

Oxford DSiE

SOP

The PlasmaPro 100 is a Inductively coupled plasma device (ICP) configured to provide effective high aspect ratio etching of 4 inch silicon wafers, and pieces when a carrier wafer is properly used. The unit has high and low frequency functions that make it suitable for high rate etching as well as etching to a SiO₂ stop layer with minimal footing. The process chamber substrate electrode is precisely temperature controlled from -150C to 400C (in Cryo mode) and 0 to 80 C in standard mode. The primary process gasses are C₄F₈, SF₆, Ar, and O₂.

SAFETY:

As always, follow this SOP for operation of the etcher, procedures outside the scope of this document are prohibited unless specific instructions are provided by a staff member.

This tool is equipped with a vacuum chamber, temperature controlled substrate holder, RF generators, and wafer handlers; all of which are imbued with specific hazards that are a threat to the user if proper procedures are not followed. Users are not allowed to access any portion of the tool that would require the removal of panels or open the chamber.



HAZARDOUS VOLTAGE



HAZARDOUS RF EMISSIONS



TOXIC GASES

1.0 Sample Restrictions

1.1 Absolutely no exposed metal is allowed in the process chamber. Any metal on your substrate must be COMPLETELY covered by photoresist.



METALS AND METAL MASKS ARE NOT TO BE EXPOSED TO PLASMA IN THE CHAMBER.

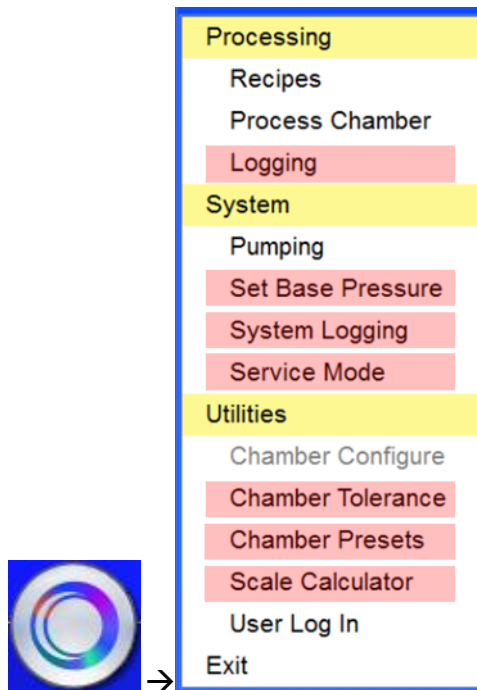
1.2 No silicone based thermal compounds are allowed. Use only staff approved thermal compounds for carrier wafer mounting.

1.3 No wet samples are allowed in the chamber. All wet processed samples must be completely dry before placing inside the tool.

2.0 Log in

2.1 Log in to TUMI

2.2 Log on tool (if needed). The login screen can be found from the menu button near the top, left corner and selecting "User log in"



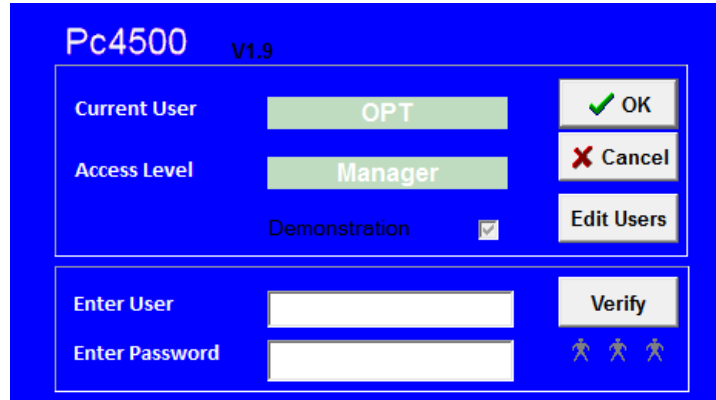
NOTE: Users are only allowed to access the menu items shown in white.

Any users caught modifying items shown in red, will have their privileges removed

2.3 The log in window shown below will appear.

2.3.1. Enter user – nrfuser

2.3.2. Enter password - nrfuser



3.0 Vent loadlock

3.1 Press the Menu icon and select “Pumping”.

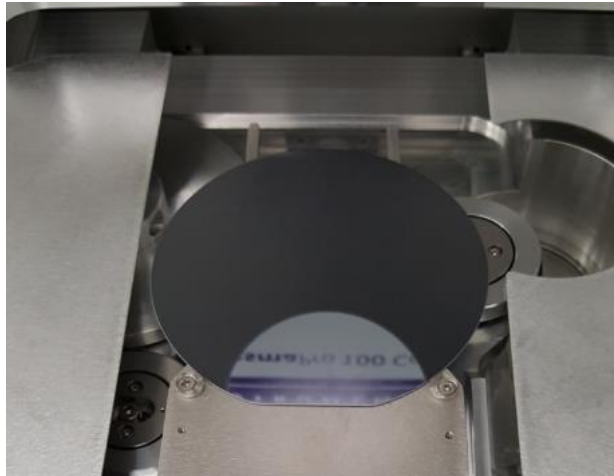
3.2 At the bottom of the Pumping page is the loadlock control panel. Click **stop** and then click **vent**



3.3 Wait until the **Vent Time Left** displays zero time (approximately 4 minutes).

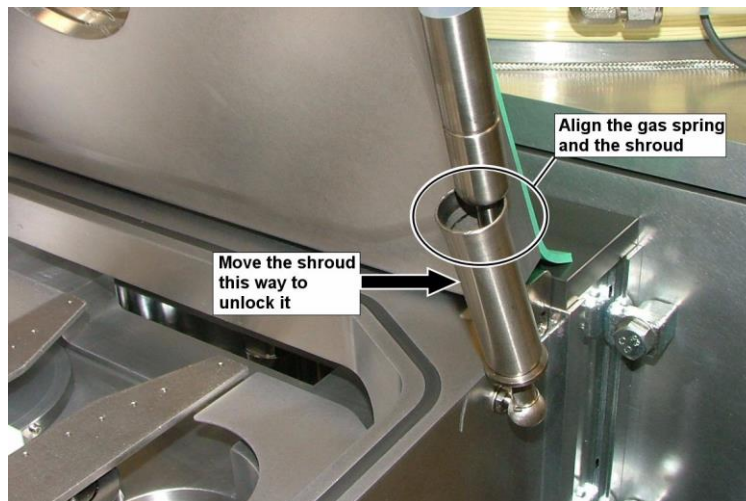
3.4 Grip the loadlock lid by the handle at the front, and lift the lid upwards until it locks in the open position

3.5 Place the wafer on the load arm with the flat facing down, and resting against the two alignment pins as shown below

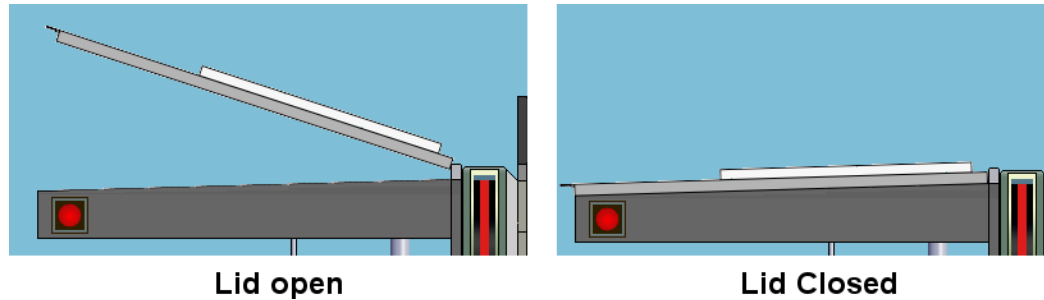


4.0 Closing and evacuating the loadlock

- 4.1 Grip the loadlock by the handle
- 4.2 Using the other hand, move the shroud on the right gas spring until it is free to move.

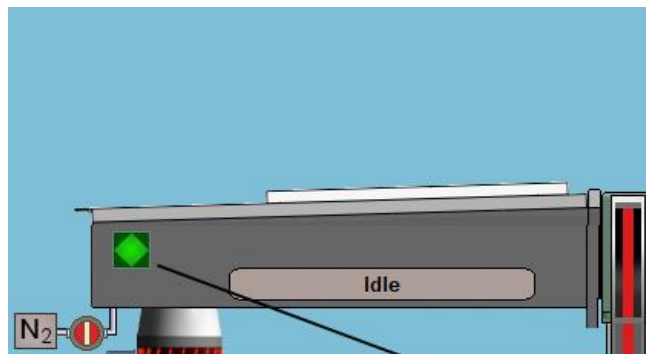


- 4.2.1. Lower the lid until it rests on top of the loadlock
- 4.2.2. A prompt will open, asking for a wafer identity. You can enter any letter or number combination to identify the wafer. We often use a date code such as 1702241300 for a wafer that was processed on February 24, 2017 at 1pm. Doing this will assist staff in finding the wafer in the machine log if the need arises. If there are no wafers in the chamber, click **Cancel**.
- 4.2.3. Check that the loadlock panel indicates that the lid is closed



4.2.4. Click **stop**, then **evacuate** in the loadlock panel

4.2.5. The loadlock will now pump down. When it is ready, the indicator will turn green.

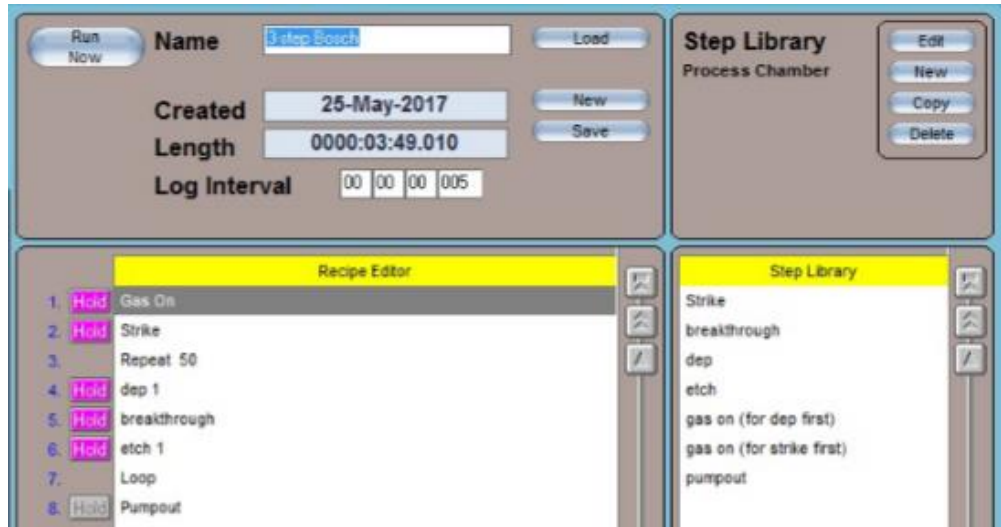


5.0 Loading And Editing Recipes

In this tool, a recipe consists of a set of discrete steps and is written similar to a basic program that consists of loops for repeated steps (i.e. etch/deposition steps).

5.1 Press the **Menu** icon and select "Recipes"

5.2 To select an existing recipe, press the **Load** button and select an existing recipe.



5.3 To edit the recipe, select the step you wish to edit and the window below will appear.



Edit Step – Opens the selected step to allow changes to parameters

Repeat Step – Inserts a repeat step or allows user to changes the number of repeats

Loop Step – Inserts a loop

Insert Step – Creates an empty row above the selected step to allow another step to be dragged into the list from the step library.

Delete Step – Deletes the selected step

Cancel Step – Cancels editing the step

5.3.1. Editing a process step. Input the following parameters:

5.3.1.1. Input a name for the step

5.3.1.2. **Step time** – typically 1.5s to many seconds long for etch/dep steps

5.3.1.3. **Log interval** – input 1s for steps that are many seconds long. For steps close to, or under 1s, put 250ms

5.3.1.4. **APC/LPS** – Select either **Pressure** and input a value in mTorr, or fixed **Angle** and input a value in %.

5.3.1.4.1. Deposition pressures are typically 25-40mT and etch

pressures from 30-60mT.

5.3.1.5. **HF** – high frequency generator value in Watts.

5.3.1.5.1. Etch step typically 10-35W and deposition power from 0-5W

5.3.1.6. **ICP** – ICP generator value in Watts. **This should be 1200W or greater (max 2500W) due to instabilities at lower power.**

5.3.1.7. **LF** – low frequency generator value in Watts. Typically less than 30W. Used in place of high frequency to reduce “footing” when stopping on dielectric layers.

5.3.1.7.1. **SOI Etching** – Set HF power to zero in the recipe you used to perform the bulk etch, and set LF power to 8-10W and continue the etch. Alternatively, use the Oxford HAR 3 step recipe.

5.3.1.8. **Table** – chiller temperature and should input 15°C

5.3.1.9. **Helium Backing** – helium backside pressure, and should be 10 Torr.

5.3.1.10. **Gases** – C4F8 (typically 100-200sccm for deposition), SF6 (100-200sccm for etching)

5.3.2. Press **Save**, to save the step

5.3.3. If you changed anything besides the number of loops, rename the recipe at the top of the page and click **Save**

5.4 Editing a step from the **Step Library** is performed the same way and can be dragged over to the **Recipe Editor** list

5.4.1. Step types

5.4.1.1. Etch

5.4.1.2. Deposition

5.4.1.3. Breakthrough – a short etch step to only remove polymer

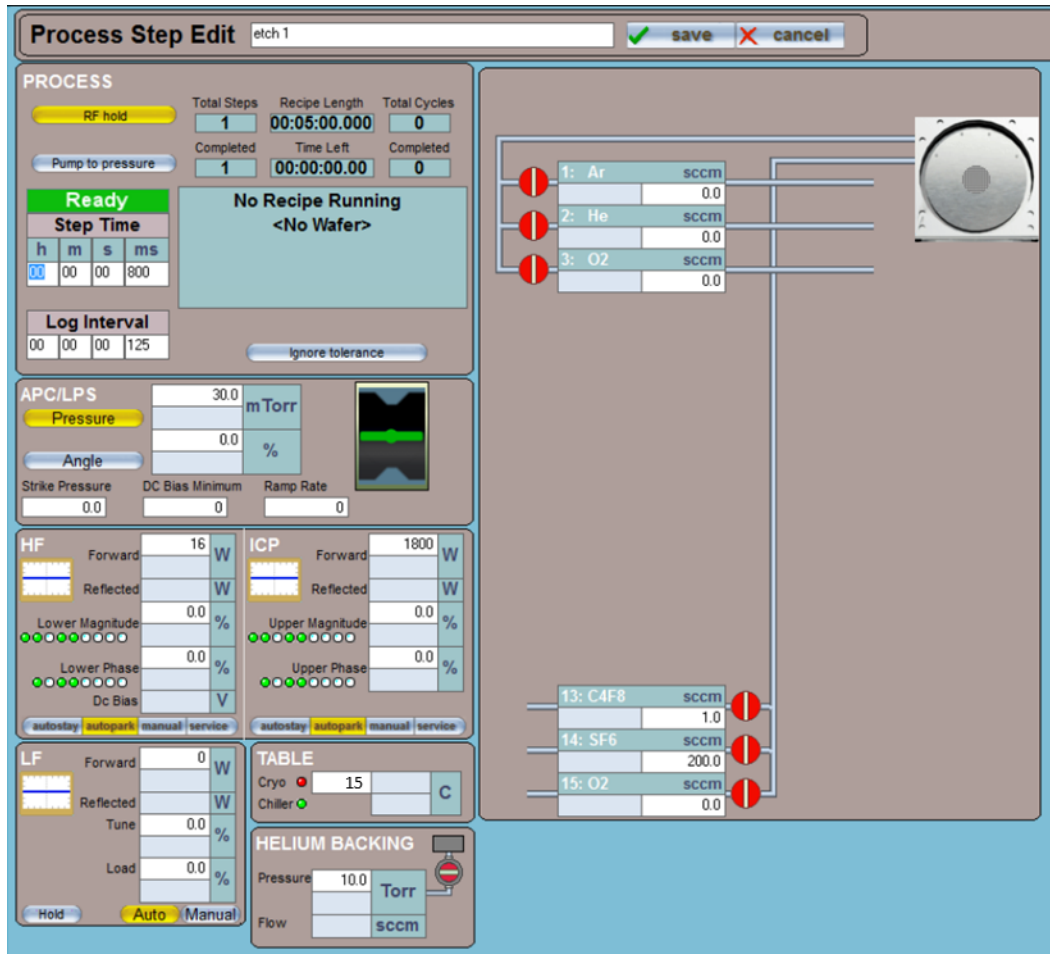
5.4.1.4. Gas on – turns on gases for stabilization

5.4.1.5. Strike – Short step to assist plasma ignition (mainly O2)

5.4.1.6. Pumpout – all gases off and pumps on chamber

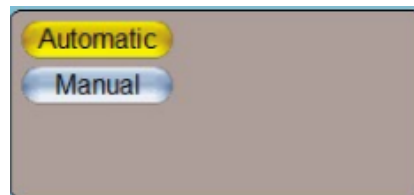
5.4.1.7. Descum – short O2 step to clean surface (typically 10s)

Etch step example



6.0 Running a recipe

6.1 From the recipe page, ensure that **Automatic** is selected. This mode will allow it automatically load the wafer from the loadlock, run the recipe, and then unload the wafer.



6.2 Press the **Run Now** to run the selected recipe. The wafer will now be loaded and processed.

6.3 If you wish to watch the process, the press the **Menu** icon and select

Process Chamber. From the page, you can view all of the process variables as it is run.

6.4 When the process is finished, a window will appear saying the process is complete. Click the **OK** button

7.0 Unload Wafer

7.1 Vent load lock – See section 3.0

7.2 Remove your sample and place the O2 Clean wafer on the load arm

7.3 Evacuate the loadlock – See section 4.0

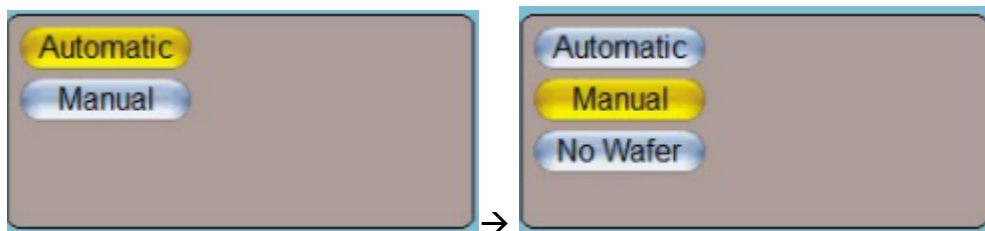
8.0 Interwafer Clean

8.1 This tool has the capability to run a short clean without a wafer, in between multiple wafer runs if you have more than one.

8.1.1. From the **Recipe Page**, load a recipe “O2 Clean no wafer”

8.1.2. Press the **Manual** button and a **No Wafer** button will appear. Press the **No Wafer** button

8.1.3. Then press **Run Now**



9.0 Run Standard O2 Clean

9.1 When all of your runs are complete, load the “O2 Clean With Wafer” recipe.

9.2 Ensure that **Automatic** is selected, and then press **Run Now**.

9.3 Log off TUMI