

Lindberg/Blue 3-Zone Thermal Oxidation/Anneal Furnace (Model STF55666C-1)

Operating Instructions

This tool is to be used by authorized personnel only. For training & consultation contact: Facilities Manager or Cleanroom Engineer.

- Check inside the furnace tube to make sure the furnace tube is empty.
- Log usage time and enable equipment in iLabs.

Furnace Temperature Controller Setup (Yokogawa Model UP150)

1. Locate controllers on the side panel outside in the chase area (**Figure 1**).
2. Determine the temperature profile for your process - sequence of temperature setpoints, ramp times, push and pull times and soak times.



Figure 1 – Lindberg Temperature Controller Setup

3. Set up controllers' timing/temperatures to reflect process sequence according to programming procedure in [Temperature Controller Manual](#) .
5. When finished programming, press and hold **SET/ENT** until the current temperature is displayed.
6. Starting with the LEFT controller, press and hold the **RUN** button until the light comes on. Do the same for each of the other two controllers. When the last controller is activated, the breaker will switch on. Processing will begin.
7. To turn off the furnace after your processing has been completed and your

substrates have been removed from the furnace simply, deactivate the tool in iLabs.

DI Water Bubbler Setup for Wet Oxidation

1. Remove clamp holding the fill tube cap. Remove fill tube cap and place on a clean surface.
2. Refer to **Figure 3**. Fill the bubbler with fresh DI water using a clean beaker and funnel. **NEVER RE-FILL BUBBLER WHILE IT'S HOT AND NEVER LET IT RUN DRY.**



Figure 3 – Filling DI Water Bubbler for Wet Oxidation

3. Fill the bubbler no higher than the designated mark on the bubbler.
NOTE: Replace DI water entirely if the last oxidation run was performed more than 48 hours prior.
4. Place the fill tube cap back on the fill tube and clamp it. Do not over tighten the clamp.
5. Turn on the Variac (bubbler heater) and set knob to 50 (which means 50% of 110 V)
6. Make sure that the bubbler vent valve is venting to the atmosphere by positioning the valve as shown in **Figure 4**.

Substrate Preparation and Loading/Unloading

1. Prepare and clean your Si substrate by using an appropriate cleaning method such as HF, RCA, or Piranha clean procedure.
2. Load the Si substrate on a clean quartz boat making sure they are situated properly in their slots.
3. Place the quartz boat in the center of a glass quartz boat loader/unloader

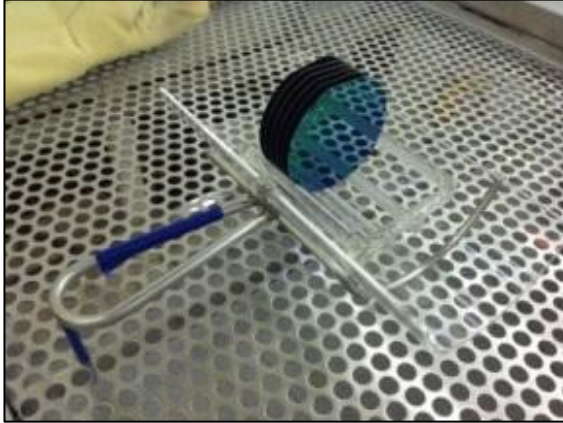


Figure 5 – Wafers in a Quartz boat sitting on a Glass Quartz Boat Loader/Unloader

4. Wear thick padded protective gloves to begin loading.
5. Remove the end cap from the furnace tube.
6. Hold the end of the glass loader flush with the bottom of the furnace tube.
7. Push the quartz boat into the furnace with the short quartz push rod.



Figure 6 – Quartz boat being loaded/unloaded using the short quartz rod and glass boat loader/unloader.

8. Use the long push rod to push the quartz boat towards the center of the furnace tube at a rate of about 1 inch every 5 seconds.

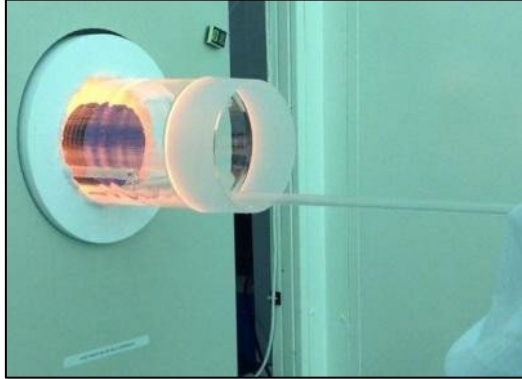


Figure 7 – Long push rod being utilized to load/unload quartz boat

9. Remove the long push rod and place the end cap back on the tube

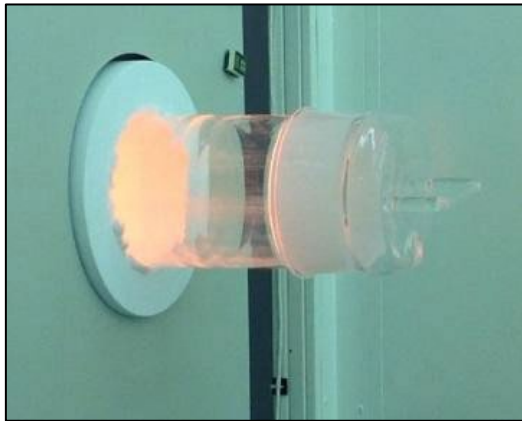


Figure 8 – Furnace with end cap in place. The end cap hole should be on the bottom.

10. Refer to **Figure 4**: Turn the bubbler vent valve to direct flow into the furnace (vapor to process position).
11. Refer to **Figure 9**: Turn on the Wet O₂ switch and set the flow to a **setting of 10-20** on the Wet O₂ flowmeter.

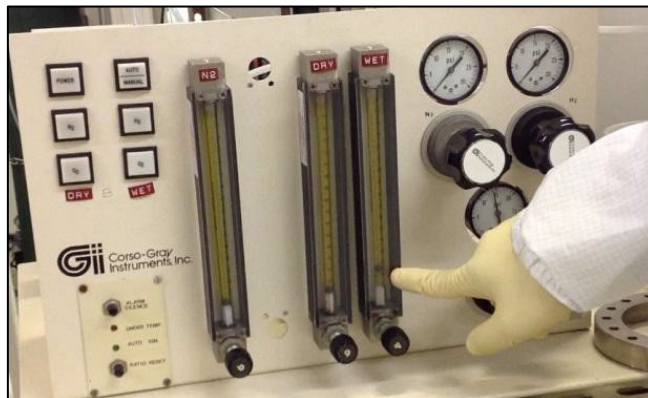


Figure 9 – Flowmeters on the gas panel for the Lindberg/Blue Oxidation Furnace

12. Use a timer to keep track of the oxidation time.
13. Shut off the bubbler and the Wet O2 switch once your timer indicates the end of the oxidation process.
14. Return the vent valve to the vent to air position.
15. Using the padded gloves and CAREFULLY remove the end cap off the tube.
Occasionally, the end cap becomes hard to remove and sometimes a side-to-side motion will assist.
16. Place the end cap on the metal table next to the furnace.
17. Use the push rod to pull the boat slowly and carefully out of the furnace and onto the boat loader at a rate of about 1 inch every 5 seconds.
18. Place the end cap back on the tube.
19. Deactivate furnace tube on iLabs.
20. Allow the substrates to cool down, typically 10-15 minutes, before handling.
21. Refer to **Figure 10**: You could use the handy wafer oxide color display located on the furnace processing table to determine approximate oxide thicknesses on your Si substrates. This is mainly for trouble shooting and educational purposes. More exact measurements must be made with the ellipsometer or reflectometer.



Figure 10 – Wafer Oxide Thickness Color Guide

Furnace Temp.	Left Zone	Center Zone	Right Zone
950 C	966	965	988
1000 C	1042	1016	1038
1050 C	1092	1066	1085

TABLE 1 – Oxidation Temperature Settings

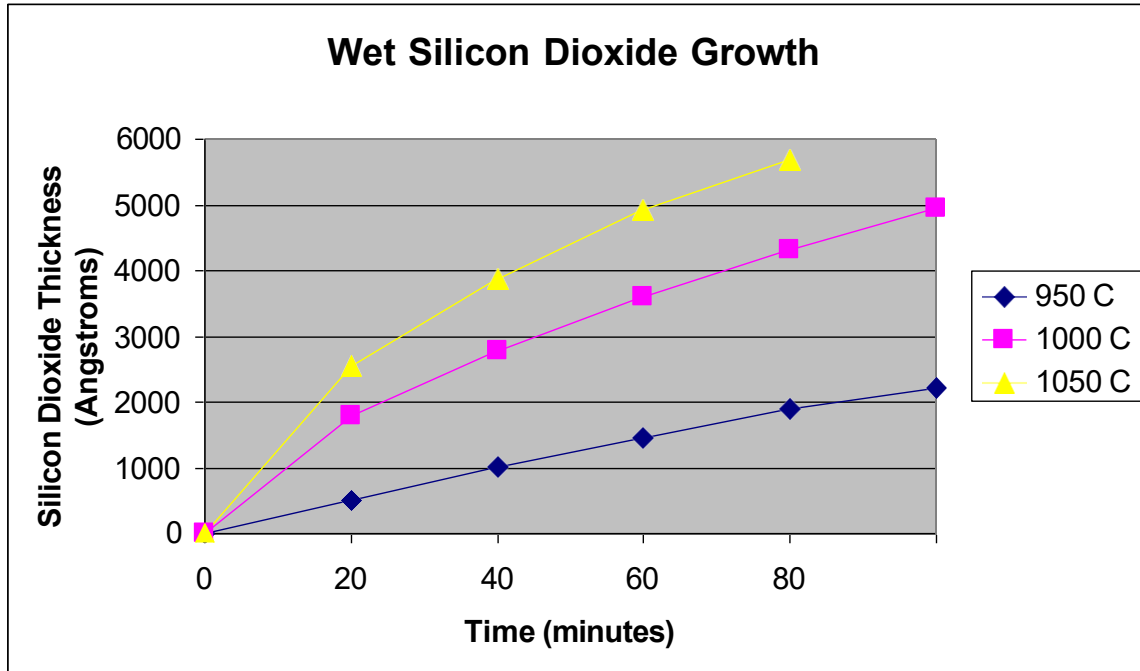


FIGURE 3 - Si Thermal Oxide Growth vs. Time in the Furnace Tube

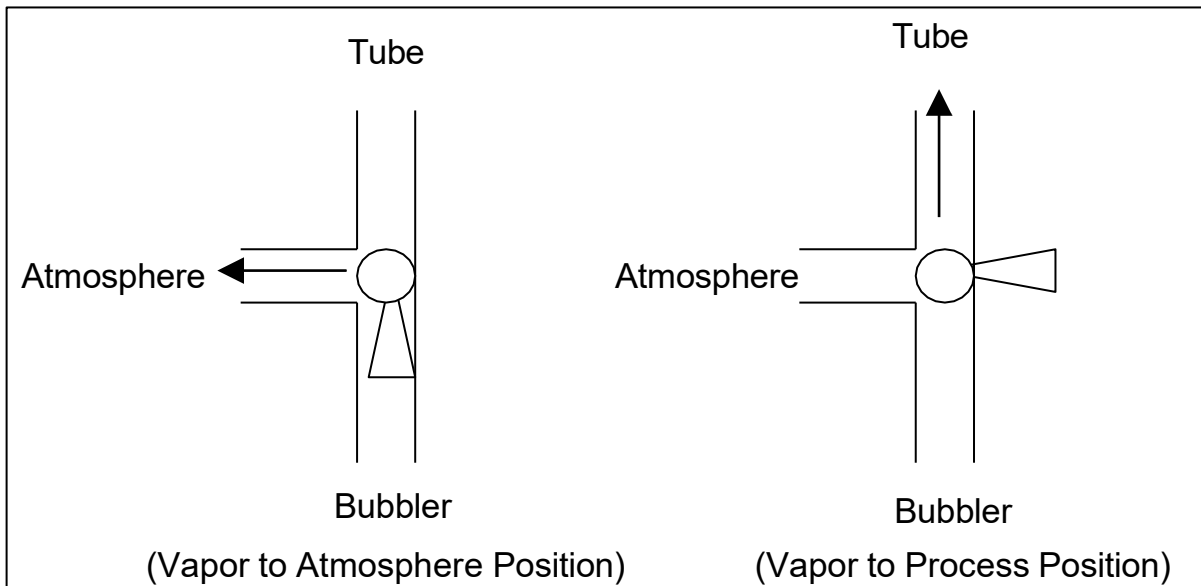


FIGURE 4 - Bubbler Valve Positions