

MSA1 Operating Procedure

3-Point Bending Testing

TA Instruments RSAIII Micro-Strain Analyzer

See RSA3 User Manual (pdf file located on computer desktop)

Start-Up

1. Log in usage using the SMIF web site.
 - a. If needed: Login to Windows on the MSA1 computer. Choose SMIF user and enter smif as the password
2. Turn up the air supply until the pressure reads 80psi
3. Turn on the power switch located on the back left side of the tool
4. Open the TA Orchestrator software on the computer
5. Turn the transducer motor on and set oven temperature (if desired)
 - a. From the **Control** pull-down menu, select **Instrument Control Panel**
 - b. Click the Motor Power On button
 - c. If you want to use the oven for the measurement:
 - i. Type in the desired temperature(25C – 600C)
 - ii. Set temperature control to Oven
 - iii. Click the Environmental Controller On button
 - d. Click OK

Tool and Sample Mounting (see pages 105-107 in RSA3 User Manual)

6. From the **Control** pull-down menu, select **Gap Control Panel** and click on **Send to Top** to raise the motor to the tool loading position.
7. Click on **Offset Force to Zero**
8. Tool Set-Up
 - a. Choose the appropriate lower support size based on sample geometry and stiffness
 - b. Mount the upper and lower 3-point bending tools on the actuator shafts. The longer piece is mounted on the top and u-shaped support is mounted on the bottom.
9. Verify that the Force in the Gap/Instrument Control panel reads $-68.5\text{gm} \pm 1.0\text{gm}$ with the longer 3-point bending tool mounted on top. *If the force value is different than this, contact SMIF to perform a tool mass calibration.*
10. Click on **Offset Force to Zero** to zero the normal force on the motor with no sample present
11. Place the sample on the lower support tool
12. Using the stepper control buttons on the ride side of the instrument, lower the upper tool to a point where the upper tool fulcrum is a couple of millimeters above the sample surface.
13. Enter 0 for the **Commanded Gap** and the desired **Max allowed Force** based on your sample. 500g is a typical value for the force.

14. Click on **Zero Fixture** button to lower upper fulcrum to contact the top of the sample surface. *Note: The fixture should be zeroed at the temperature you will run the experiment.*
15. Click **Exit** in the Gap/Instrument Control Panel

Test Set-Up and Measurement (See Chapter 3 in the RSA3 User Manual)

16. Click the green **START** button to enter the **Edit/Start Instrument Test** panel.
17. Click on **Save As** to select your directory.
 - a. You should save your data in your own folder located in the “User Data” folder on the desktop
 - b. Enter a filename (e.g., sample name) and click **Save**
18. Enter Operator and Test Notes if desired
19. Under **Sample Geometry**:
 - a. Select the **Predefined Geometries** button (*Note: you can also save geometry settings and recall them by selecting the Stored Geometries button*)
 - b. In the **Geometry** pull down menu select “Three Point Bending Geometry”
 - c. Click on **Edit Geometry** and enter the sample dimensions. The length value is the width of the lower u-shaped support; 10mm, 25mm, or 40mm.
 - d. Click on **Options** and enter or verify that the tool mass = 68.5gm
 - e. Click **OK** twice to exit the Geometry menu windows
20. Under **Test Set-Up**:
 - a. Select the **Predefined Test Setups** button (*Note: you can also save test setup settings and recall them by selecting the Stored Test Setups button*)
 - b. Select the desired **Measurement Type** button (Dynamic or Transient) and select the desired Test Setup from the pull-down menu. See Chapter 3 in the RSA3 User Manual for a description of the various Test Setups.
 - c. Click **Edit Test** to edit the test parameters. Click on **Help** button for an explanation of the test parameter settings. (*Note: a positive extension value will pull the tools apart and a negative extension value will push the tools together*)
21. Click **Begin Test** to start the test
22. The data will be plotted in real time
 - a. Graphing options can be modified by right clicking on the graph and selecting **Plot Set-Up**.
 - i. Select the **Layout** tab to change the axes of the plot
 - ii. Click on **Help** under each of the page tabs to read a description of the various graphing options.
 - b. You can toggle between graph display and spreadsheet display by clicking on the “Toggle Plot/Spreadsheet” icon
23. See Help files for descriptions of various data analysis functions

Saving Data

Please save all data in your directory in the User Data folder on the desktop

24. To save the data in the Orchestrator format
 - a. From the **File** pull down menu choose **Save As** and type in filename and select your directory in the User Data folder.
25. To save the data in the Text format
 - a. From the **File** pull down menu choose **Export**
 - b. Select your directory in the User Data folder and type in a filename
 - c. Under the **Save as Type** pull down menu, select **Excel Ascii**
26. To save a picture of a graph:
 - a. From the Choose Copy from the Edit pull down menu (or press Ctrl+C). Open up the Paint application and choose Paste. You can then save the graph in a number of different picture formats (e.g., tiff, jpeg, etc).

Shut Down

27. From the **Control** pull-down menu, select **Gap Control Panel** and click on **Send to Top** to raise the motor to the tool loading position
28. Unload your sample
29. Remove the upper and lower 3-point bending tools and place the tools in the black storage box
30. Click **Exit** in the Gap/Instrument Control Panel
31. Turn off the transducer motor and oven (if used)
 - a. Select **Instrument Control Panel** from the **Control** pull-down menu
 - b. Click Motor Power Off button and Environmental Controller Off button
 - c. Click OK
32. Exit the TA Orchestrator software
33. Turn off the power switch located on the back left side of the tool
34. Turn off the air supply
35. Log out usage using the SMIF web site..