TA DSC Training Notebook

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Materials Science and Engineering
University of California, Riverside

October 16 , 2026 (rev. 1.1)

Before you begin…

- ❑ Receive a user name and temporary password for Faces scheduling
- ❑ Identify your ENGR username and Password from Systems
  - ❑ If you don't have an ENGR account, send me the following:
    - ❑ Full name
    - ❑ Principal Investigator (PI)
    - ❑ UCR Net ID
    - ❑ Email
- ❑ Coordinate a time with the lab manager for training
- ❑ Schedule a 2 hour block on Faces for your training

TA DSC Operation

I. Preparation

II. Startup

III. Design Run

IV. Running Queue

V. Results

VI. Manual Cooling

VII. Analysis

VIII. Cleanup

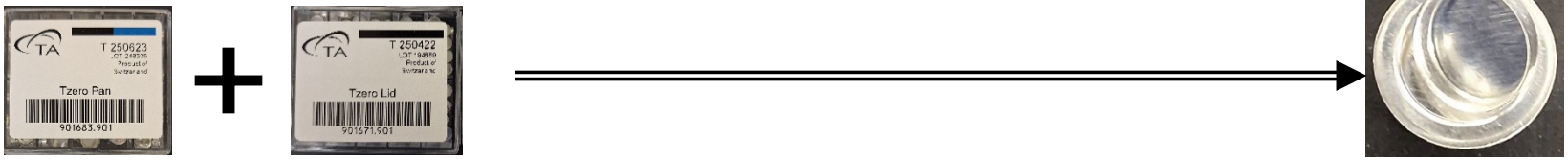
IX. Red Flags & Mistakes

I. Preparation – 1/4

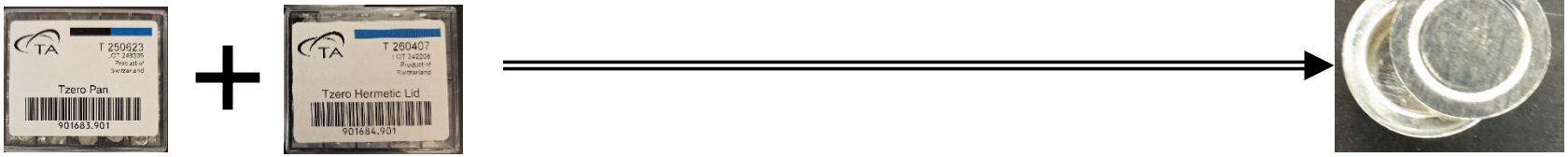
1. Prior to using DSC, check your operating conditions to avoid damage to DSC!

I. Acceptable ***Aluminum Tzero Pans + Lids***

a) Tzero Pan + Tzero Lid = no expected vapor pressure w/ Vol = 20µL



b) Tzero Pan + Tzero Hermetic Lid = max Pressure = 2 atm w/ Vol = 40µL



c) Any potential **vapor pressure** generated will need to be determined prior to running – **schedule meeting with Manager** first to discuss potential damage to DSC (e.g. Temp @ 323°C will result in 2 atm; Temp @ 600°C will result in 3 atm!)

II. Acceptable ***Gas environments***

a) Gas 1 = 100% Nitrogen (Default Gas)

b) Gas 2 = Air (80% Nitrogen + 20% Oxygen) – **See Lab Manager**

III. Acceptable ***Heating Rates***

a) 10 K/min, 20 K/min, 30 K/min – See Lab Manager for other heating rates ($$)

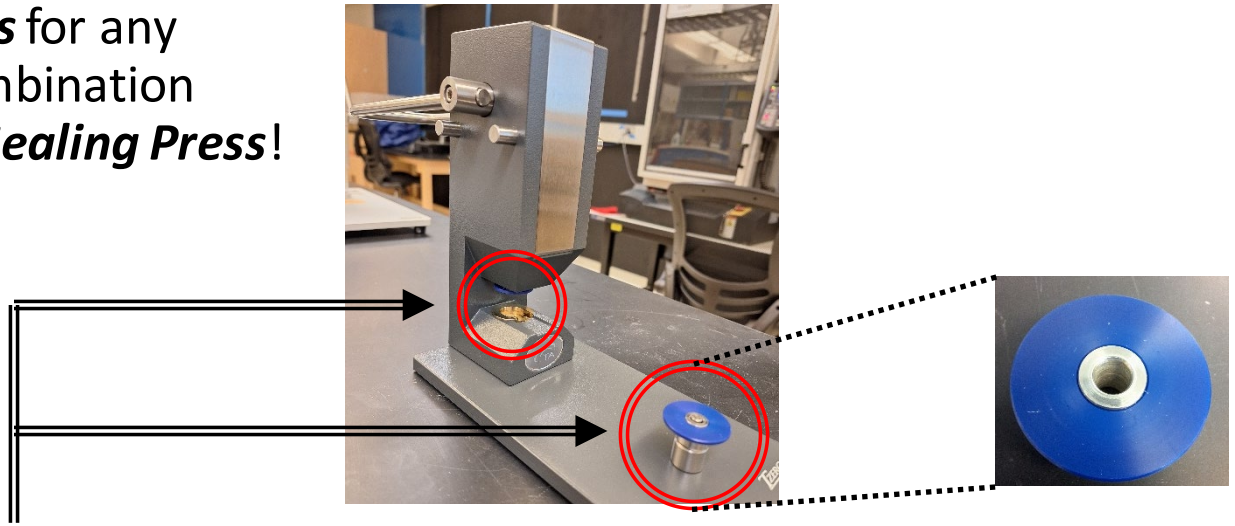
I. Preparation – 2/4

2. Sign in on the ***Sign-In Sheet***

3. Wipe down the ***Table*** and ***Tools*** for sample preparation with ***IPA***

4. Select either standard ***Tzero Lid***  or ***Tzero Hermetic Lid*** 

   Using ***Sealing Press*** for any other pan + lid combination will DAMAGE the ***Sealing Press***!

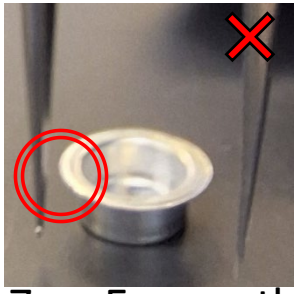


5. Confirm the ***Blue Die Sets*** are installed in ***Sealing Press***

I. Preparation – 3/4

6. Always handle the pans and lids carefully with tweezers holding only the lid and avoid altering shape by gripping or squeezing the pan base or bottom

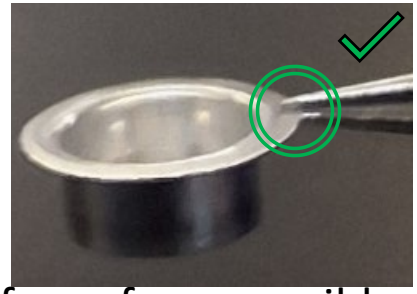
Incorrect

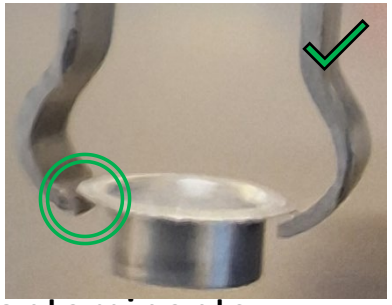






Correct





7. Ensure that all surfaces of pans are clean and free of any possible contaminants

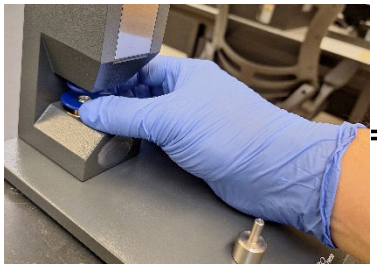
8. Minimize mass of sample to be **2 to 5 mg** to avoid complications with DSC

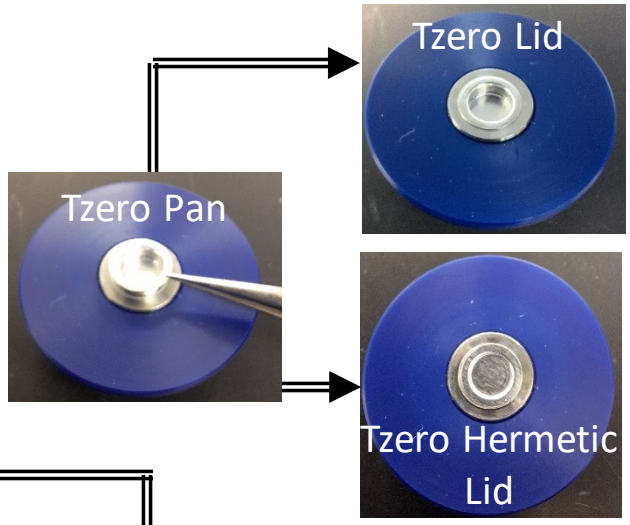
9. Use provided balance to measure and calculate the following masses (4 total)

Reference Pan (R):	**(1)** Empty Pan + Lid	
Sample Pan (S):	**(2)** Empty Pan + Lid [Unsealed]	**(3)** Sample + Empty Pan + Lid
Sample Mass:	Calculate (3) – (2) = **(4)** Sample	

I. Preparation – 4/4

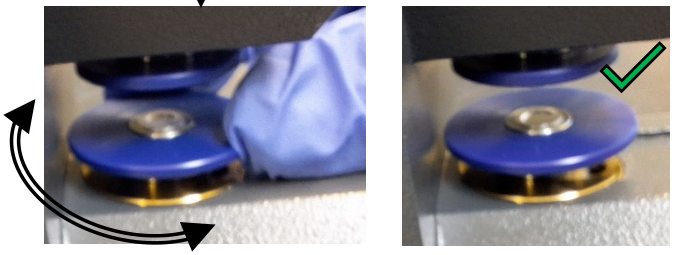
10. Carefully place sample pan in the lower die and position the matching lid in place





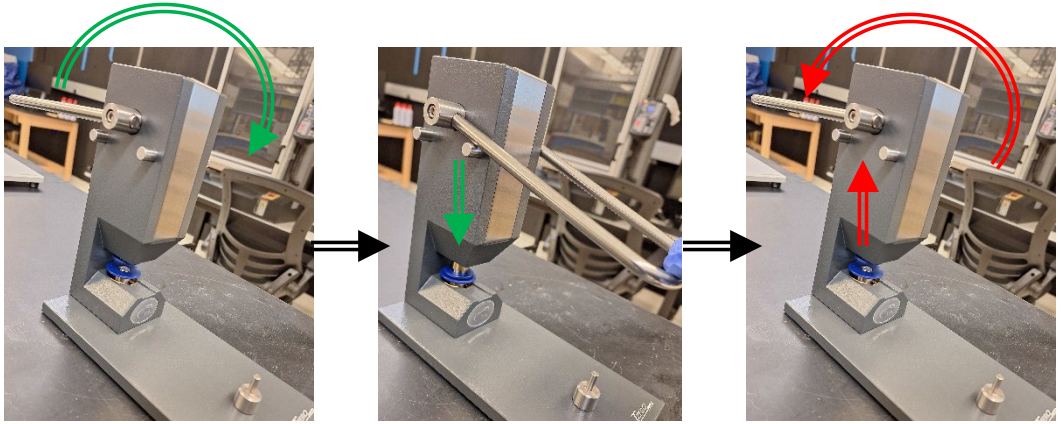
11. Place the lower die with the prepared sample pan into the press

12. Rotate the die slightly back and forth to ensure that that it is seated properly



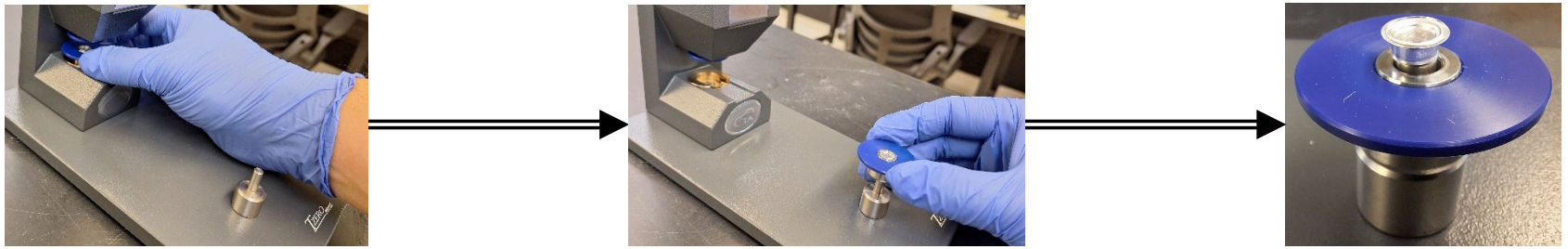
NOTE: IMPROPER ALIGNMENT WILL BREAK PRESS $$$

13. Pull the handle forward until it automatically drops on its own to seal the pan, then move the handle back



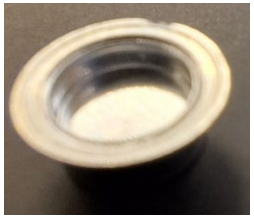
I. Preparation – 5/6

14. Carefully remove the ***Lower Die*** and ***Sample Pan*** from ***Press*** and place on top of the ***Pan Removal Tool***



15. Carefully set aside the sealed ***Sample*** and ***Reference Pans***

Tzero Pan + Tzero Lid



Tzero Pan + Hermetic Lid



16. You should now have the mass of the following:
    1) ***Mass of Empty Reference Pan***
    2) ***Mass of Empty Sample Pan***
    3) ***Mass of Sample*** (should be 2 – 5 mg)

I. Preparation – 6/6









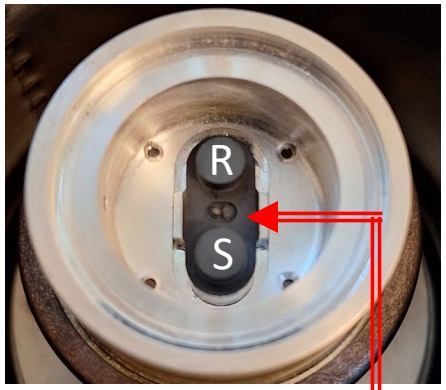
17. Carefully remove the DSC ***Furnace Cover*** and place on ***Metal Tray***

18. Carefully remove the ***Cell Lid*** and place on ***Metal Tray***

19. Use provided ***Fiberglass Polishing Pen*** to gently polish pads if dirty



20. Carefully place ***Reference Pan (R)*** on ***Top Pad*** and ***Sample Pan (S)*** on ***Bottom Pad***



21. Ensure that NO sample is present on the exterior of your ***Pans*** as your sample will transfer over onto the ***Pads***

22. Never touch or drop anything on the exposed ***Thermocouples*** between the ***Pads***

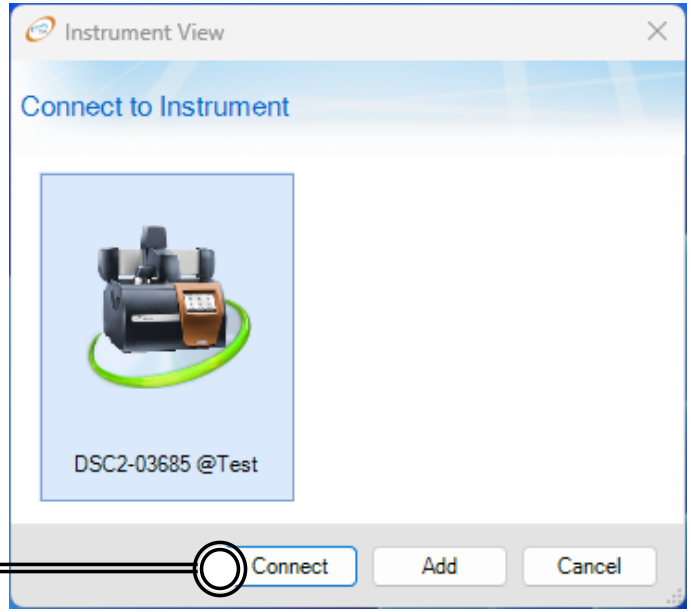
23. If the ***Sample Chamber*** is excessively dirty with fiberglass residue, contact the Lab Manager to remove it (NEVER BLOW AIR OVER OPEN SAMPLE CHAMBER!)

II. Startup – 1/2

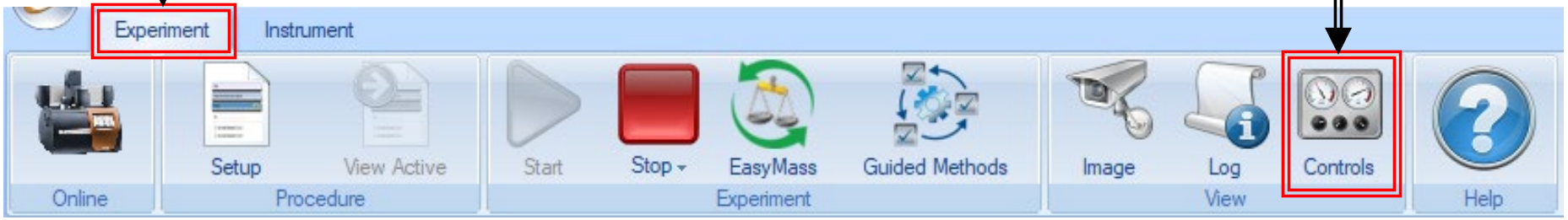
1. Click on the ***TRIOS*** icon to start DSC measurement program



2. Click on ***Connect*** to select the DSC 25 Instrument



3. Click on the ***Controls*** under the ***Experiment Tab*** to bring up the ***Control Panel***

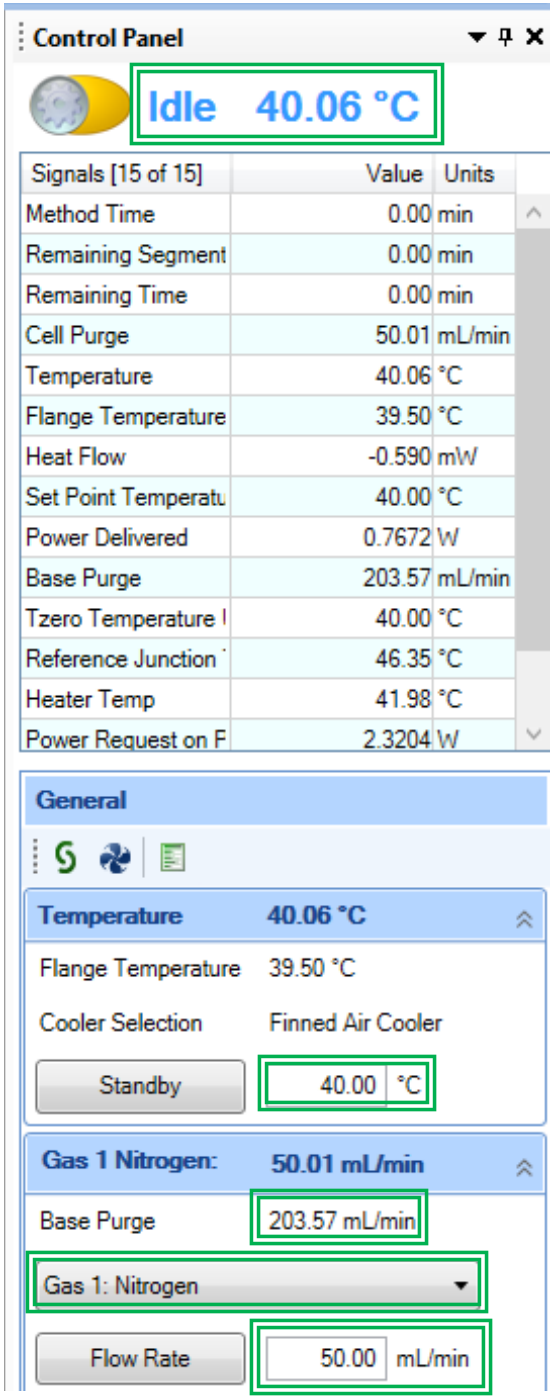


II. Startup – 2/2

4. Check and confirm the following (settings should only be changed by Manager!):
   - Status = Idle (Not actively running)
   - Temperature is ≈ 40°C
   - Standby Temperature = 40°C
   - Gas 1: Nitrogen @ Flow Rate = 50 mL/min
   - Base Purge Flow Rate ≈ 200 mL/min
   - DO NOT CHANGE SETTINGS
   - Contact Manager immediately if different!

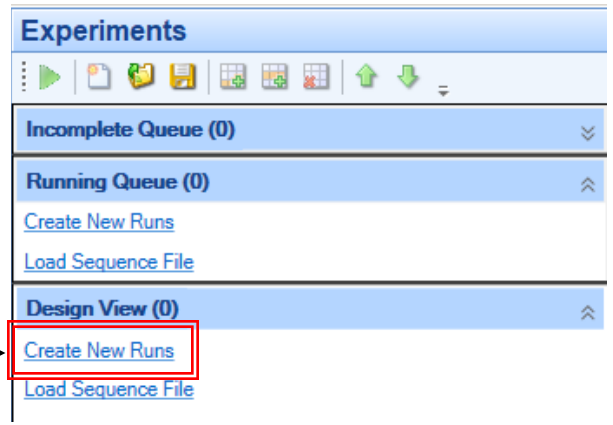
5. Click on the ***Controls*** under the ***Experiment Tab*** to close the ***Control Panel*** to prevent accidental changes

6. You may return to ***Control Panel*** to identify settings to help with troubleshooting



III. Design Run – 1/6

1. Click ***Create New Runs*** under ***Experiments > Design View***



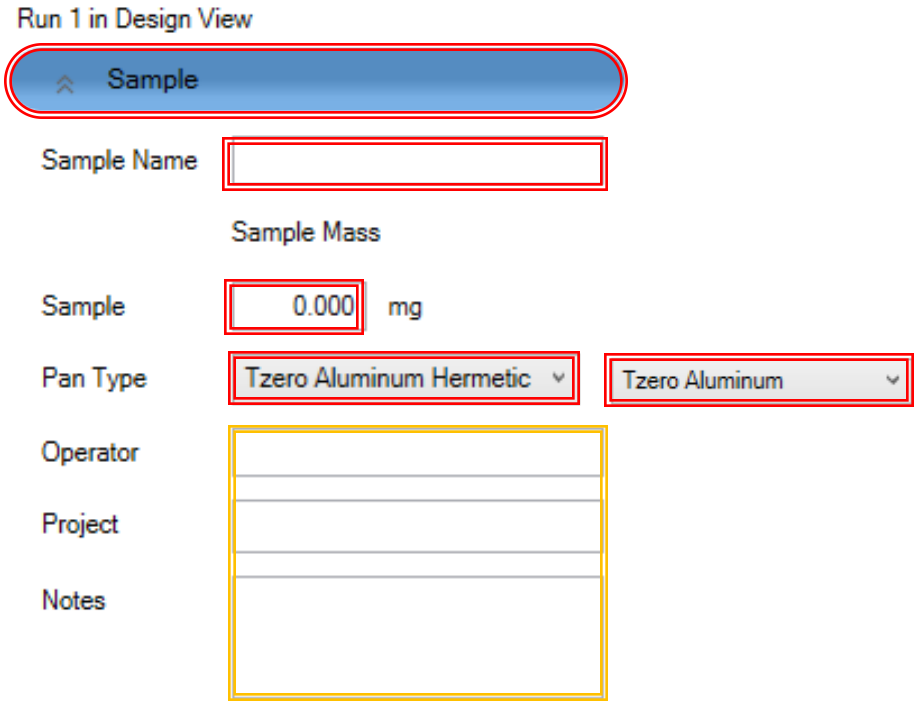
2. Expand the ***Sample Heading*** 

3. Input the ***Sample Name***

4. Input the ***Sample Mass*** in ***mg***
   Note: (Stay under 5 mg to protect DSC)

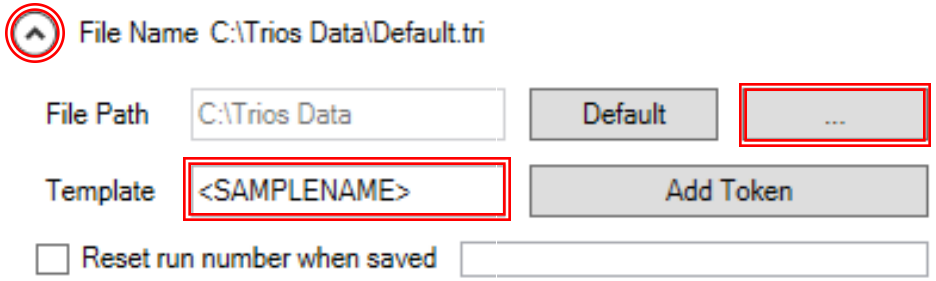
5. Select the ***Pan Lid Type***:
   - ***Tzero Aluminum Hermetic (Lid)***
   - ***Tzero Aluminum (Lid)***

6. Include optional information if desired:
   - ***Operator***
   - ***Project***
   - ***Notes***



III. Design Run – 2/6

7. Expand ***File Name***

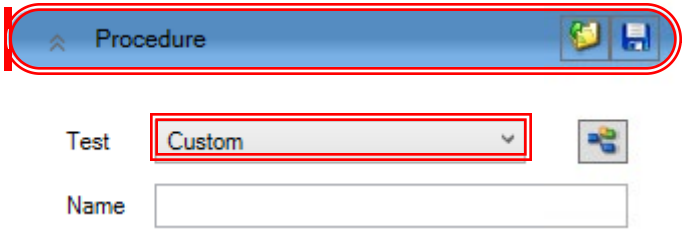


8. Click on the ***File Path Button …***

9. Select the appropriate ***Folder*** to store your ***Run*** data in ***C:/Trios/Data/<Your PI Group>***

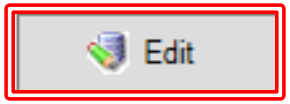
10. Enter your desired ***Filename*** in ***Template*** field (Default is set to "***Sample Name***")

11. Expand the ***Procedure Heading*** ⌃⌃



12. Select ***Custom*** (**Default**) in the ***Test*** field or choose from list of ***Templates*** (**Advanced**)

13. Click the ***Edit*** button to manually build your ***Procedure***

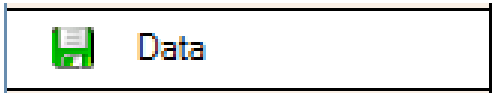


III. Design Run – 3/6

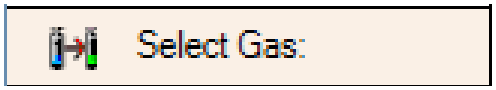
14. Review available ***Method Segments*** in the ***Help*** if desired



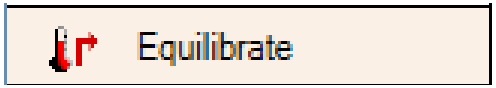
15. The following ***Method Segments*** will be the most commonly used:



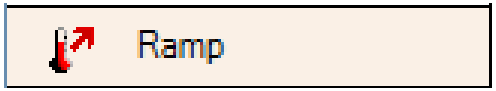
Data controls data collection during experiment; data storage is automatically initiated by the first ***Ramp***, ***Isothermal***, or ***Step*** segment; use only if collecting all data (e.g. during ***Equilibrate***)



Select Gas segment controls switching between ***Gas 1 (Nitrogen)*** to ***Gas 2 (Air)*** -> MUST ADD IF USING AIR FOR RUNS

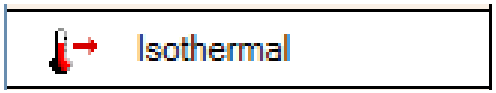


Equilibrate segment heats or cools the furnace to the defined temperature, stabilizes the furnace at that temperature, then continues to the next segment. This segment does not automatically start data collection.

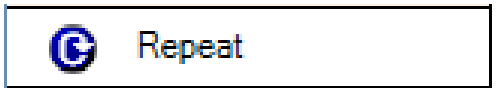


Ramp segment heats or cools the sample at a fixed rate until it reaches the specified temperature, producing a linear plot of temperature vs time. This segment automatically turns on data collection, except when preceded by a ***Data Off*** segment.

III. Design Run– 4/6



Isothermal segment holds the sample at the current temperature for a defined period of time. This segment automatically turns on data collection, except when preceded by a ***Data Off*** segment.



Repeat segment repeats a group of one or more segments with a method for the number of times specified



Up and ***Down*** arrows move selected segment up and down; respectively



New Method, clears method segments



Remove method segment

16. Click ***Apply*** when finished creating or updating your ***Procedure***

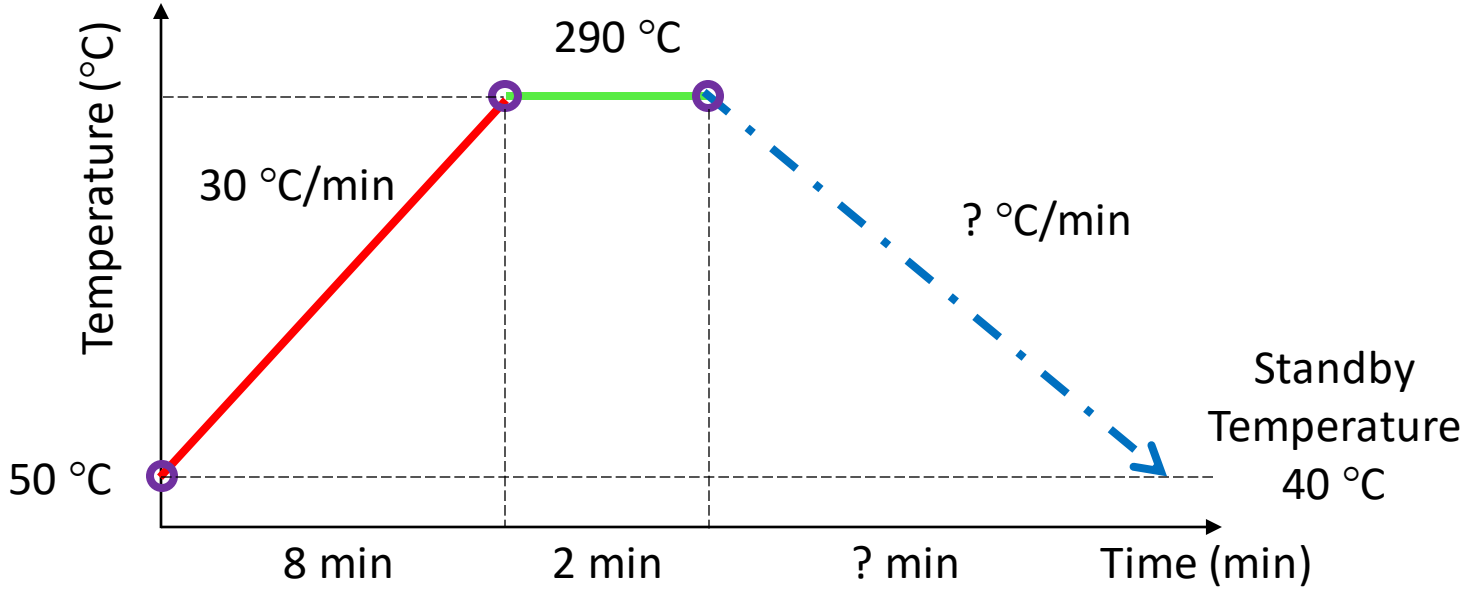


III. Design Run – 5/6

17. Build the below ***Temperature Program*** with correct ***Method Segments***

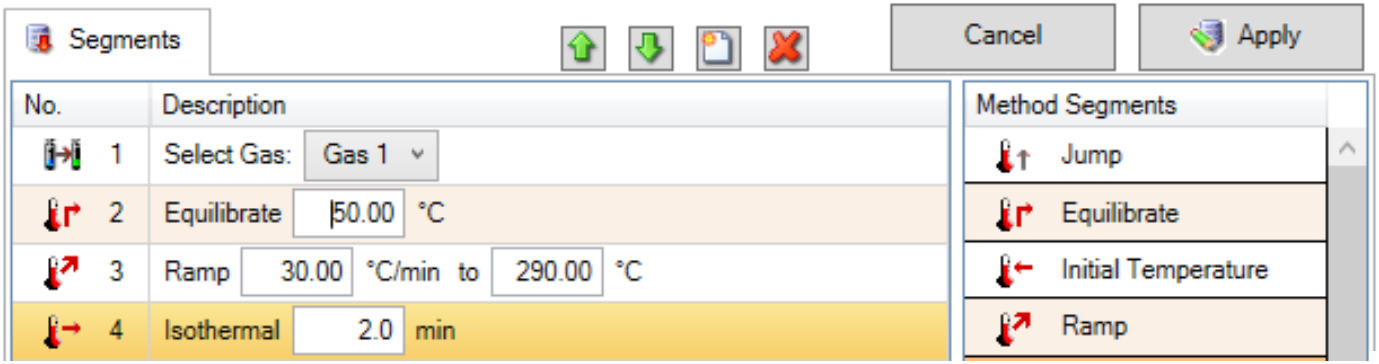
For NEW USERS AND TRAINING PURPOSES ONLY!

Go ahead and create a ***Procedure*** below with the following temperature profile and include the choice of ***Gas 1 (Nitrogen)*** as the first step

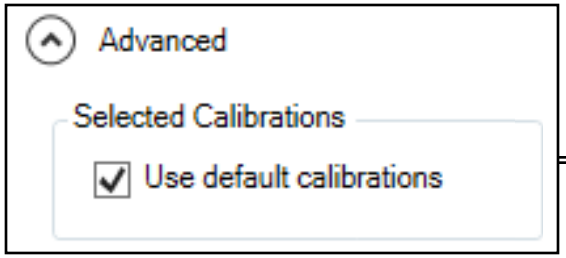


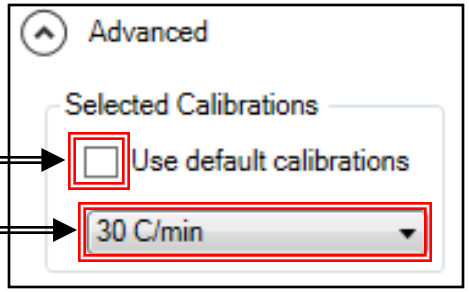
III. Design Run – 6/6

18. Your desired ***Temperature Program*** details can be reviewed in table



19. Expand ***Advanced*** options

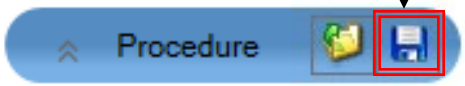




20. Confirm "***Use default calibrations***" is ***Unchecked***

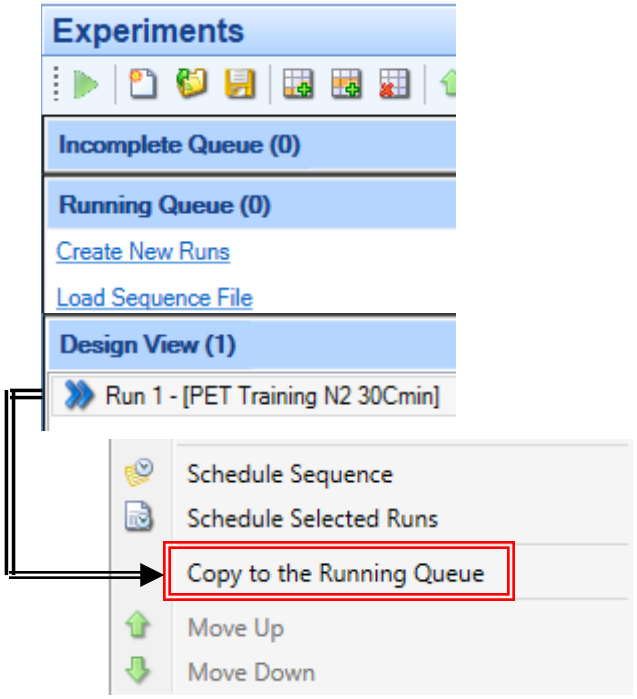
21. Select the appropriate ***Heating Rate*** in dropdown

22. Click the ***Save*** button to save your ***Procedure*** in ***C:/Trios/Procedure/<Your PI Group>***



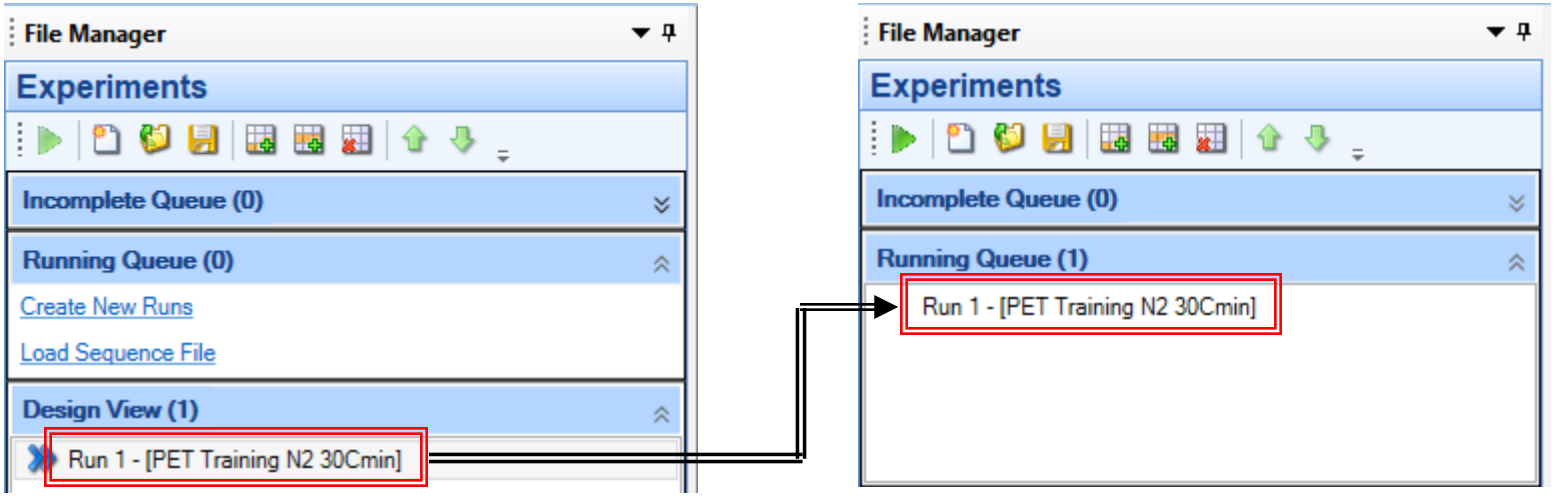
IV. Running Queue – 1/1

1. When ready, ***Right-Click*** on your ***Design Run*** under the ***Design View*** in the left column



2. Select "***Copy to the Running Queue***"

3. Your ***Temperature Program*** will now be ready to be run under the ***Running Queue***



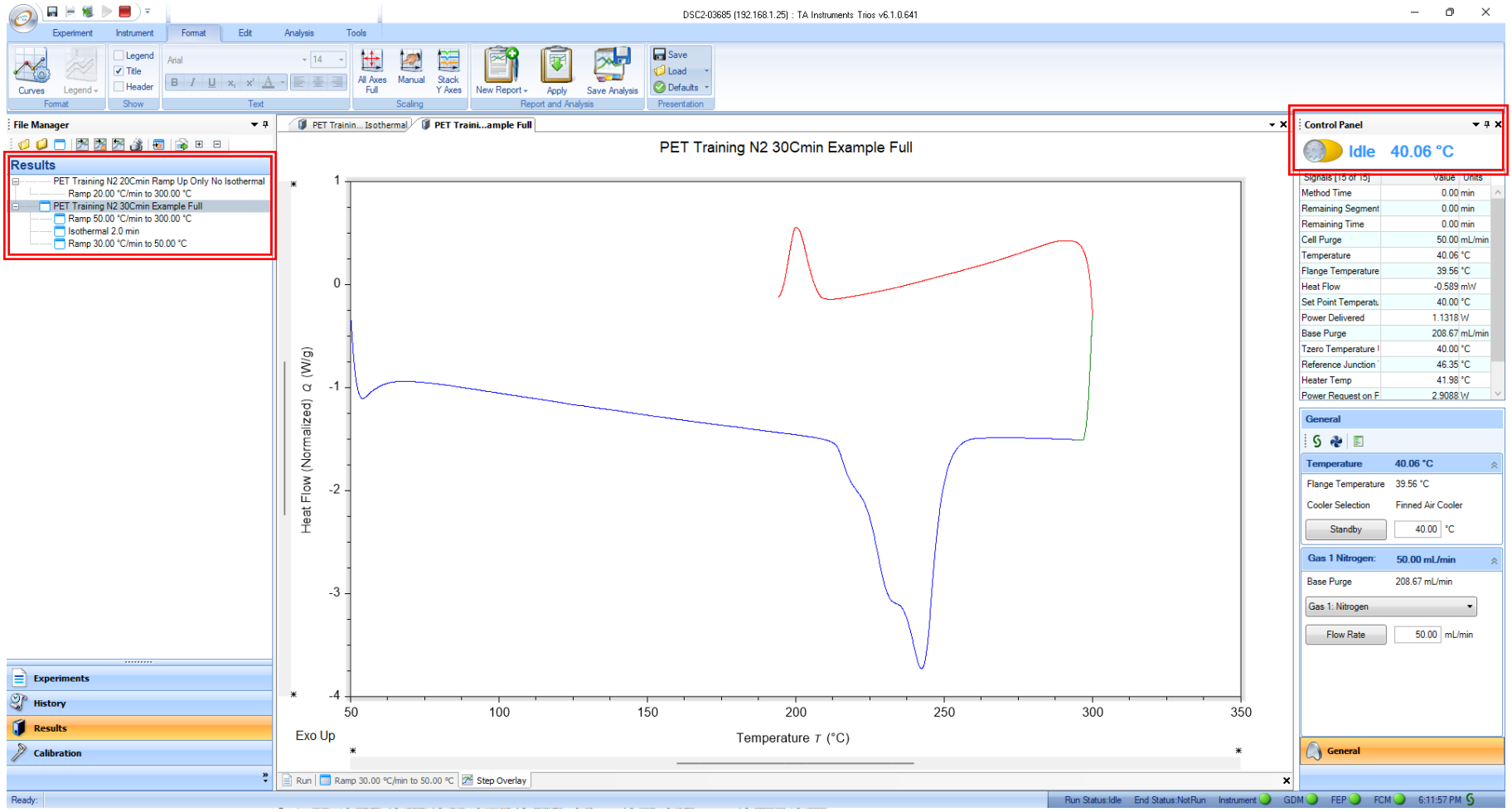
6. Click the ***Start*** button to begin your program



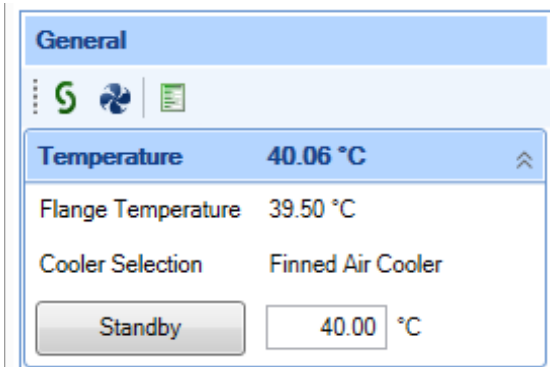
V. Results – 1/1

1. Completed experiments will be listed in the ***Results*** table on your left

2. The current ***Status*** and ***Temperature*** will be shown under ***Control Panel*** on your right



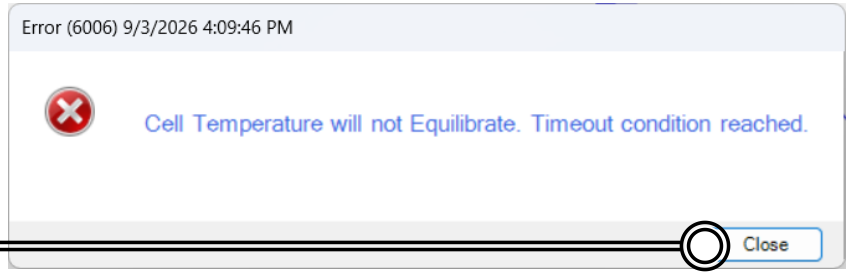
VI. Manual Cooling – 1/3



1. Once your run is completed, the ***DSC*** will SLOWLY cool back down to the ***Standby Temperature of 40 °C***

NOTE: THERE IS NO ACTIVE COOLING ENABLED ON THIS DSC

2. You may receive an error if the time required exceeds their preset value, and you can just ignore and close the ***Error***



3. For those that wish to continue with more runs you can speedup the cooling manually

WARNING – THIS WILL PUT THE DSC IN DANGER OF DAMAGE SO PROCEED CAUTIOUSLY!

4. Carefully remove the ***Furnace Cover*** and place onto the ***Metal Tray***

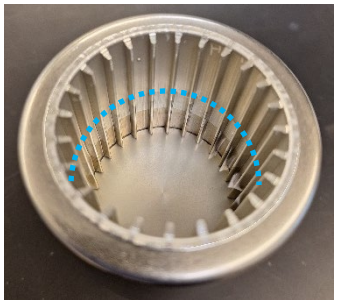




WARNING – DO NOT PLACE ANYTHING HOT ONTO THE PLASTIC OR IT WILL MELT!

VI. Manual Cooling – 2/3



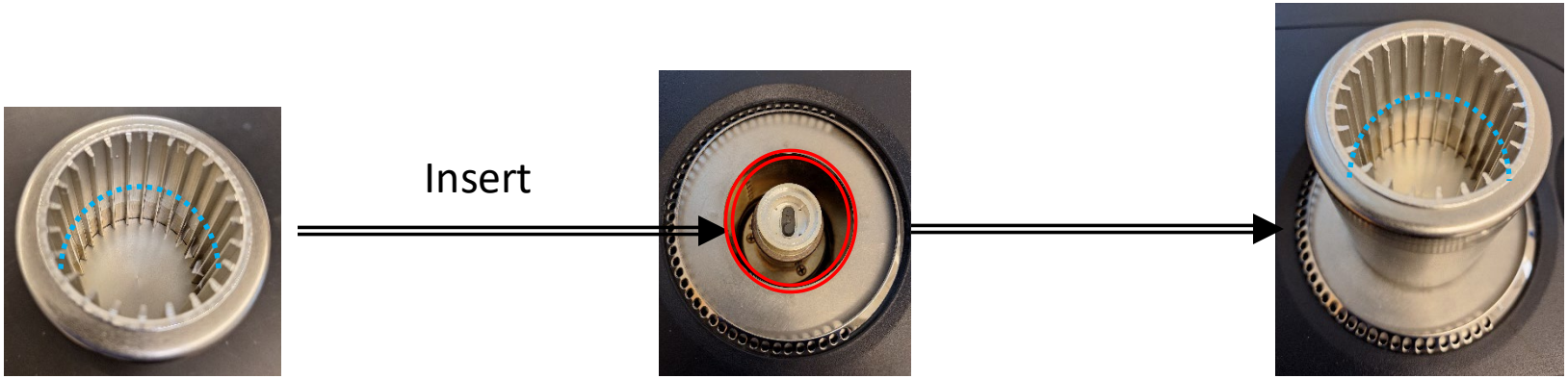


5. Carefully take the ***Quench Cooling Accessory (QCA)*** and fill with ***DI Water*** at the ***Sink*** (DO NOT OVERFILL!)

6. ***Wipe Off ANY Moisture*** or ***Water Droplets*** on the ***Exterior*** of the ***QCA***

WARNING – MOISTURE COMING INTO CONTACT WITH DSC FURNACE WILL DAMAGE IT!

7. Carefully ***Insert QCA*** over the ***Furnace*** – ***AVOID SCRATCHING THE EXTERIOR***



WARNING – SPILLING LIQUID INTO DSC FURNACE WILL DESTROY THE DSC!

8. Allow the ***QCA*** to cool the ***Furnace*** by heating up the ***DI Water***

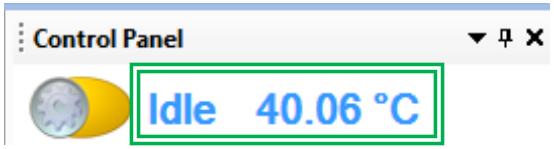
VI. Manual Cooling – 3/3

9. Once temperature has dropped, carefully ***Remove QCA*** - ***WITHOUT SPILLING***

WARNING – QCA MAY BE HOT TO TOUCH SO DO NOT ALLOW IT TO OVERHEAT!

10. Head over to the ***Sink*** and ***Pour*** out the ***Hot DI Water***

11. Repeat Steps 5 – 10 until ***Standby Temperature*** or ***Desired Temperature*** is reached



12. Remove ***QCA*** and place ***Furnace Cover*** back over the ***Furnace***



VII. Analysis – 1/2

1. Analysis of your results can be performed under ***File Manager > Results*** tab

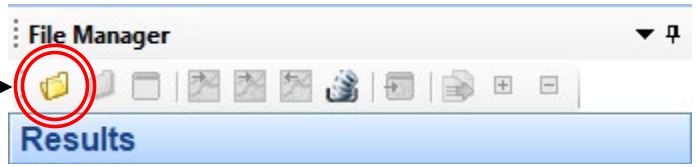
2. Click on ***Open Folder*** button to find your data in ***C:/Trios/Data/<Your PI Group>***

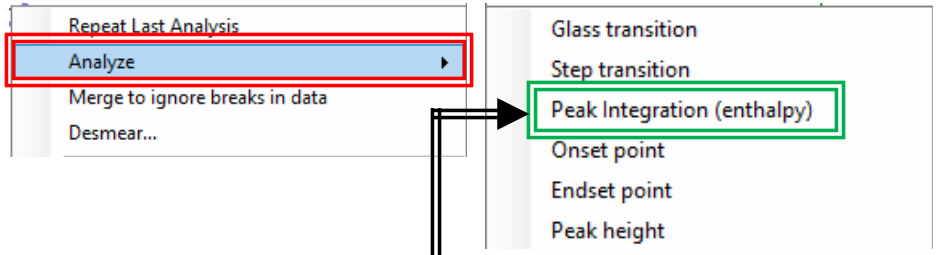
3. ***Right-Click*** on ***Graph*** and select ***Analyze***

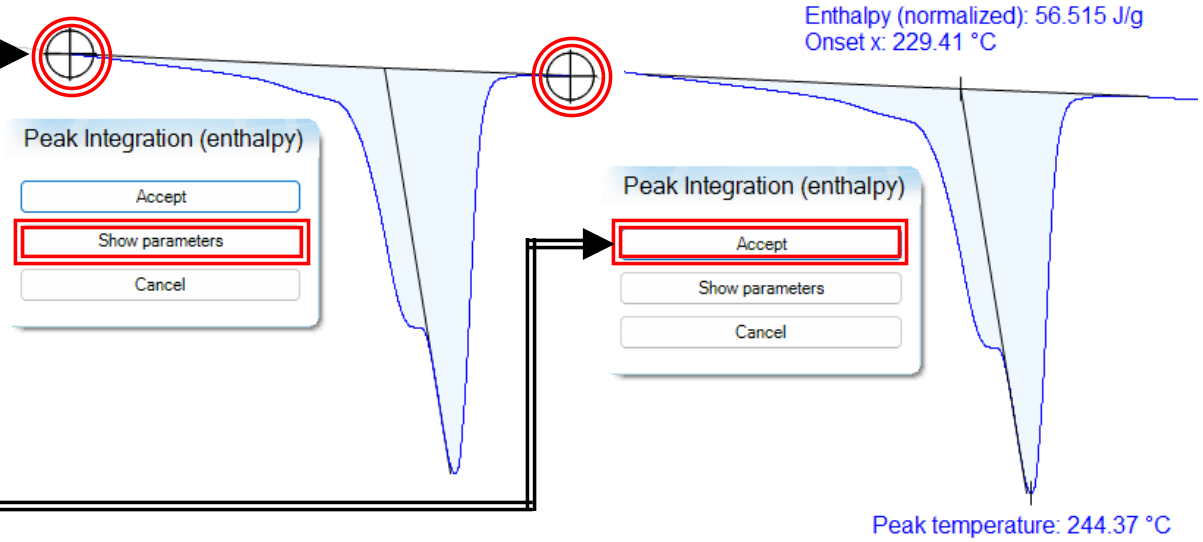
4. Select the desired ***Analysis*** (e.g. Peak Integration)

5. Move the ***Limits*** and click ***Show Parameters*** to preview analysis results

6. Click ***Accept*** when complete



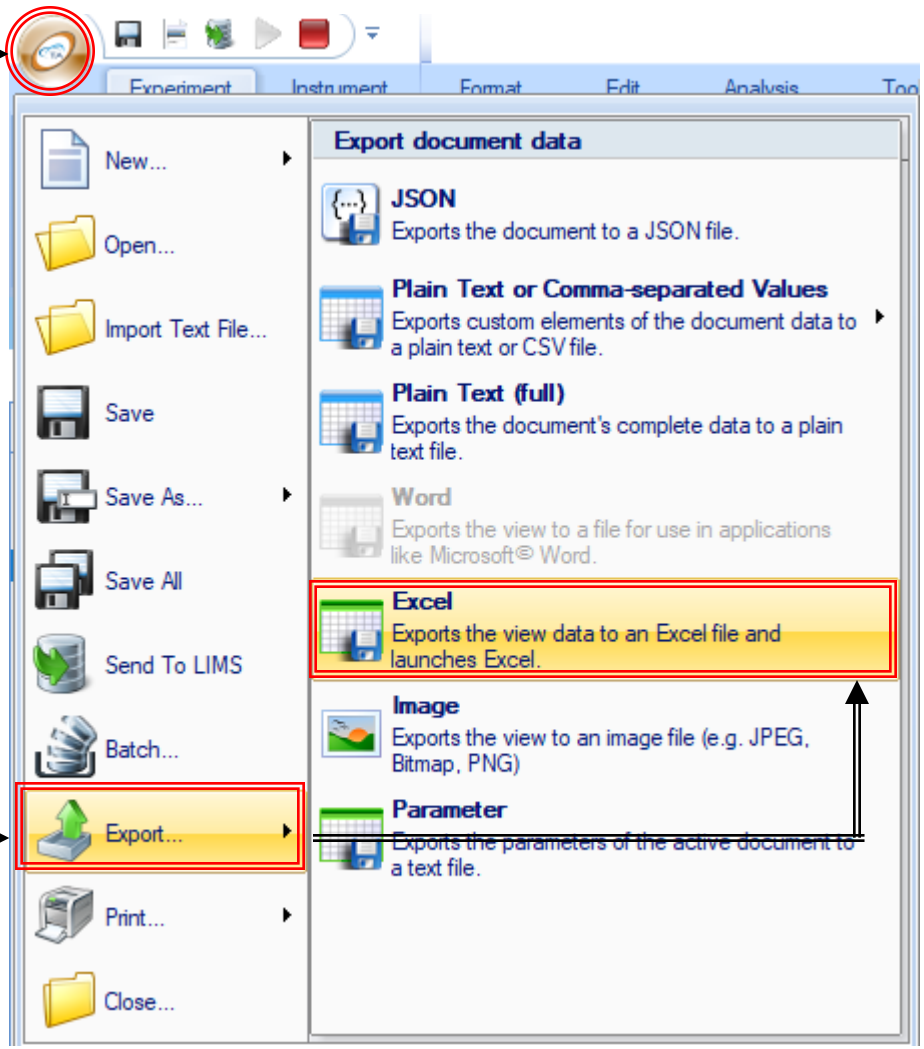




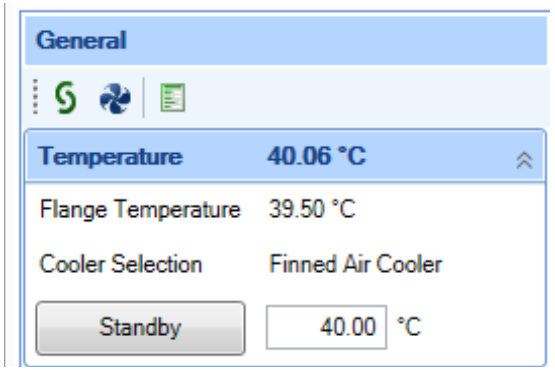
VII. Analysis – 2/2

7. To ***Export*** your data to ***Excel***, ***Click*** the ***Trios Icon***

8. Select ***Export*** and desired ***Excel*** format



X. Clean Up – 1/1



1. After experiment(s), ***DSC*** should cool itself down to ***Standby Temperature*** of ***40 ℃*** on it's own (ignore ***Timeout Error*** if it pops up)

2. Carefully remove your ***Sample*** and ***Reference Pan*** from ***Furnace*** when safe to handle



WARNING – DO NOT PLACE ANYTHING HOT ONTO THE PLASTIC OR IT WILL MELT!

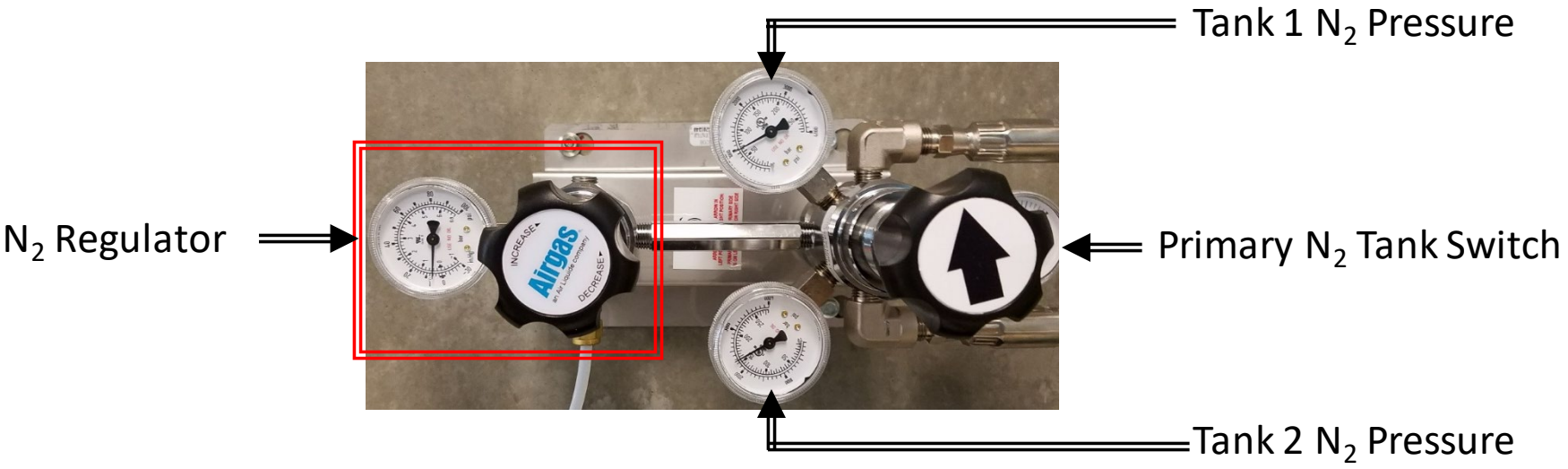
3. When DSC temperature reaches around ***50 ℃***, click the ***X*** to close the software

4. ***Log out*** of your ENGR account

5. Clean up the lab bench and place all items back in their respective drawers

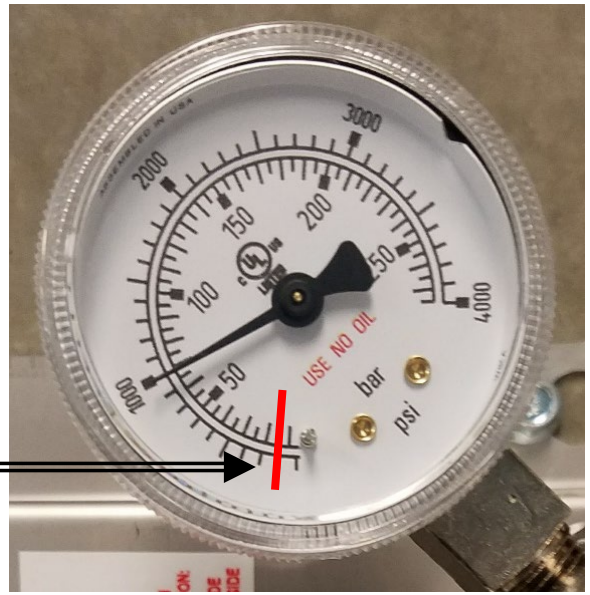
6. Sign out on the ***Sign-In Sheet*** before leaving

XI. Red Flags & Mistakes – 1/3



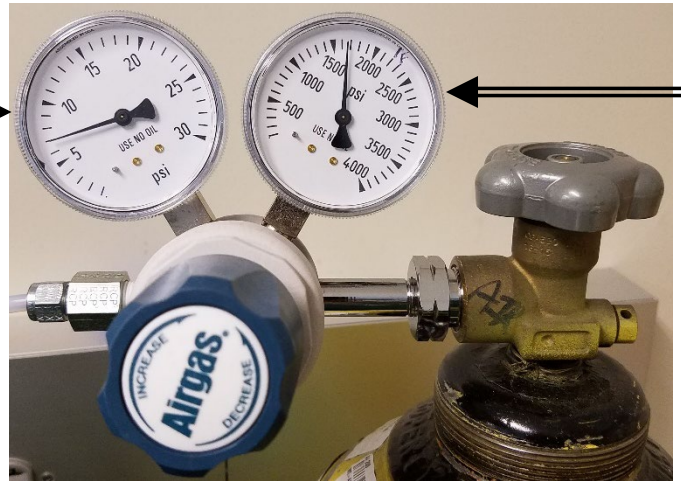
1. DO NOT ADJUST THE REGULATOR AS THIS MAY DAMAGE MASS FLOW CONTROLLERS $$$

2. Check if Tank 1 or 2 N_2 pressure is at least **200 psi**, else contact Lab Manager to replace tank



XI. Red Flags & Mistakes – 2/3

Regulated Air Pressure ≈ 7 psi



Air Tank Pressure

3. DO NOT ADJUST THE REGULATOR AS THIS MAY DAMAGE MASS FLOW CONTROLLERS $$$

4. Check if Air Tank pressure is at least **200 psi**, else contact Lab Manager to replace tank



XI. Red Flags & Mistakes – 3/3

5. Remove any trace of sample on outside and underneath crucible, as it will contaminate the DSC sample chamber $$$



6. Avoid over-filling the crucible in case the sample vaporizes and explodes contaminating the DSC sample chamber $$$



DSC sample chamber



7. To protect the DSC from maintenance and damage, DO NOT EXCEED 5 MG OF SAMPLE MASS

8. Any usage of ***Air*** or adding ***Pin Hole to Lid*** requires ***Manager*** approval to confirm it is safe to DSC $$$