

ARES Rheometer Testing Manual

Introduction

The ARES is a rheometer, and measures the flow of a material under certain stresses and/or temperatures. The ARES in 130C has compression and torsion testing functions. For the former, flow is measured for a gel sample pushed between two parallel plates. For the latter, force is applied to cured epoxy in a twisting motion. This manual will detail how to perform these tests on the ARES rheometer.

Safety Information

- This process involves bringing samples up to a high temperature. Avoid touching the machine while the test is running to prevent injury.
- This machine has moving parts. Avoid touching the motor while turning it on.
- Wear gloves while handling uncured epoxy. Skin sensitivities can develop upon consistent exposure.

Procedure

This document contains the following sections:

- A. Powering On (6 steps)
- B. Parallel Plate Test (8 steps)
- C. After Testing (6 steps)
- D. Torsion Bar Test (6 steps)
- E. Exporting Test Data (2 steps)

Materials

- Small spatula
- Allen wrench
- Uncured epoxy or cured epoxy torsion samples

ARES Test

Powering On:

1. Turn on the air, up to the left when you walk into the room.



Off: the red handle is perpendicular to the pipes



On: the red handle is turned 90 degrees.

2. Switch on the Hankison.



The Hankison in 130B. There is now one specifically for the ARES in 130C.

3. Switch on the ARES. The power switch is located on the right hand side of the console underneath the metal covering.



The on/off switch on the side of the ARES

4. Using the mirror located behind the ARES, confirm that the pressure is stable and let the machine warm up. Take this time to sign into the log book for the ARES. The machine should read the temperature of the room once ready to use.



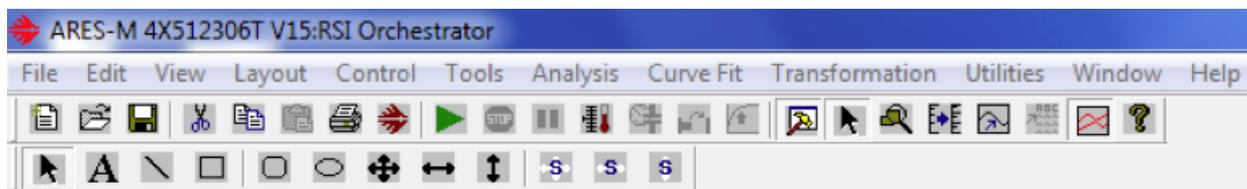
The screen on the ARES reads 21.1 C here , about room temperature.

5. The startup software is RSI Orchestrator. Open it up to prepare for testing.

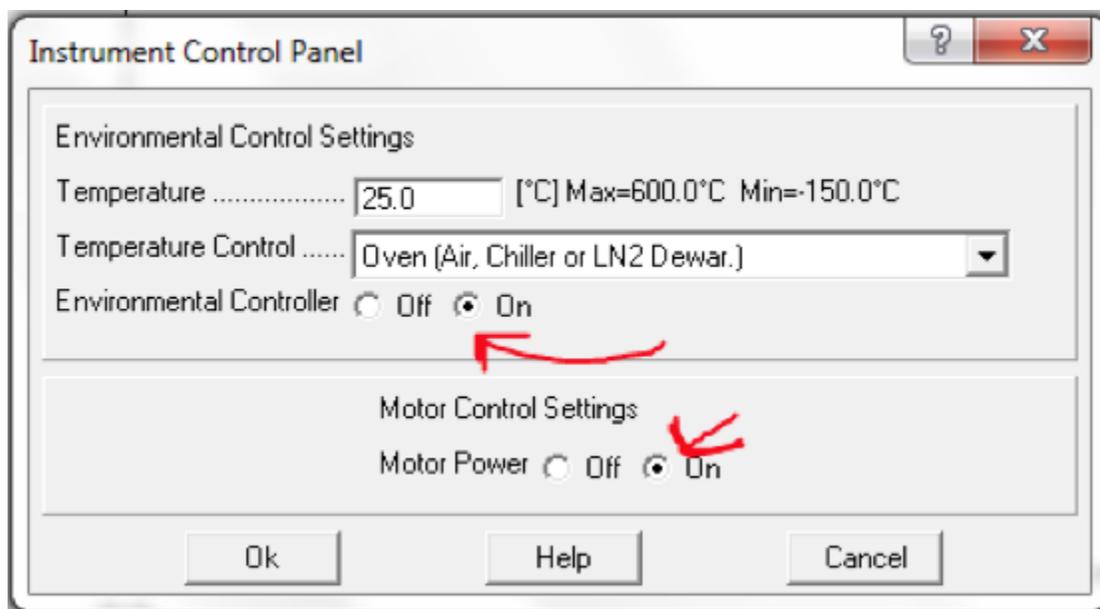


The “RSI Orchestrator” program icon

6. Under the **Control** menu, open **Instrument Control Panel** and set the environmental controller and the motor to **On**. Alternatively, click on the control panel button located in the shortcuts menu and it will open the window.



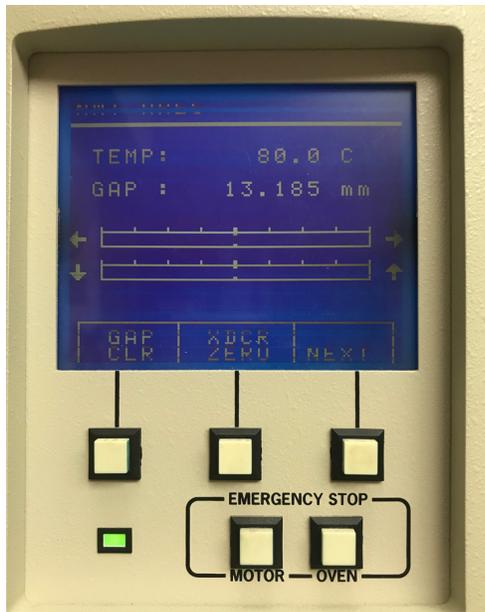
The RSI Toolbar



The Instrument Control Panel, accessed from the “Control” panel.

Parallel Plate Test

1. Before beginning, install the proper fixtures for the parallel plate test. Use the allen wrench to loosen screws, and your hand to tighten them. Measure and record the diameter of the fixture where the sample will be added.
2. Start by zeroing the transducer, XDCR ZERO, so there is no normal force on the plate.



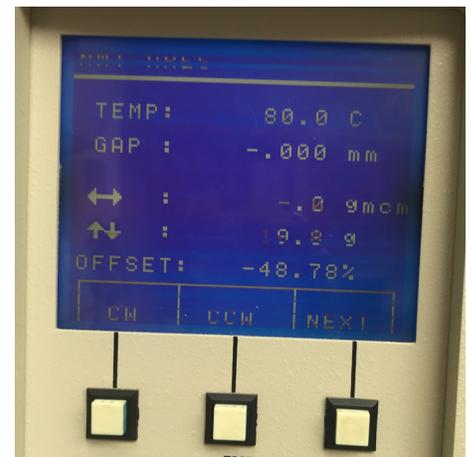
The XDZR ZERO button is the upper center one.



The jogging panel of the ARES

1. Now, simultaneously pressing the downward arrow and the middle button, jog the top plate down until it almost makes contact with the bottom fixture. There should be no normal force.

2. Once the plates are fairly close, use the bottom arrow only to very slowly bring the top plate down. Avoid overloading the machine by watching the value of the normal force on the screen. Bring it down until the normal force becomes slightly positive, around 10 grams.

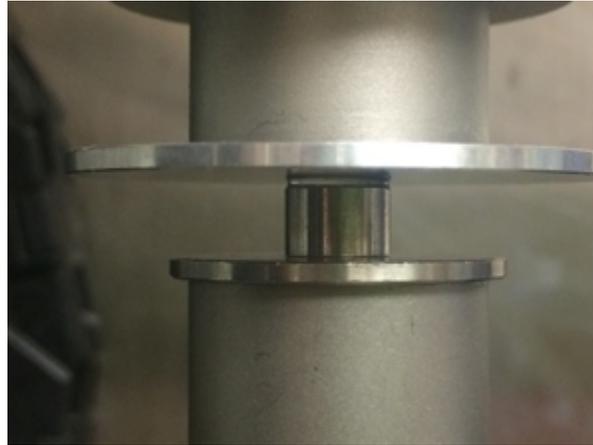


3. Clear the gap using the GAP CLR button.

4. Jog the top plate back up using the upward arrow and the middle button.

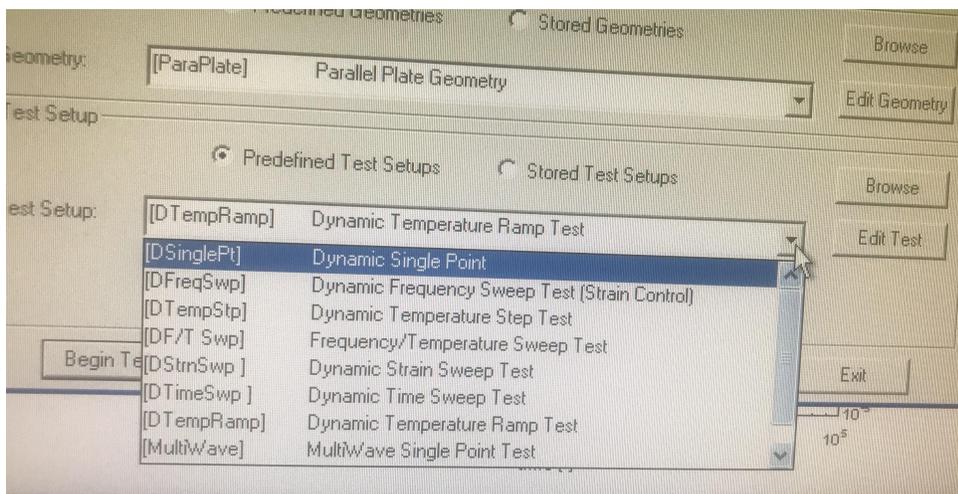
5. Add a thin layer of the liquid/gel sample to evenly coat the bottom plate.

- Jog down the top plate using both the bottom and middle arrow keys until the top fixture barely makes contact with the sample. Then, use only the bottom arrow until the sample is uniformly cylindrical, and does not dip inwards or outwards at its center. The sample sandwiched between the two plates should be about 1 to 2 mm thick.



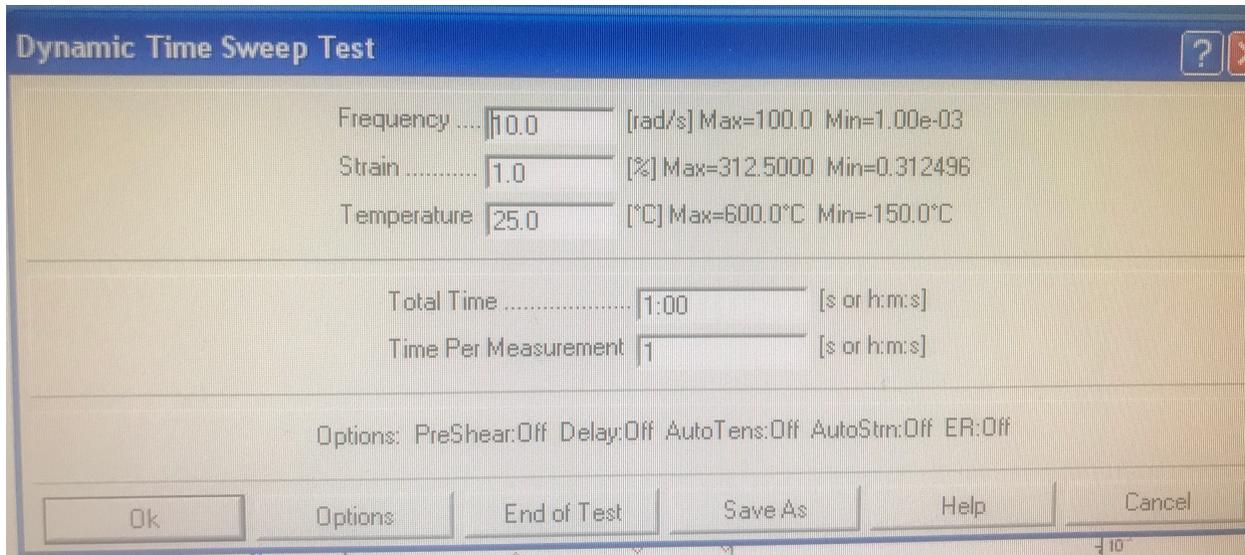
The sample forms a proper cylinder between the plates. The test can now begin.

- Click the start button on the computer screen. Name your test file appropriately: make sure to include all relevant information, and use underscores to break phrases instead of spaces. Once this is done, the details of the test may be input to the computer.



Test setup screen

The test primarily being run at this time is the dynamic time sweep. Fill in the parameters and click ok.



ARES test parameter window

8. Once parameters have been defined, click the **Begin Test** button.

After Testing:

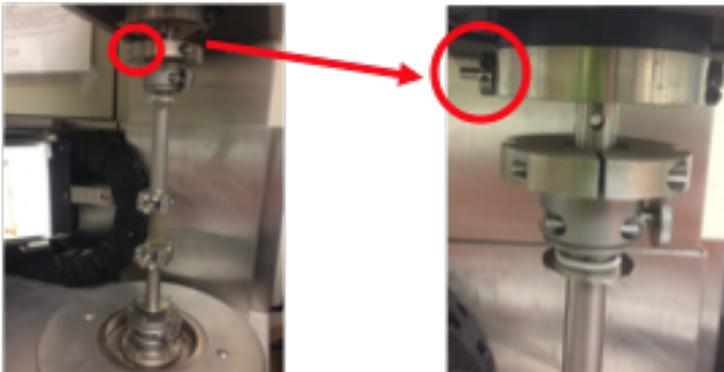
1. Before shutting down the machine, make sure you have saved you test data.
2. Turn the motor off by going to **Control** and then **Instrument Control Panel**.
3. Loosen the tested sample with an Allen wrench, and store appropriately.
4. Turn the power off using the switch on the main box.
5. Turn off the main air.
6. Export your test data if necessary (see “Exporting Data” segment).

Torsion Bar Test

1. Install the proper fixtures to the ARES.

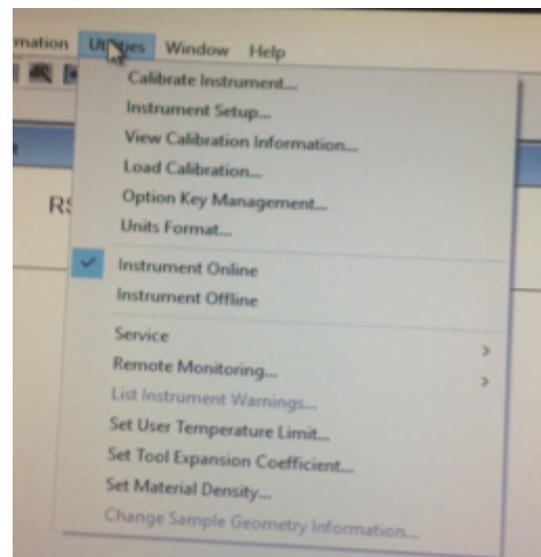
Make sure the pin pictured is projecting on the left (as pictured). You should not have to adjust this, but it is good to check.

Install the torsion bar fixture, loosening screws with an allen wrench and tightening them by hand.



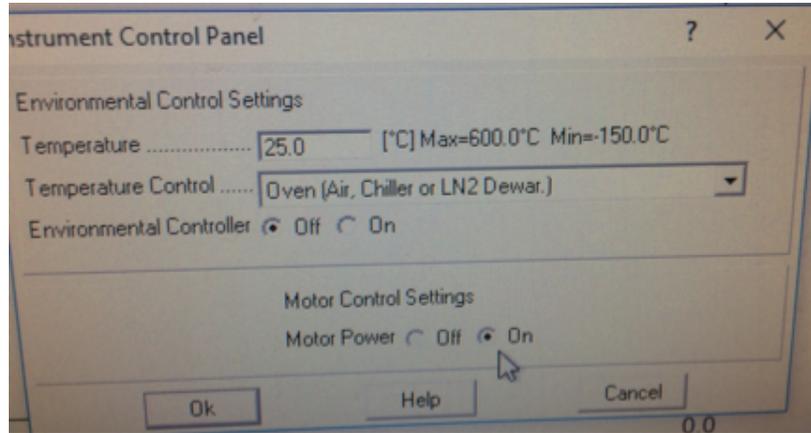
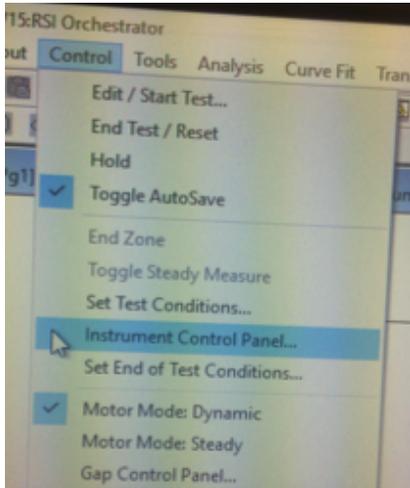
The installed torsion bars.

2. Make sure the instrument is online.



3. Turn the motor on. The motor must be on before installing a sample.

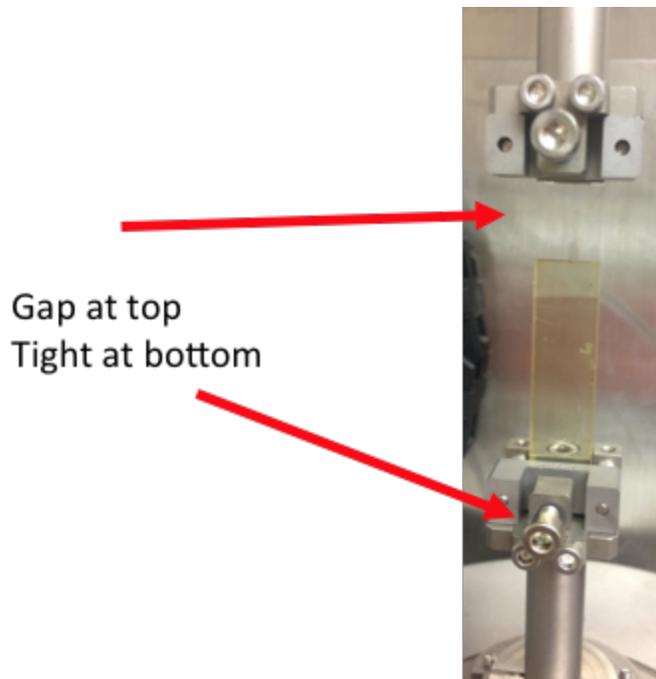
Check under "Utilities" to confirm the instrument is online.



Access the Instrument Control Panel from the “Control” tab.

Turning the motor on can be done near the bottom of the Instrument Control Panel.

4. When installing the torsion bar, slip the bar in place in the bottom fixture and tighten it with an Allen wrench. Make sure the upper grip is open, and then with the jog-up/jog-down buttons move the upper fixture down over the sample. Watch the screen where the torque and normal force are showing. Use the CW (clockwise) and CCW (counterclockwise) to rotate the lower grip to keep torque ~ 0 (between -10 and +10gcm). Also make sure the normal force does not get too high, keeping the value slightly negative.



There should be a gap between the upper bar and the sample when first loaded. The upper bar will be jogged down once ready.

5. Tighten the sample with an Allen wrench making sure the torque stays in range and adjust CW and CCW as the sample is tightened. Don't panic if it jumps to several hundred.

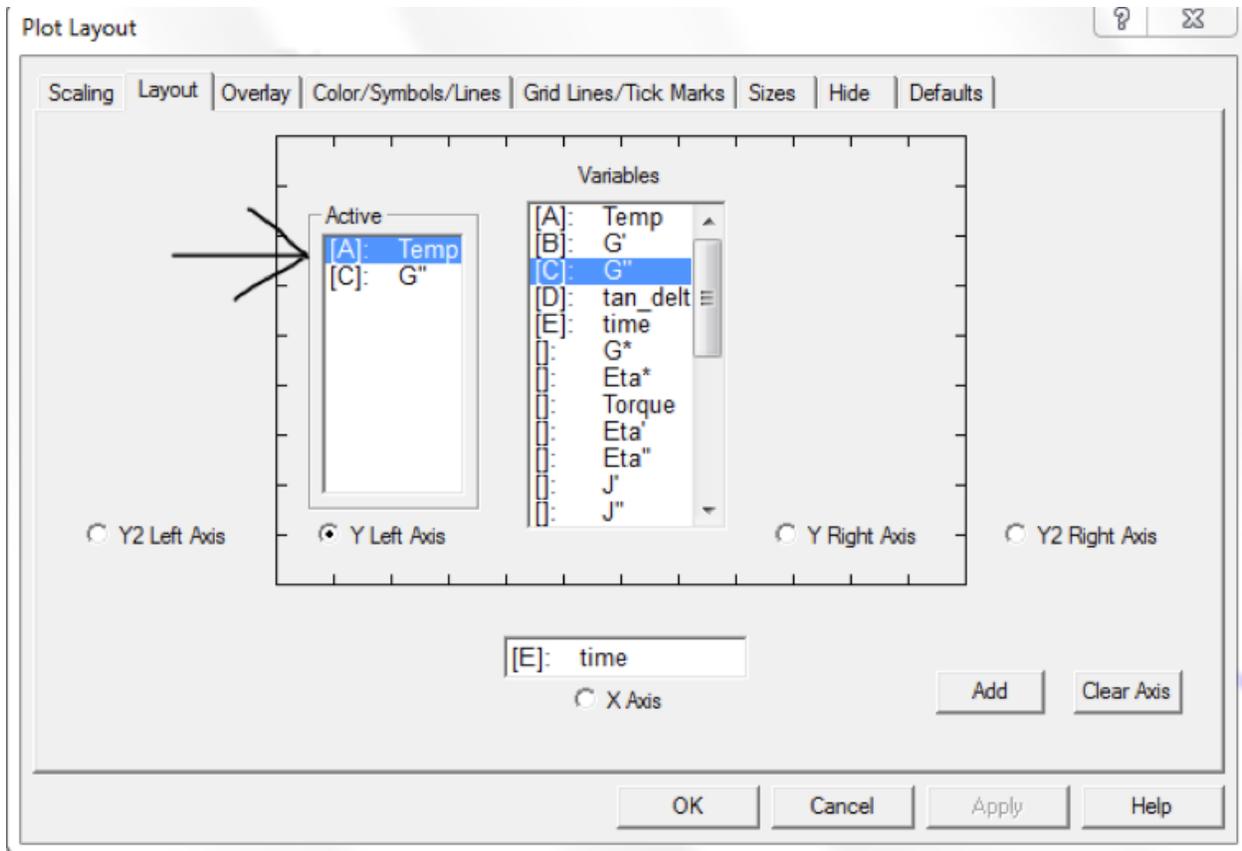
If torque overloads during installation of sample, two things must be done to correct:

- Reset by clicking "End Test/Reset" (the Stop sign)
- Turn motor back on

6. You are now ready to perform a test. Follow the same steps of running a test and shutting down the machine as defined in the "Parallel Plate Test" segment.

Exporting Test Data

1. In the RSI software, open the test file that you would like to export. Add all the desired data to the plot. Do this under **Layout** (double click on the plot).



The “Layout” tab under “Plot Layout”

2. Once the plot with all the data is open, click **File** and then **Export**. Set the data to save as ‘.txt’. Also set the desired destination of the exported file.