PHOTOLITHOGRAPHY BAY VACUUM OVENS

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OVERVIEW

There are various oven options in the photolithography bay of the cleanroom. These can be useful as they apply a more consistent heat to your wafer than the hotplates will and can therefore be useful for keeping tighter controls on your photoresist bakes. The drawback is that oven bakes usually take substantially longer than the few minutes needed on hotplates.

There are three options for ovens in the photolithography bay. The first option is the two blue ovens right next to the spinner bench. These are useful as they are quick to heat up and process with. The drawback is that they do not have control over the ramp-up and cool-down. These are most useful if you are wanting to place your wafer into an already heated environment.

The next option is the YES Polyimide oven. This oven offers the tightest control over the ramp-up and cool-down of the chamber. The drawback of this system is that it is very slow and any process will probably take hours.

The last option is the YES Image Reversal oven. This is usually reserved for image reversal and vapor prime. These processes involve flooding the chamber with ammonia and adhesion promoter vapor respectively. Because of this, the chamber is relatively "dirty" compared to the other two options and it is generally recommended to go with one of the others. This SOP will still outline its operation in the event it is needed though.

BLUE M VO OVENS

NOTE: DO NOT allow the oven to operate over 260°C (500°F).

No Vacuum Procedure:

1. Set Temperature
   a. Turn ON main power switch. Allow the controller to run its initial diagnostics.
   b. Press the lower portion of the controller to illuminate the Increment, Decrement, and Scroll keys.
   c. The process (actual temperature) is displayed on the top display line. The set point temperature is displayed on the bottom line. Press the Increment or Decrement keys until the desired set point is indicated on the bottom line of the display.

Vacuum Procedure:

1. Set Temperature
   a. Turn ON main power switch. Allow the controller to run its initial diagnostics.
   b. Press the lower portion of the controller to illuminate the Increment, Decrement, and Scroll keys.

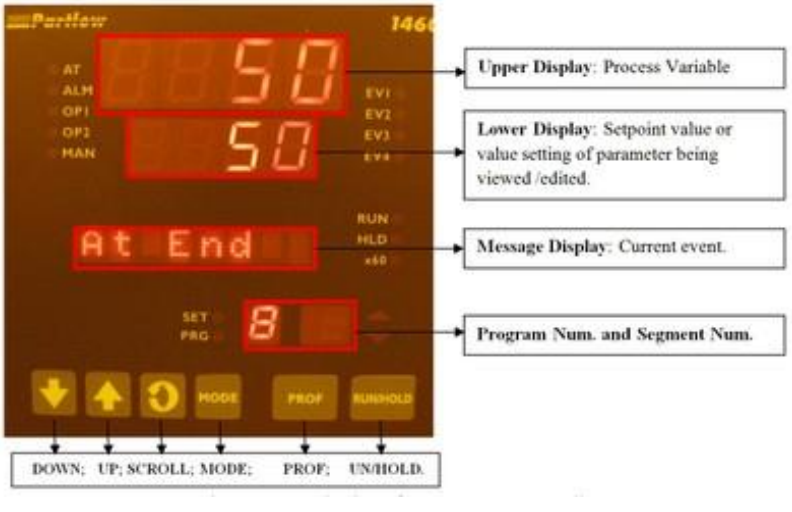
c. The process (actual temperature) is displayed on the top display line. The set point temperature is displayed on the bottom line. Press the Increment or Decrement keys until the desired set point is indicated on the bottom line of the display.

2. Release vacuum and open the oven door
   a. Shut off VACUUM valve to isolate the oven from the vacuum source.
   b. Open VENT valve to bleed air into the oven.
   c. Open the oven door when the oven is under atmospheric pressure.
3. Put oven under vacuum
   a. Close the door.
   b. Close VENT valve to isolate oven from the atmosphere.
   c. Turn on the vacuum pump.
   d. Open VACUUM valve. The vacuum should start building up as shown on the vacuum gauge.
   e. Let the vacuum building up to about 15-inch Hg. Close VACUUM valve, isolating the oven.
4. Use nitrogen (optional)
   a. Release the vacuum (see part B).
   b. Make sure VACUUM valve is closed. VENT valve is opened.
   c. Open GAS valve.
   d. After the processing, put the oven under vacuum again.

YES POLYIMIDE OVEN

The YES high temperature cure oven is designed to provide a controlled ramp curing process for temperatures up to 550°C in an oxygen-free environment. In addition, YES ovens provide a cleaner process in a controlled environment, so you'll get higher yields. Critical steps in any cure process include complete removal of residual solvents, uniform temperature distribution, pressure control, ability to maintain dry inert atmosphere, and control of heating and cooling rates.

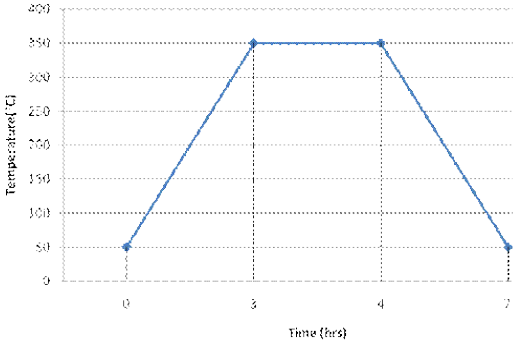
Enter the program profile:



1. To enter the program profile, press **UP** arrow and **SCROLL** key simultaneously until the unlock message appears and release the keys. Using UP arrow, increase the number to 10 (unlock number). Press **SCROLL** key and release.
2. Press **PROF** (Profile) key until the desired program # (1-8) appears in the **SET PRG** display and then press **RUN/HOLD** key to enter the programming mode.

Set up a program:

Generally, 6 steps will be required to be programmed for the above temperature profile. Please notice that for each ramp state a hold band **MUST** be performed to ensure the actual temperature reaching the setting temperature. If not, the hold band will keep ramping up or down until temperature reaches the set point. Each step has three parameters: **Desired Temp., Time, and Event**. Please follow the following steps to finish your first program.



Step 1:

1. Use **UP/DOWN** arrow to select desired temperature, e.g. 350°C. Then press **SCROLL** key.
2. Set up Time for current temp. (Idle) to reach desired temperature, e.g. 3.00 (hrs). Then press **SCROLL** key.
3. Select event: 0000 for ramping up; then press **SCROLL** key to enter the second step.

0000 (ramping up), 0001 (ramping down), 0010 (dwell state).

Step 2:

1. The temperature would be the previous temperature for hold band, "_ _ _ _" represents previous temperature in **Step 1**. Or use **UP** or **DOWN** arrow to set T to 350°C. Then press **SCROLL** key.
2. The time for hold band is always 0.01 (1 min). Then press **SCROLL** key.

3. Select event: 0000 for ramping up; then press SCROLL key to enter the third step.

Step 3:

1. The temperature would be the previous temperature for dwell state, "_ _ _ _" represents previous temperature in Step 2. Or use UP or DOWN arrow to set T to 350°C. Then press SCROLL key.
2. Set up the time you want hold, e.g. 1.00 (hrs). Then press SCROLL key.
3. Select event: 0010 for dwell state; Then press SCROLL key to enter the forth step.

Step 4:

1. Use UP or DOWN arrow to select the desired temperature, e.g. 50°C. Then press SCROLL key.
2. Set up the time you want current temp. (Idle) to reach the desired temperature, e.g. 3.00 (hrs). Then press SCROLL key. Usually choosing 0.01 (min) if you want the oven cooling down ASAP.
3. Select event: 0001 for ramping down; then press SCROLL key to enter the fifth step.

Step 5:

1. The temperature would be the previous temperature for hold band, "_ _ _ _" represents previous temperature in **Step 4**. Or use **UP** or **DOWN** arrow to set T to 50 °C. Then press **SCROLL** key.
2. The time for hold band is always 0.01(1 min). Then press **SCROLL** key.
3. Select event: 0001 for ramping down; then press **SCROLL** key to enter the final step.

Step 6:

1. The temperature would be the previous temperature for hold band, "_ _ _ _" represents previous temperature in **Step 5**. Or use **UP** or **DOWN** arrow to set T to 50 °C. Then press **SCROLL** key.
2. Keep pressing **DOWN** key until "**END**" appears. Then press **SCROLL** key.
3. Press "**MODE**" twice until the "**EXIT**" appears in Message Display.

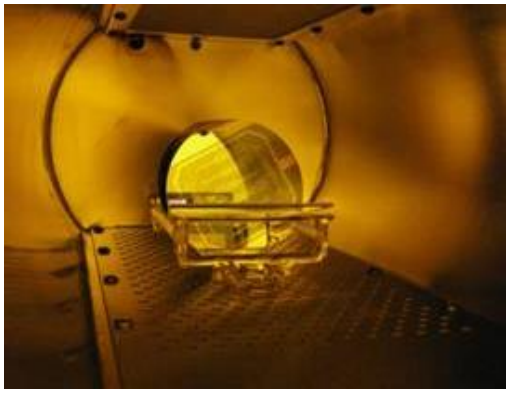
Run a program:

Operator's Touch Screen Panel

1. While you can program the YES Oven without logging in to FOM, to run a process you must log in or it will fail.
2. Press ENTER RECIPE NUMBER, type in the program number, e.g., 4, press ENTER, then DONE.
3. Press ACCESS AND ALARM PANEL »»» ENTER ACCESS CODE: 1984. ENTER and then DONE
4. Press GO TO RECIPE SET UP PANEL »»» GO TO RECIPE 4 SET UP PANEL.
5. Enter the optimized value in the following pictures if N_2 is only used gas.

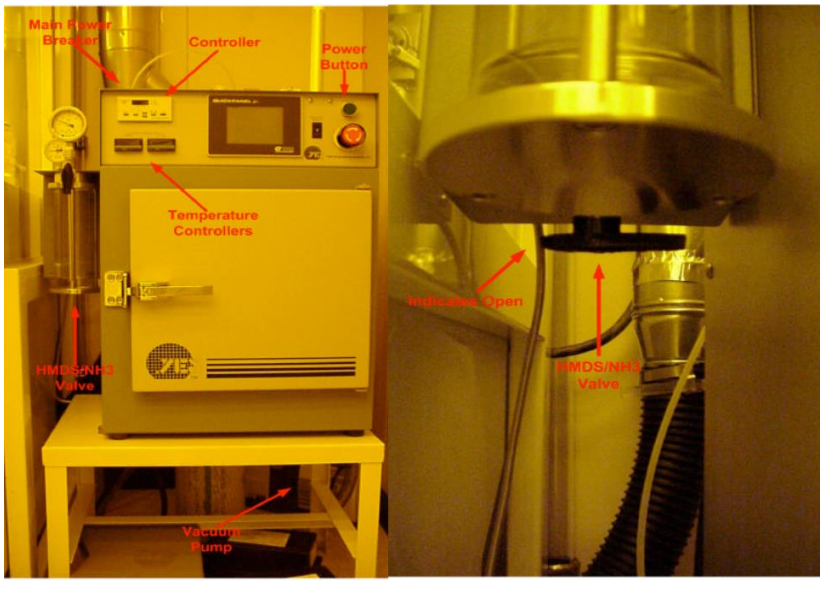
NOTE: ENTER RAMPE UP WAIT ABORT TIME IN MUNITES should be longer than the time in your ramping up step.

6. Press "EXIT" and open chamber and load samples vertically using the glass wafer boat.



7. Close chamber and press PRESS TO START PROCESS.
8. When the process was completed, press PRESS TO STOP PROCESS and open chamber to unload your samples.
9. Logout from the tool in your FOM account.

YES IMAGE REVERSAL OVEN – VACUUM BAKE



SYSTEM START-UP:

1. Don't forget to login into your FOM account and login to the tool.
2. Turn **ON** power to the oven using the breaker located on the back, left corner.
3. Press green **Power On** button
4. Turn **ON** vacuum pump located behind oven on the floor.

VACUUM BAKE:

1. Turn HMDS/NH_3 valve to HMDS position (located behind glass cylinder, short end of knob indicates valve selection)
2. Select **4** on the Thumbwheel.
3. Set temperature for front/rear zones. Press and hold **SET BUTTON** (far left), set temperature to desired setting.

NOTE: Oven must be at set temperature before beginning processing.

Front Zone: 20-160°C
Rear Zone: 20-160°C

4. Press **S.P.** on the controller and check each set point.

   Recommended Settings:

Set point 1 (Display Set Point)	600 Torr
Set point 2 (Set Point 2)	10 Torr
Set point 3 (Alarm 3 Low Limit)	1 Torr
Set point 4	no recommendation

   Press **S.P.** to exit programming mode.

5. Using the touch screen press

   GOTO Alarms Panel

   GOTO Process Variables

6. Enter Process Variables.

To change, touch screen button for variable, enter number, press Enter, and then press Done.

Recommended Process Variables:

Number of dehydration cycle purges:	3
Number of exit cycle purges:	1
IR Wafer Warm Up Delay:	0
Process duration:	Process dependent

7. Press GOTO OPERATOR PANEL.
8. Load Samples.
9. When oven has stabilized at set temperature, press START.
10. When Process is complete Shutdown oven.

SHUTDOWN:

1. Turn OFF breaker on back of oven.
2. Turn OFF vacuum pump.
3. Logout from the tool in your FOM account.