ASTM	D 1002	Lap Shear Strength Properties of Adhesives in	106	ASTM	E 8	Tensile Properties of Metals (Rect Bars)	107	ASTM	D 790	NEW Flexural Properties (3 Point)	108	ASTM	E10	Brinell 10 / 1500	901	UNITED	Cyclic	NEW Cyclic Burn-in
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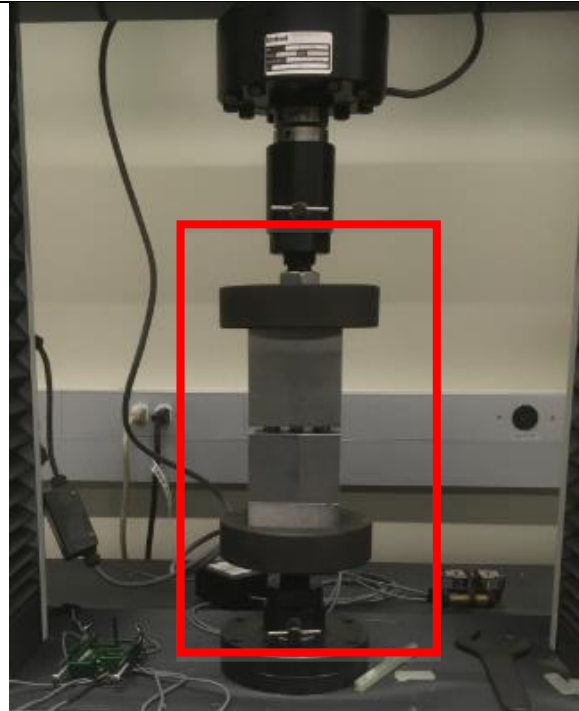
COMPRESION TEST**11. Identify your compression fixture.**

The “combined loading compression” (CLC) fixture must be utilized for accurate compression testing. **Follow the following process in clamping the specimen in the compression fixture:**

- Insert one side of the specimen in the bottom half of the fixture until it touches at the bottom.
- Tighten screws evenly.
- Keep the distances between the two halves of the fixture as 12.5-25 mm as per the test.
- Fix the specimen in the upper half.
- Tighten screws evenly.



On the UTS, fix the cylindrical bases into the grips of moving and stationary head to support compression fixture. Place the clamped compression fixture in between the cylindrical bases with a slightest touch of the upper cylindrical base.



Select appropriate ASTM procedure based on the type of material being tested. 'ASTM D6641 Compression Composite'.

General Compression 1 in/min

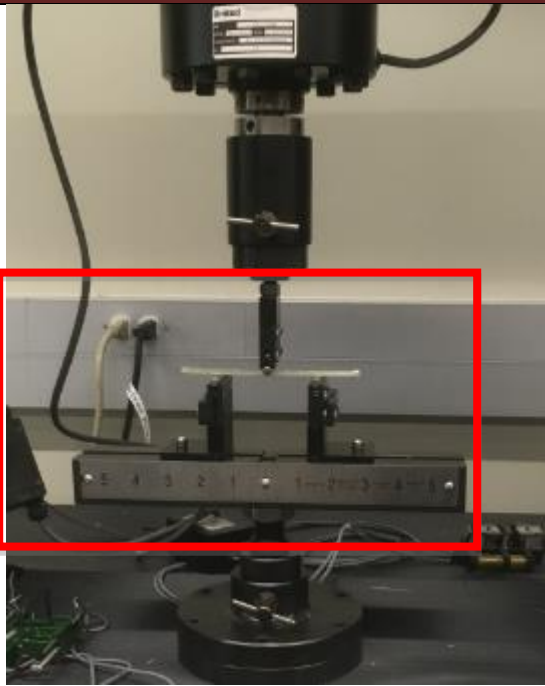
Template List Hardware Scales Control Segments Data & Reports

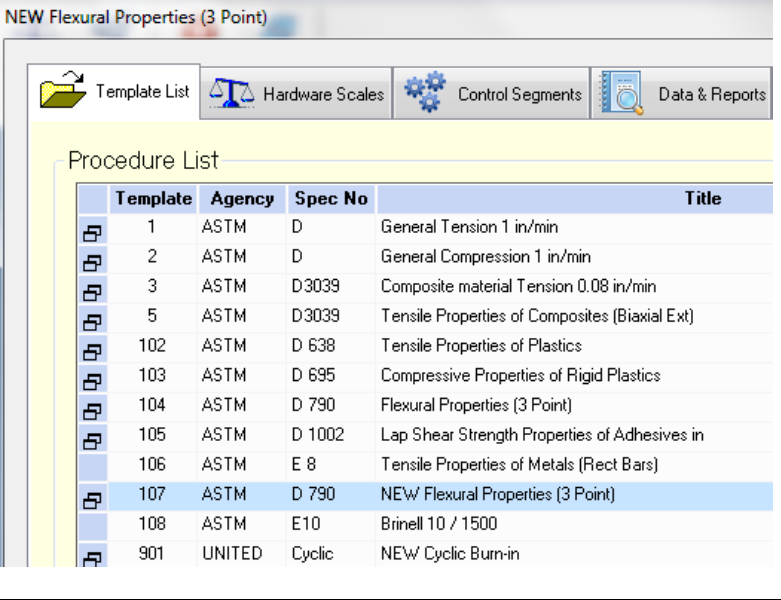
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FLEXURE TEST

Identify the 3-point loading fixture for flexural testing. Place the loading nose in the upper jaw of the moving head and the supports base on the lower jaw of the stationary head.



<p>Select appropriate ASTM procedure based on the type of material being tested. <u>'ASTM D790 flexure.'</u></p>	 <p>NEW Flexural Properties (3 Point)</p> <p>Template List Hardware Scales Control Segments Data & Reports</p> <p>Procedure List</p> <table border="1"> <thead> <tr> <th>Template</th> <th>Agency</th> <th>Spec No</th> <th>Title</th> </tr> </thead> <tbody> <tr><td>1</td><td>ASTM</td><td>D</td><td>General Tension 1 in/min</td></tr> <tr><td>2</td><td>ASTM</td><td>D</td><td>General Compression 1 in/min</td></tr> <tr><td>3</td><td>ASTM</td><td>D3039</td><td>Composite material Tension 0.08 in/min</td></tr> <tr><td>5</td><td>ASTM</td><td>D3039</td><td>Tensile Properties of Composites (Biaxial Ext)</td></tr> <tr><td>102</td><td>ASTM</td><td>D 638</td><td>Tensile Properties of Plastics</td></tr> <tr><td>103</td><td>ASTM</td><td>D 695</td><td>Compressive Properties of Rigid Plastics</td></tr> <tr><td>104</td><td>ASTM</td><td>D 790</td><td>Flexural Properties (3 Point)</td></tr> <tr><td>105</td><td>ASTM</td><td>D 1002</td><td>Lap Shear Strength Properties of Adhesives in</td></tr> <tr><td>106</td><td>ASTM</td><td>E 8</td><td>Tensile Properties of Metals (Rect Bars)</td></tr> <tr><td>107</td><td>ASTM</td><td>D 790</td><td>NEW Flexural Properties (3 Point)</td></tr> <tr><td>108</td><td>ASTM</td><td>E10</td><td>Brinell 10 / 1500</td></tr> <tr><td>901</td><td>UNITED</td><td>Cyclic</td><td>NEW Cyclic Burn-in</td></tr> </tbody> </table>	Template	Agency	Spec No	Title	1	ASTM	D	General Tension 1 in/min	2	ASTM	D	General Compression 1 in/min	3	ASTM	D3039	Composite material Tension 0.08 in/min	5	ASTM	D3039	Tensile Properties of Composites (Biaxial Ext)	102	ASTM	D 638	Tensile Properties of Plastics	103	ASTM	D 695	Compressive Properties of Rigid Plastics	104	ASTM	D 790	Flexural Properties (3 Point)	105	ASTM	D 1002	Lap Shear Strength Properties of Adhesives in	106	ASTM	E 8	Tensile Properties of Metals (Rect Bars)	107	ASTM	D 790	NEW Flexural Properties (3 Point)	108	ASTM	E10	Brinell 10 / 1500	901	UNITED	Cyclic	NEW Cyclic Burn-in
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Summary of the Basic Steps in Performing a Test

- 1) Launch DATUM from the DATUM 5i shortcut in the United Testing folder on the desktop.
- 2) Select the desired Template for the test, read "Technical Notes," then click on the button.
- 3) Click on the Sample Information Tab on the top left of the open window.
- 4) Insert first sample to be tested.
- 5) Press the Test button on the bottom right of the window
- 6) After test has completed, enter comment if desired and click Green Arrow.
- 7) After the test machine returns to the starting point, the Analysis tab will come up to show the graph.
- 8) Click the Data & Reports tab at the top middle of the window.
- 9) Make sure the current report number is highlighted, to be able to finish the remaining tests in the batch.
- 10) Repeat steps 3-9 for all remaining tests in this batch.
- 11) To print a report, press the Data & Reports tab on the top of the window.
- 12) Highlight the report to be viewed and/or printed.
- 13) Click Reports... on the bottom left of the window.
- 14) Highlight report to be viewed and/or printed.
- 15) Click the Reports button to drop down options.
- 16) Click Test Report to view and/or print highlighted report.
- 17) Click the Print button at the top left of the tool bar.
- 18) Choose number of copies to be printed and press OK.
- 19) Close the print preview by clicking Close Print Preview button at the top

- right of the tool bar.
- 20) Click Exit button to return to testing screen. Start at step number 6 for next sample to be tested.

IMPORTANT: *Make sure the position reads zero on the testing screen (unless your template is configured to start from non-zero, such as templates run after Zero-Set Platen). If position is not zero, press F10 key to tare position. If necessary, tare Force with F11 key, Extension with F12 key. Click <Operate> to toggle display of selectable function keys.*