

# TA Instruments DMA Q-800 Standard Operating Procedure

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3/31/2016

## Safety:

**User safety:** This tool uses Liquid Nitrogen (LN2) for cooling. It is a requirement that you have Cryogen safety training to access this room (Bard Hall B56) and to use this tool. There are two main hazards with cryogenic fluids frost bite and asphyxiation.

- 1) Frost bite can occur when your skin is exposed to temperatures below freezing. To avoid this, users should be wearing safety glasses, pants and closed toe shoes when filling the cooling accessory from the larger Dewar.
- 2) Users should be aware that LN2 can pose an asphyxiation hazard if a large amount is evaporated at once. When changing from a liquid to a gas LN2 expands about 700 times. So if you spill a liter you can easily displace all of the oxygen from the room. If a large amount of LN2 is spilled leave and allow the room to vent.
- 3) The phase change expansion can also cause an overpressure hazard it is allowed to occur in an enclosed container.

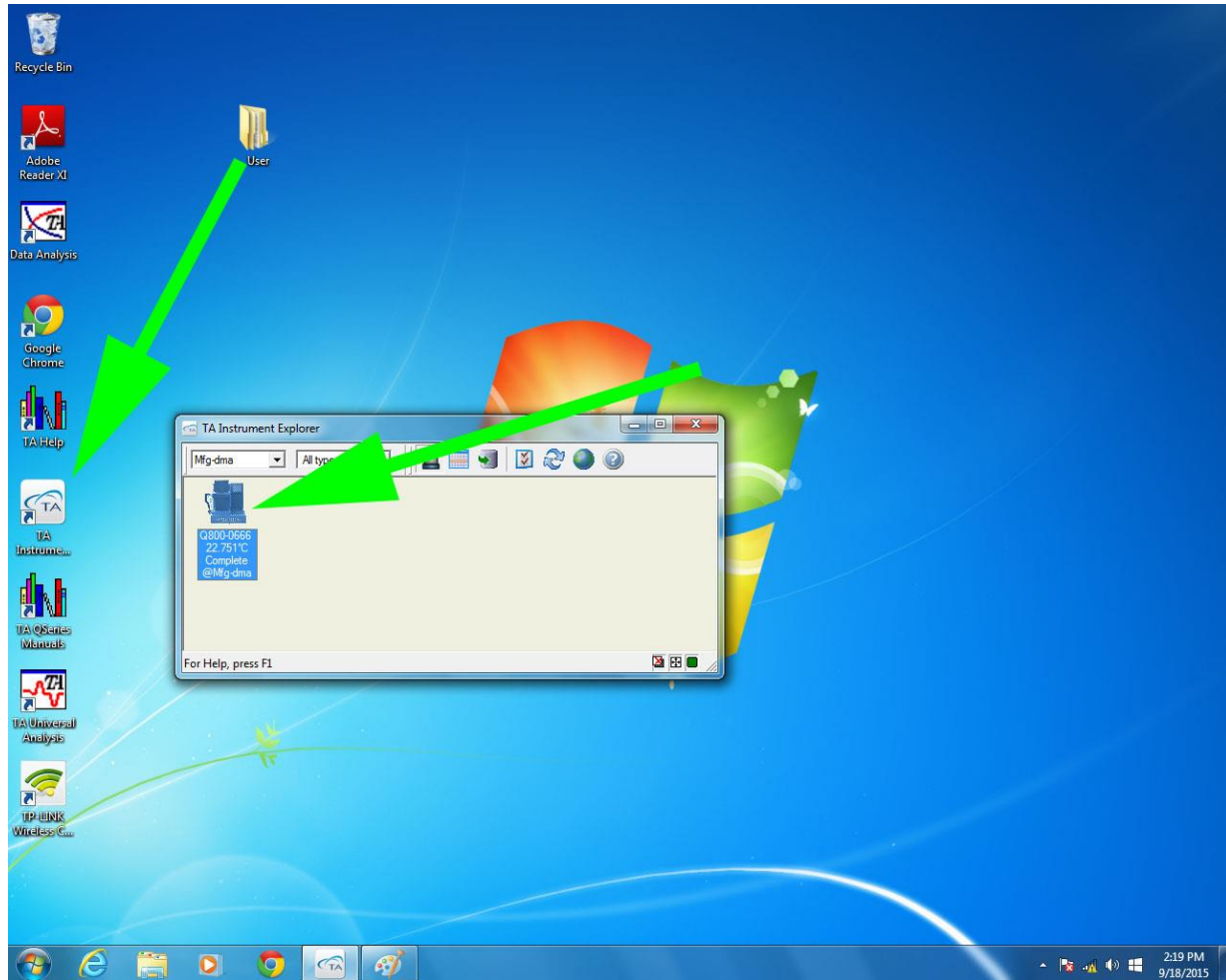
## Tool safety:

- 4) **DON'T SHUT DOWN!** The DMA Q800 should be kept ON at all times.
- 5) Be very cautious when closing the furnace. Some of the clamps including the regular compression, the flex and the sandwich shear are tall enough to hit the furnace when it is closing. If this occurs it will bend the drive shaft. If using these fixtures they need to be locked in the down position before closing the furnace to avoid this
- 6) Never close the furnace with any of the submersion clamps. Even if the clamp is in the down position the furnace will hit the clamp upon closing and likely bend the drive shaft.

## Getting Started

**Coral:** The DMA computer monitor is interlocked with Coral. This means that there is no power to the monitor until the instrument is enabled in Coral. To enable the instrument you can use the dedicated Coral computer that is located in B56. Log into Coral using your net ID credentials, Highlight the DMA and go to Equipment actions > enable and say okay at the prompts. Once enabled your account will be charged a \$15 set up charge and \$30/hour after.

## Software-



Once the tool is enabled open “TA Instrument Explorer” and select the Q800 to open the user interface.

### Install clamp:

Select the proper geometry from the cupboard by the windows. On the computer, go to the calibration menu and select clamp. Select the proper geometry from the clamp type dropdown menu. Select next and follow instructions for calibrating the clamp. Once the clamp is calibrated you will be directed back to the main window.

### Clamp calibration notes:

- 7) It is a requirement that you go through training for each clamp, but after the initial instrument training the clamp specific training will be brief.
- 8) Go to the help menu and open and follow installation and calibration instructions for the clamp that you are installing.
- 9) DO NOT close the furnace for any of the submersion type clamps
- 10) DO ALWAYS make sure that the furnace will not hit the clamp when you are closing it. For some clamps mainly compression and 3 point bending the furnace can hit the clamp if it is in the up position when the furnace is closed.

- 11) For the compression clamp: you will need to leave the fixed part of the clamp off until after you have completed the mass calibration. Also, it is typical for this clamp to have relatively high compliance values  $<0.6 \mu\text{m}/\text{N}$  particularly if you are using the larger platen set.

**Experimental parameters-** Once your clamp is calibrated you can begin setting up your testing parameters. Go to Experimental menu > wizard. Once in the wizard follow the prompts to set up your experiment. Once the experiment is set up you will be directed back to the main window.

**Loading sample and starting test:**

- 12) Right click in the plot area and select signals from the popup menu, select the proper signals for your test and adjust the scaling as needed.
- 13) Measure the required dimensions for sample using the caliper. Please note that there is generally one dimension that you will be measuring using the instrument.
- 14) Load sample into the clamp and use the measure function to measure the sample's gauge length. This will apply the preload force and measure the dimension that will be used for calculating strain.
- 15) Start the test.
- 16) Once the test is completed open the TA instruments universal analysis software to view your data.

**Specs/Notes:**

- 17) Max instrument load is 18N.
- 18) The measurable stiffness range of the instrument is a fixed quantity between 100 to 10,000,000 N/m. But the actual sample stiffness will determine the type of clamp and your sample dimensions for testing to maintain the sample within the load limits of the instruments.
- 19) Be cautious about using samples that are not reasonable in size or stiffness: For example using very thin samples with the compression clamp may introduce a large amount of artifact into your data. Also if the sample stiffness is too high or too low the machine will not measure the sample accurately.