

Furnace B & C OTF-1200X Training Notebook

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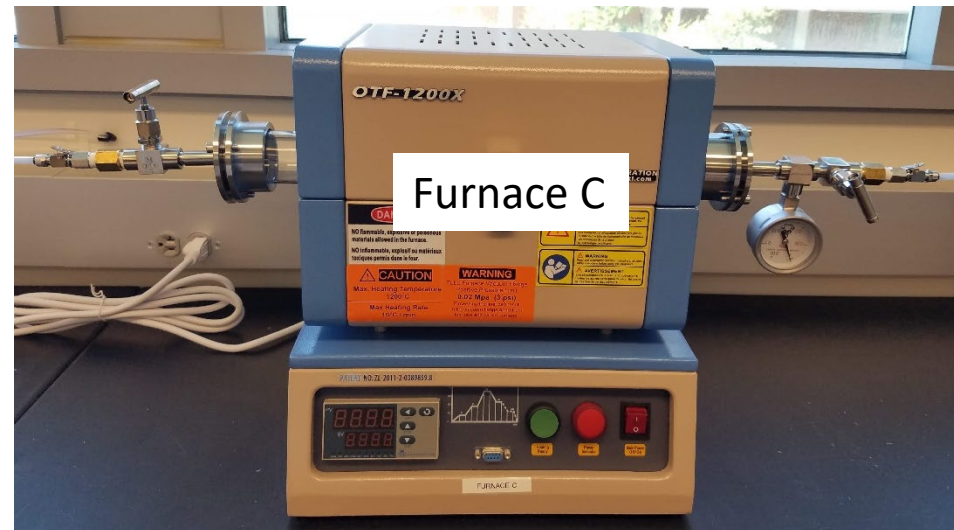
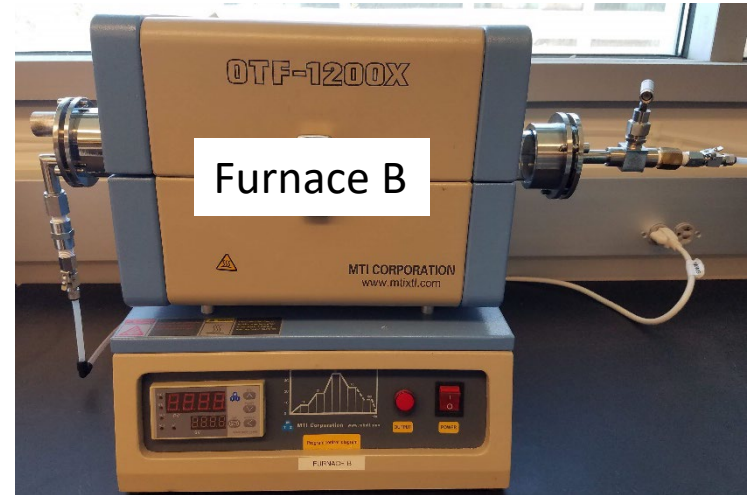
August 31, 2021 (rev. 3)

Before you begin...

- ☐ Complete the required safety training modules on UC Learning
 - ☐ Laboratory Safety Fundamentals
 - ☐ Hazardous Waste Management
 - ☐ Compressed Gas Safety
- ☐ Submit a copy of your Training Transcript to Lab Manager
- ☐ Review the MSE Policies and Regulations
- ☐ Fill out the MSE 150, 250, 309 FAU Authorization Form with PI signature
- ☐ Provide your ENGR username to Lab Manager to set up Faces account
- ☐ Arrange a time for training with Lab Manager
- ☐ Schedule your reservation on Faces for your training

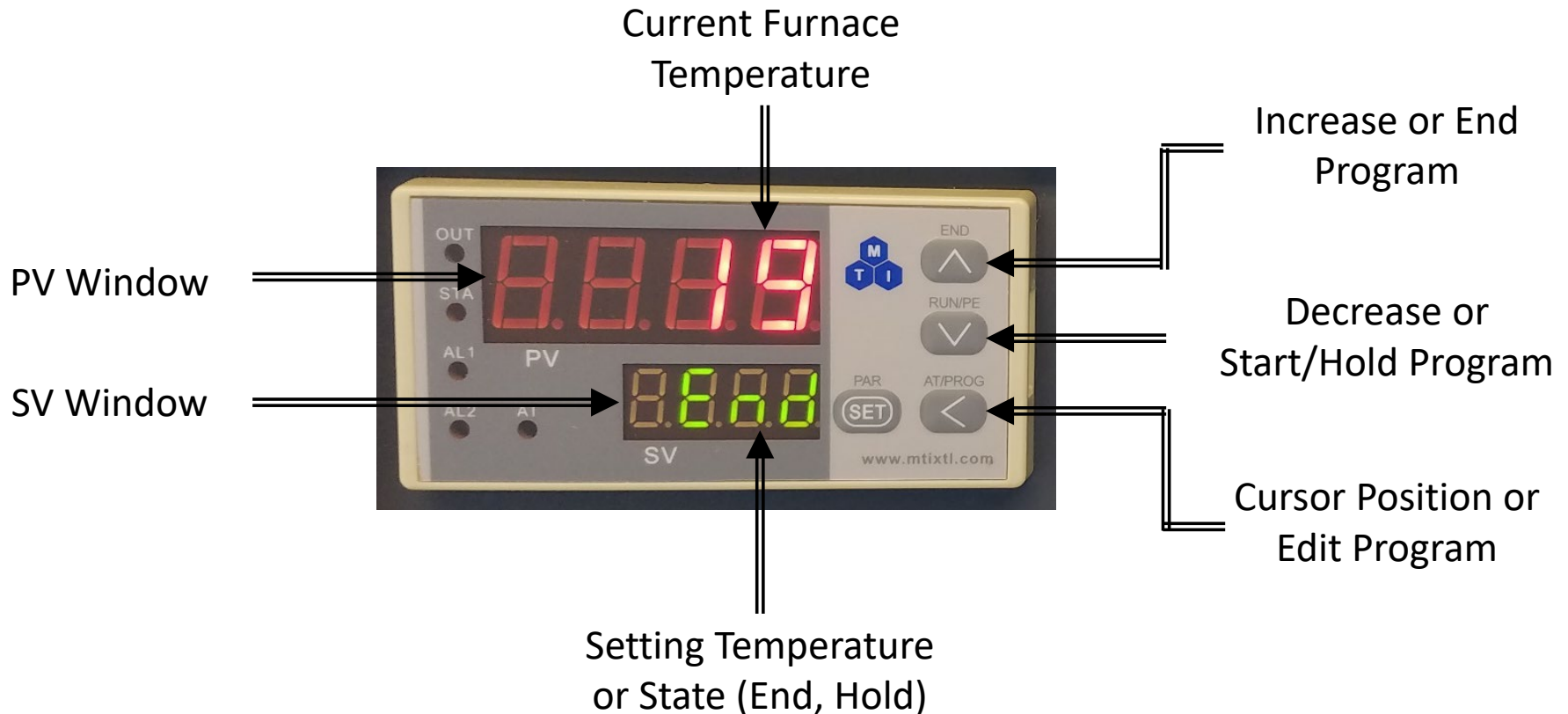
Furnace B & C OTF-1200X Furnace Operation

- I. Startup
- II. Initial Tube Assembly
- III. Sample Loading
- IV. Final Tube Assembly
- V. Turning On Purge Gas
- VI. Measurement Program
- VII. Start Measurement
- VIII. Sample Unloading
- IX. Cleanup



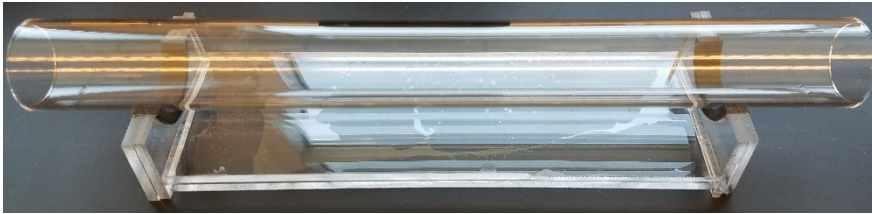
I. Startup – 1/1

1. Sign-in on the appropriate instrument sheet located on the table:
Furnace B or Furnace C



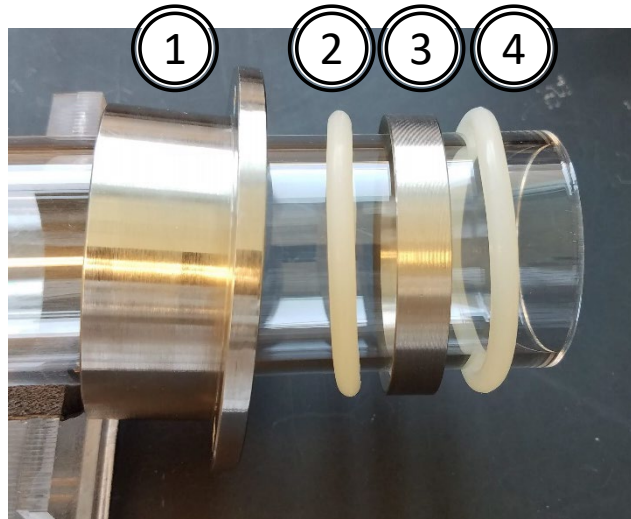
II. Initial Tube Assembly – 1/2

1. Remove any dust or particulates on the outside and inside of your quartz tube with the provided air-gun
2. Place clean tube on provided tube stand

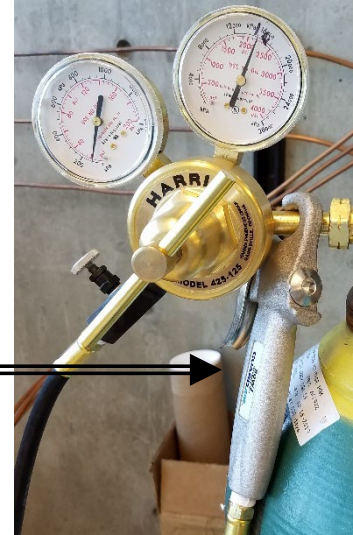


3. Insert the following on one end of the tube in order

1. Inner-flange
2. O-ring
3. Spacer
4. O-ring

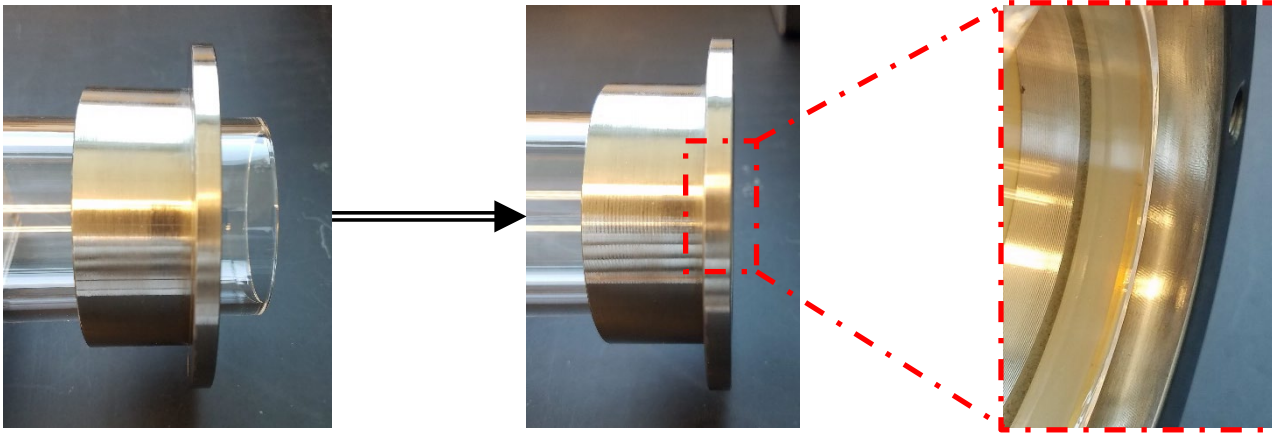


4. Repeat Step 3 for the other end of the tube

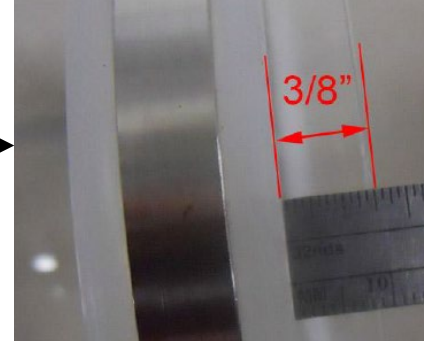


II. Initial Tube Assembly – 2/2

5. Slide and push the inner-flange against the o-rings toward the end until the inner-flange is slightly protruding past the tube



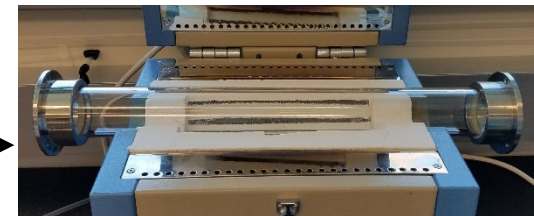
6. Confirm that outer o-ring is less than $\sim 3/8"$ or ~ 10 mm from the edge of the tube to prevent damage to tube when sealing



7. Unhook latch and open tube furnace

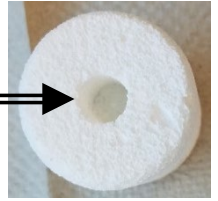
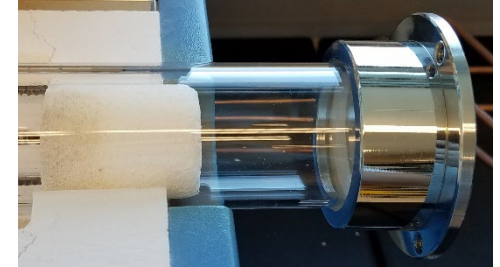


8. Place tube on tube furnace and center

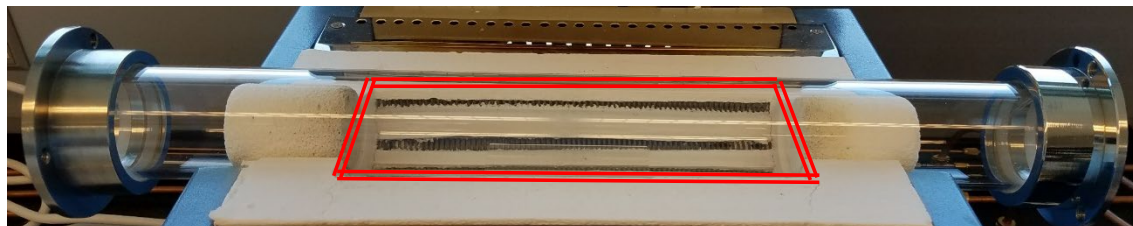
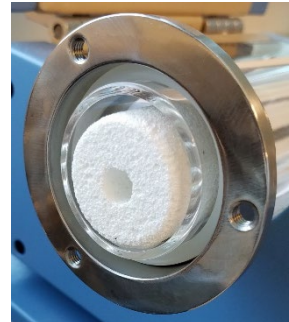
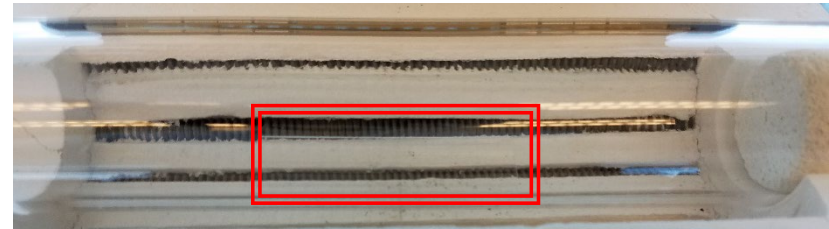


III. Sample Loading – 1/1

1. Orient alumina foam block so that the hole is facing outward
2. Insert the alumina foam block and carefully push the foam block into the inlet side until it is positioned adjacent to the hot zone using the provided hook



3. Carefully insert your sample into the tube and center using the hook
4. Orient alumina foam block so that the hole is facing out again and insert the into the other end of the tube toward the outlet side
5. Carefully push the foam block until it is positioned adjacent to the hot zone using the provided hook

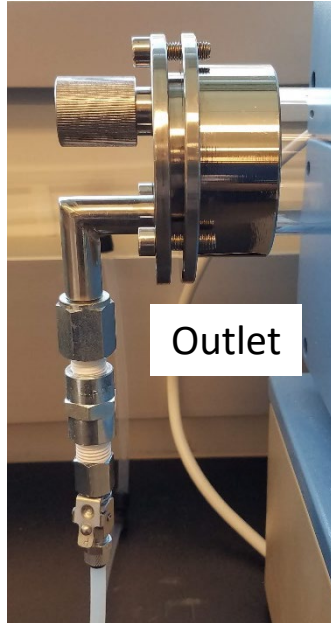


Hot Zone

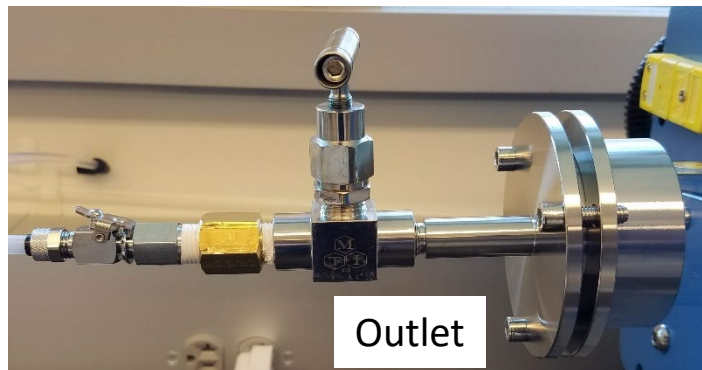
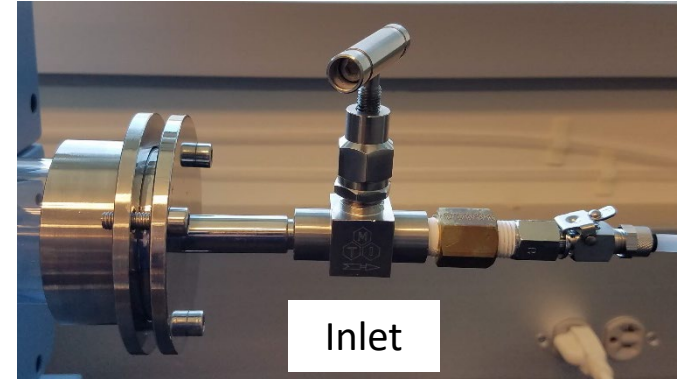
IV. Final Tube Assembly – 1/2

1. Identify the appropriate outer-flanges for Furnace B or C

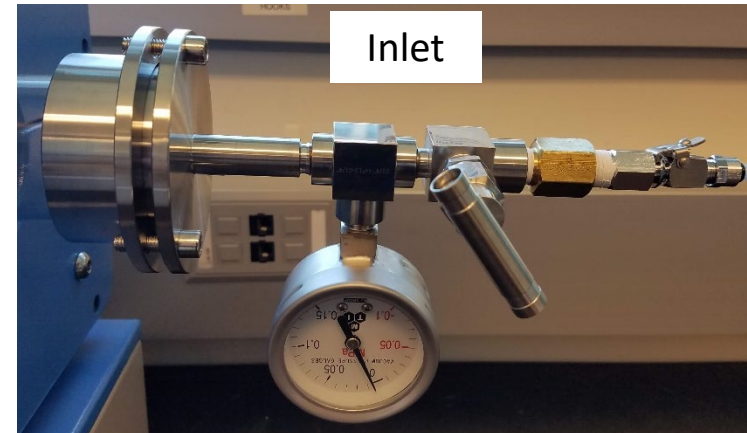
DO NOT MIX AND MATCH DIFFERENT FLANGES!!!



Furnace B

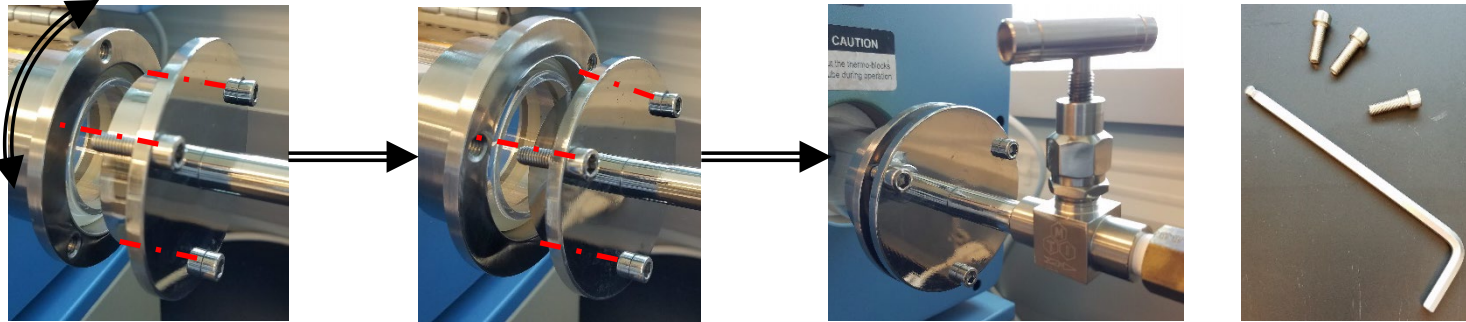


Furnace C

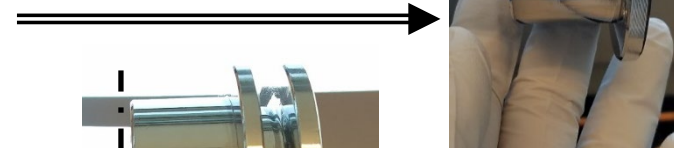


IV. Final Tube Assembly – 2/2

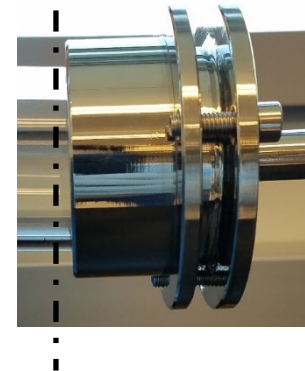
2. Align the inner-flange to match desired orientation of outer-flange and tighten screws using the hex key provided a little at a time alternating among them



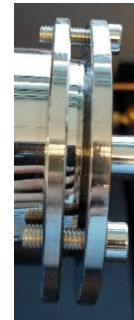
3. Holding onto inner-flange while tightening the screws help prevent it from becoming crooked



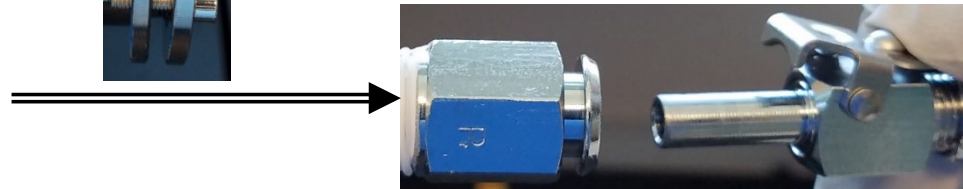
4. Unscrew and re-align o-rings if flanges are not parallel



5. Tighten the screws until the gap between the flanges are $\sim \frac{1}{4}$ " or 5 mm wide



6. Attach quick-disconnect lines to the inlet and outlet ports



V. Turning On Purge Gas – 1/1

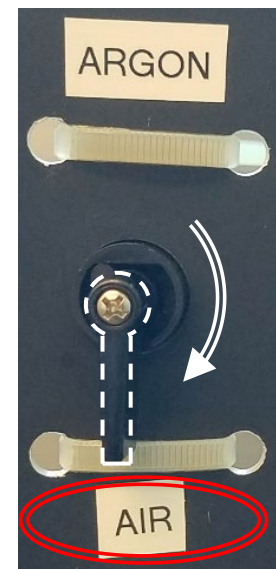
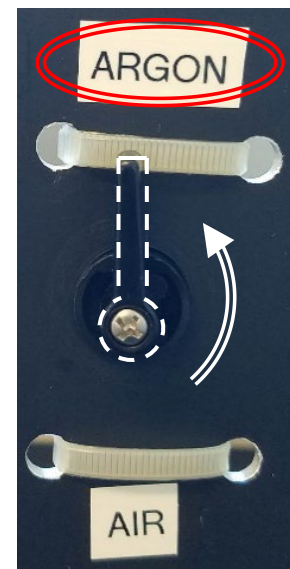
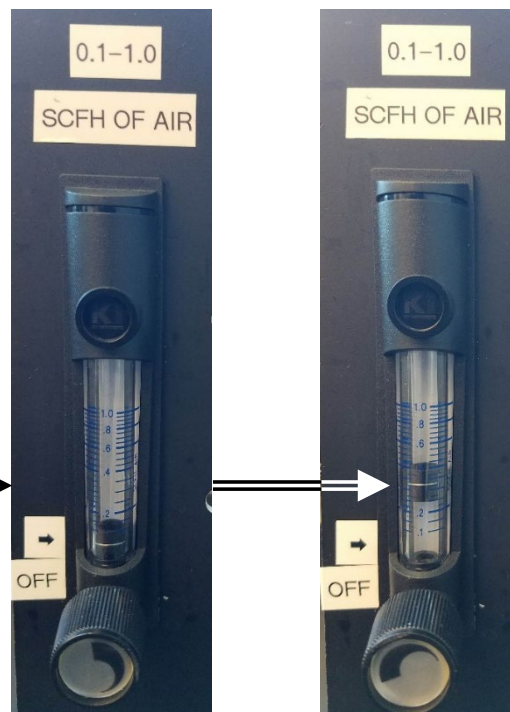
1. Turn the switch towards the desired purge gas:
Argon or Air

2. Turn the rotameter valve
to adjust desired flowrate

Increase



Decrease

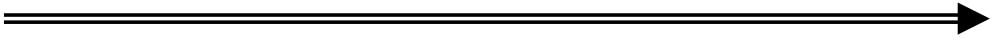


SCFH	mL/min
0.1	47.6
0.5	238
1.0	476

3. Close the furnace lid and lock

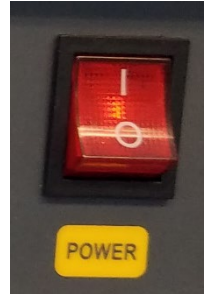


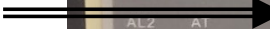
VI. Measurement Program – 1/4

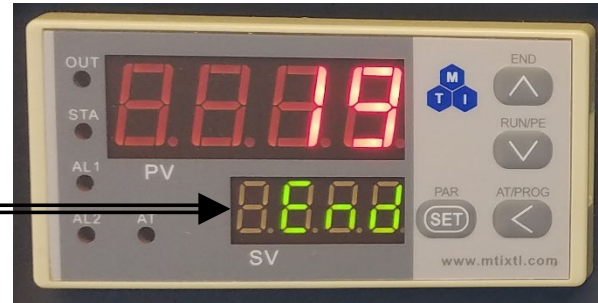
1. Turn **ON** the furnace  at the front panel if **OFF**

On

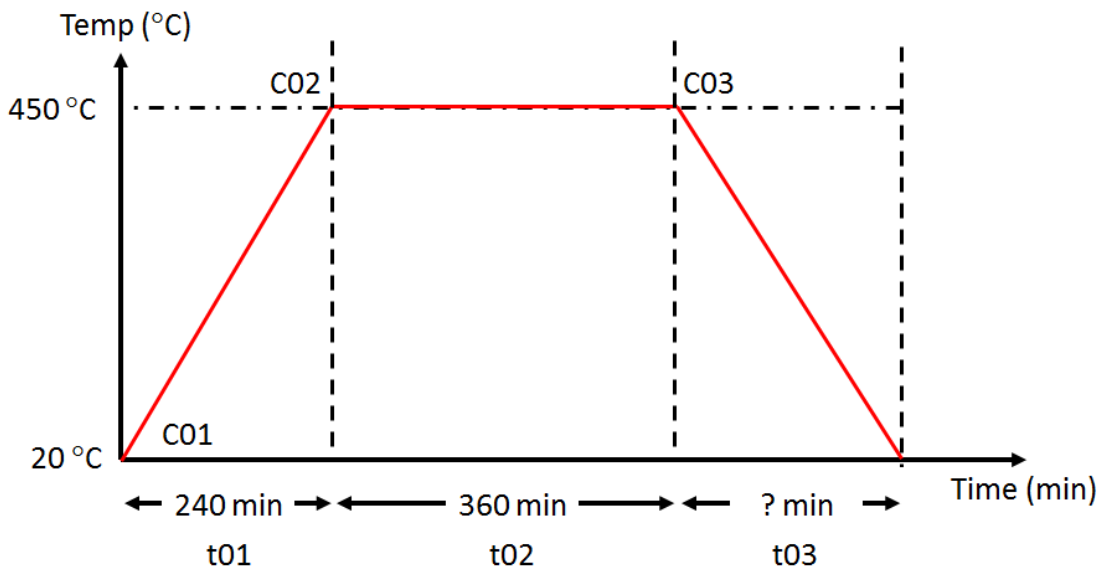
Off



2. The furnace is in the normal state if the SV indicates a flashing **End** 



3. Sketch the temperature heating program separately to determine the appropriate values to enter into the controller (see example below)



Parameter	Value
Max Temp (< 1 hour)	1200 °C
Max Continuous Temp	1100 °C
Normal Heating Rate	≤ 10 °C/min ≤ 60 °C/hr
Max Heating Rate	≤ 30 °C/min ≤ 180 °C/hr

VI. Measurement Program – 2/4

4. Enter the input data of your heating program into the prompt (see example)

5. Press ← once to display C01 on PV



6. Set to 20 °C by using keystrokes ← to move cursor and ↑ ↓ to change value

7. Press **Set** key to complete input and display t01



8. Set to 240 min by using keystrokes ← to move cursor and ↑ ↓ to change value

9. Press **Set** key to complete input and display C02



10. Set to 450 °C by using keystrokes ← to move cursor and ↑ ↓ to change value

VI. Measurement Program – 3/4

11. Press **Set** key to complete input and display t02



12. Set to 360 min by using keystrokes ← to move cursor and ↑ ↓ to change value

13. Press **Set** key to complete input and display C03



14. Set to 450 °C by using keystrokes ← to move cursor and ↑ ↓ to change value

15. Press **Set** key to complete input and display t03



16. Set to **-121** using keystrokes ← to move cursor and ↑ ↓ to change value

This last entry is used to issue a Stop Program command to stop the furnace and allow it to cool back to room temperature naturally

VI. Measurement Program – 4/4

17. The table below shows the summary of all input for the example

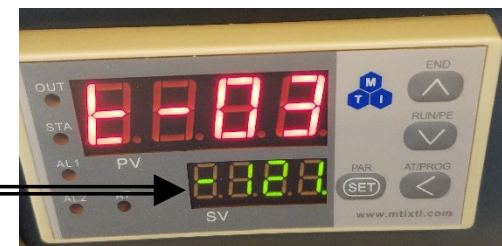
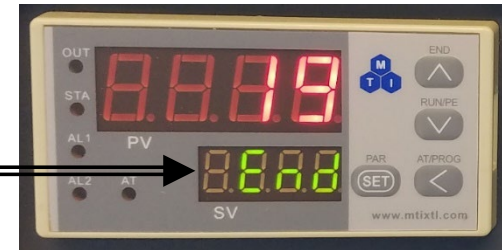
Prompt	Input Data	Description
C01	20 °C	Initial temperature
t01	240 min	Time to ramp temperature from 20 °C to 450 °C in 1 st segment
C02	450 °C	Target temperature of 1 st segment
t02	360 min	Time to hold temperature at 450 °C in 2 nd segment
C03	450 °C	Target temperature of 2 nd segment
t03	-121	Program End: Furnace will cool down naturally

18. Wait until **End** shows on SV window again

19. Confirm the program first before running

20. Press ← key to check program

21. Press **Set** key to cycle and check the program until **-121** is shown again



VII. Start Measurement – 1/1

1. To start and run the program, press and hold the ↓ for about 2 seconds until **run** is displayed on SV window

Note: Holding ↓ too long may start the program then immediately place the system in hold by accident



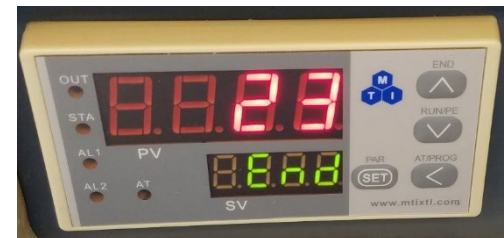
2. To hold the program, press and hold ↓ for 2 sec until **-PE-** flashes on SV window



3. To continue the program from a hold, press and hold ↓ for 2 sec until **run** flashes on SV window again



4. To stop the program, press and hold ↑ for 2 sec until **End** flashes on SV window

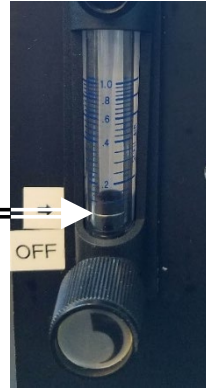
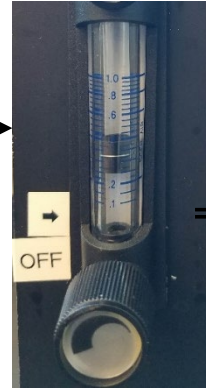
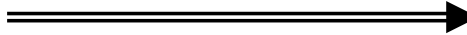


VIII. Sample Unloading – 1/1

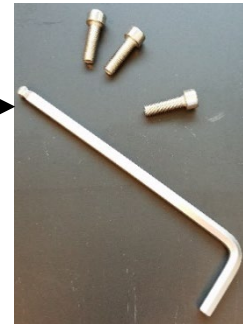
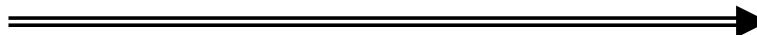
1. The program is completed when the normal state shows **End** flashing with current temperature in the PV window



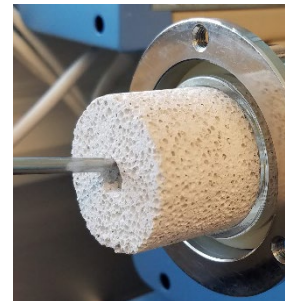
2. Turn the rotameter valve to shut off purge gas



3. Remove the outer-flanges by loosening the screws



4. Open up the furnace and remove the alumina foam blocks with the provided hook



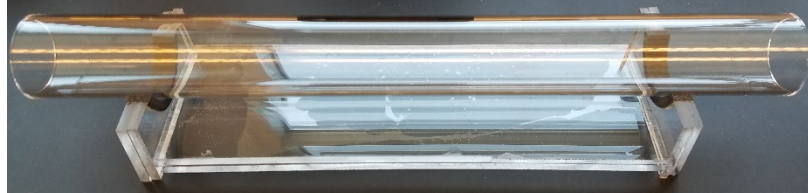
Note: Remove blocks with the hook in the up position and lift the foam block up while sliding out of the tube

5. Clean the hook first and push or pull the sample out of the tube



IX. Cleanup – 1/1

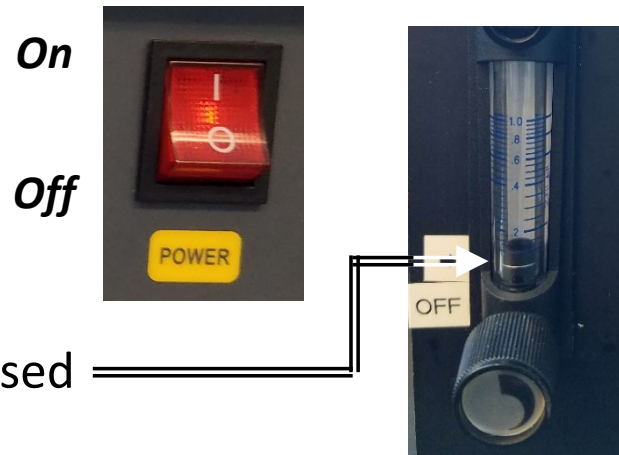
1. Remove the o-rings, spacer, and inner-flanges from your tube



2. Clean all items and place them back into the designated drawer space

3. Return your own tube, o-rings, and alumina blocks back to your drawer

4. Close the furnace tube and turn **OFF**



5. Confirm the rotameter valve is fully closed

6. Sign-off on the instrument sheet and note the tank pressure

IF TANK PRESSURE FALLS BELOW 200 PSI CONTACT THE LAB MANAGER

