Ares-G2 with Oven– Quick Start Guide

Polymer Facilities - MRL @ UCSB
Rachel Behrens (rachel@mrl.ucsb.edu)

Reservations: Reserve time on FBS, login to FBS to access instrument. Record instrument time used on Log sheet.
If requesting use with an accessory (UV, APS, etc.), please request at least 48 hours in advance by email.

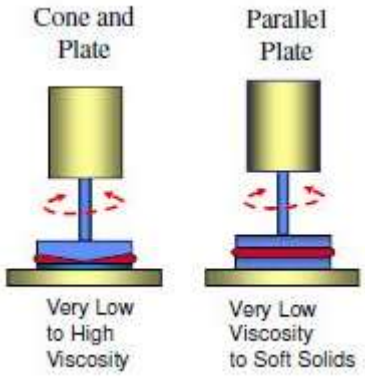
Safety: The rheometer contains a high-torque motor.
To avoid damaging the motor and instrument, do not operate the instrument without turning on the air.
Keep hands clear of the motor while it is operating.
Oven and cooling unit can get very hot and very cold. Do not touch while running.

Turning on the Instrument:

1. Start your timer on FBS.
2. Open the air valve to the rheometer (valve on the blue line).
3. Turn on switch to rheometer on the front of the instrument – instrument will go through an initialization (do not interfere during this process)
4. Fill the LN2 if needed
5. On the computer, open Trios
    a. connect to Ares-G2 @MRL 1051

Choosing your parameters:

- Plate geometry and size
    - Plates (8mm, 25mm)
    - Cone (25mm)
    - Disposable plates – only for samples that would ruin permanent plates (i.e. cured epoxies)
- Operational range
    - Minimum torque that can be measured by the transducer
    - Transducer settings
        - Low: fluids with low viscosity
        - Medium
        - High: stiff materials
    - Maximum strain that can be generated by the motor



Choosing a Geometry Size:

1. Assess the 'Viscosity' of your sample.
2. Lower viscosity → larger plate diameter
    a. Low & Medium viscosity (honey)- 25 mm geometry
    b. High viscosity (caramel)- 8 mm geometry
3. Examine data in terms of absolute instrument variables [torque/speed/displacement] and modify geometry choice to move into optimum working range.
4. You may need to reconsider your selection after the first run.

Lower Tool Installation:

1. Turn off motor using button on the front of the instrument
2. To install lower plate, loosen the knob on the lower arm and insert the tool into the lower portion, with the notches on the tool fitting into the cross bar on the lower arm.
3. Push lower plate fully down and hold tool in place.
4. Hand tighten the knob, and fully tighten with torque wrench.
5. Check that the lower tool is not loose, and there are no gaps.
6. Select the geometry you are using in the software from the Geometry drop down menu at the top of the page.

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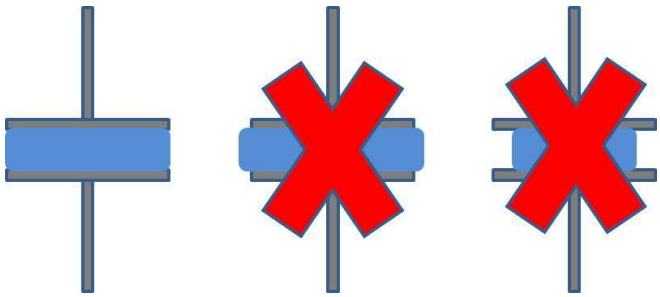
Upper Tool Installation:

1. To install an upper tool (i.e. plate, cone), loosen the knob on the upper arm and insert the tool into the upper portion, with the notches on the tool fitting into the cross bar on the upper arm.
2. Push upper tool fully upward into anvil and hold upper tool in place.
3. Hand tighten the knob, and fully tighten with torque wrench.
4. Check that the upper tool is not loose, and there are no gaps.
5. Zero the torque and axial force

Zeroing the Gap: Prior to loading your sample, you will need to zero the gap. You can zero the gap either on the touch screen or in the software. Lower the plates manually until they are ~10mm apart, and then select "zero gap" in the gap section on the right hand side in the instrument panel in Trios. DO NOT zero the transducer.

Loading sample onto bottom plate (see figure at right)

- Turn the motor off
- With the motor off, place enough sample to fill the gap (~ 1 mL depending on gap size)
- Use the gap section to set gap (typically 0.5-1mm)
- Trim sample as necessary, so that sample fills the gap



Choosing your Experiment:
Viscosity: Viscosity Flow Sweep

1 . After loading your sample, enter the desired Gap in mm, and trim sample. Sample should fill a gap.
1. Test Setup- Load **Viscosity Flow Sweep** procedure from the Procedure templates
2. Edit Test- Temp. 25˚C, Sweep Mode *log, Initial Rate γ* = 10 1/s, Final Rate γ* = 100 1/s, Points per Decade 5 .
3. Enter gap into software in the geometry section of the experiment. This will not update automatically.
4. Begin Test by clicking on the ▶ button at the top of the page.
5. Data will generate in the Results tab

G G' Crossover: Oscillation Frequency Sweep

Oscillation Frequency Sweep applies a sinusoidal strain of constant peak amplitude over a range of frequencies. The peak amplitude of strain is determined by the STRAIN command. One measurement is taken at each of the selected frequencies.

2 . If using the oven or APS, enable temperature control in the Environment section on the right hand side of the instrument panel.
3 . Turn motor off before loading sample.
4. Place the sample on to lower fixture.
5 . Enter the desired Gap in mm, trim sample and change gap in the geometry section of the experiment. Sample should fill a gap.
6. Test Setup- **Oscillation Frequency Sweep**- Edit Test* Strain Controlled. Edit Geometry- plates etc.
7. Edit Test- Temp. 30˚C, Strain 15%, Sweep Mode *log, Initial Freq. ω = 1.0 or 10.0 rad/s, Final Freq. = 100 rad/s. Points per Decade = 5.
8. Begin Test by clicking on the ▶ button at the top of the page.
9. Data will generate in the Results tab
10. Go to Analysis- G'/G" Crossover point (stamp).
11. Where- G'= Elastic (storage) Modulus, G"= Viscous (loss) Modulus, ω= Frequency (angular in rad/sec), tan δ = loss tangent = G"/G'.

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Data Processing

1. Data can be exported as a .csv or .xls by clicking on the Trios icon at the top left of the software.
2. Graphs can be saved as a .pdf by right clicking on the graph and selecting print PDF.
3. Many analysis tools are available in Trios for you to use either by right clicking on a point in your graph or under the analysis tab at the top of the software page.

Cleaning up and Shutting Down the Instrument

1. Turn off motor before removing sample or plates.
2. Remove samples from plates using solvents and wood tools. DO NOT SCRAPE PLATES WITH METAL INSTRUMENTS THAT CAN SCRATCH OR GOUGE THE PLATES.
3. Clean plates before returning to their box, and return box to their storage location.
4. Transfer data from hard drive to Z: drive or use Box or email
5. Exit Software
6. Turn off instrument
7. Turn off lab air
8. Log out of instrument in FBS
9. Record actual time on Log Sheet