

Operation Instructions for the Oerlikon Single Chamber Sputtering System



WARNINGS:

1. You must use the flashlight to confirm that what you expect to be in the loadlock is in the loadlock before you close the isolation valve. Serious equipment damage will occur if you close the isolation valve on the rod.
2. Your recipe is valid only at the time you make it. Sources get changed out and are placed on different magnetrons.
 - a. Save the recipe of the material you want to sputter (DCX, RFX)
 - b. Change the time
 - c. NEVER CHANGE THE POWER!
3. When the power turns on
 - a. You must be present at the System
 - b. You must be paying attention to the deposition
 - c. You must watch the following:
 - i. DC Bias Voltage
 - ii. Sputter Power
4. Chucks must ALWAYS be positioned on a polypropylene donut.

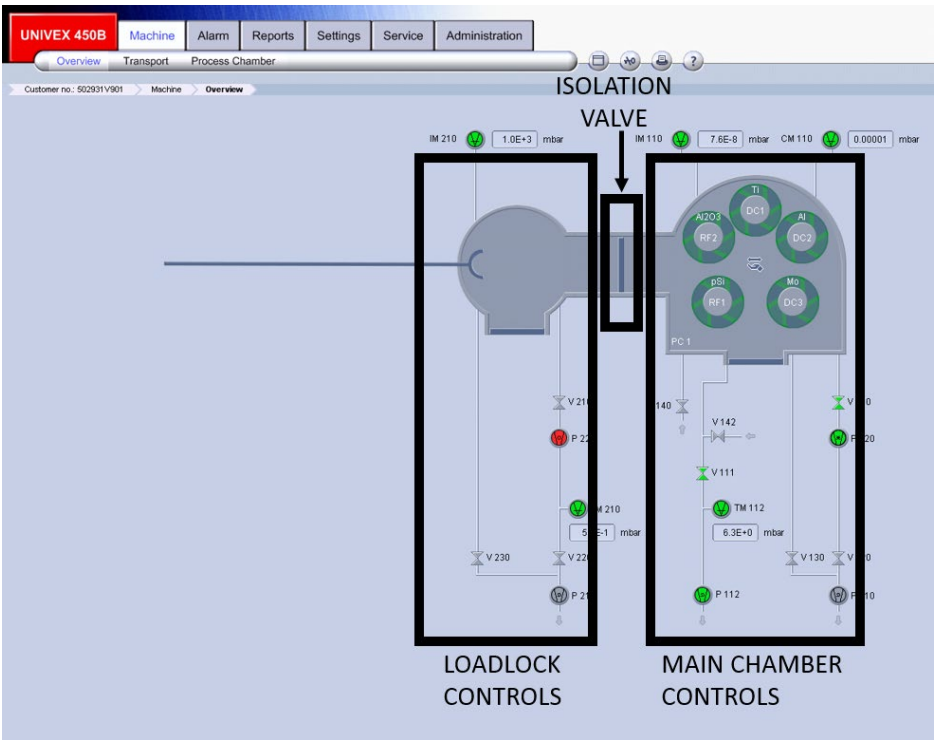
Description:

The Oerlikon 450B single chamber sputtering system (SCSS) contains 5 magnetron sputtering heads (2 RF and 3 DC). The system is equipped with Argon gas for sputtering but can also flow O₂ and N₂ for reactive sputtering. The substrate can be heated to ~350C and is typically rotated during deposition to improve uniformity. Sputtered films are more continuous than evaporated films due to scattering as a result of a much higher pressure during deposition. The SCSS is equipped with a load lock which allows for short pump down times and leads to high throughput.

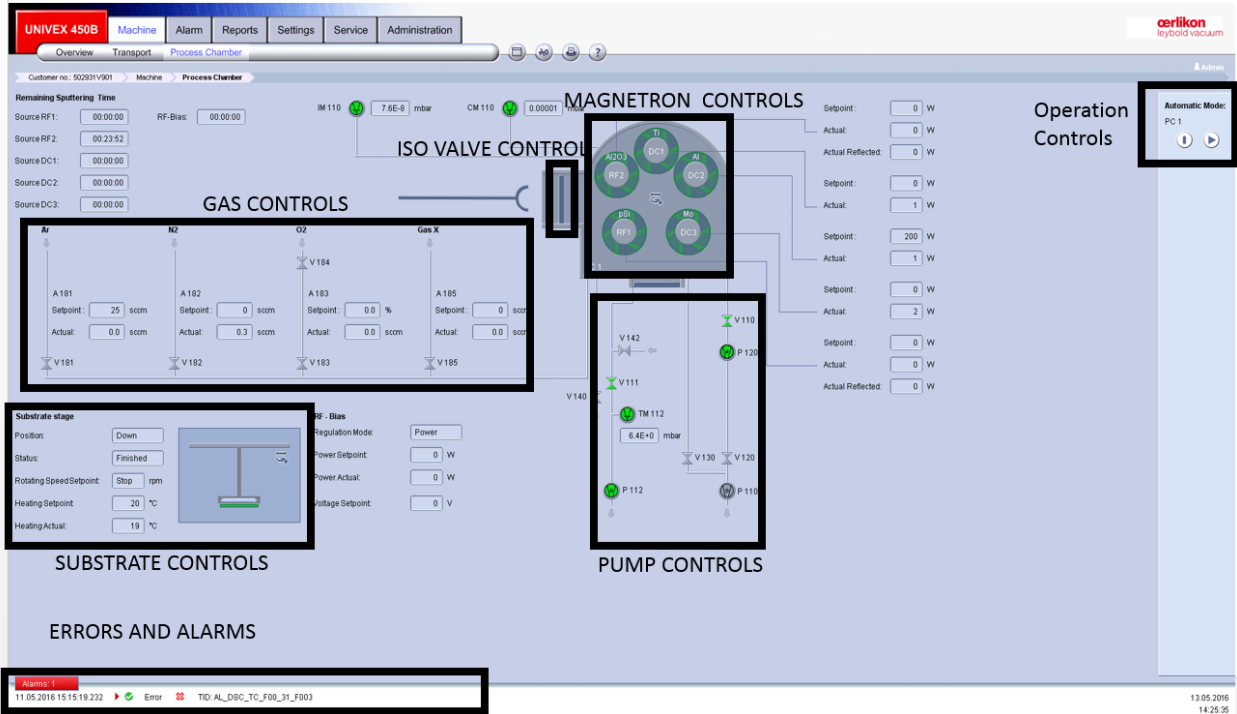
Targets Available: Ti, Au, Al, Cr, W, AlSi(2%), Mo, Ta, WSi₂, Al₂O₃, p-Si, 90W-10Ti

Gases: Argon, N₂ and O₂

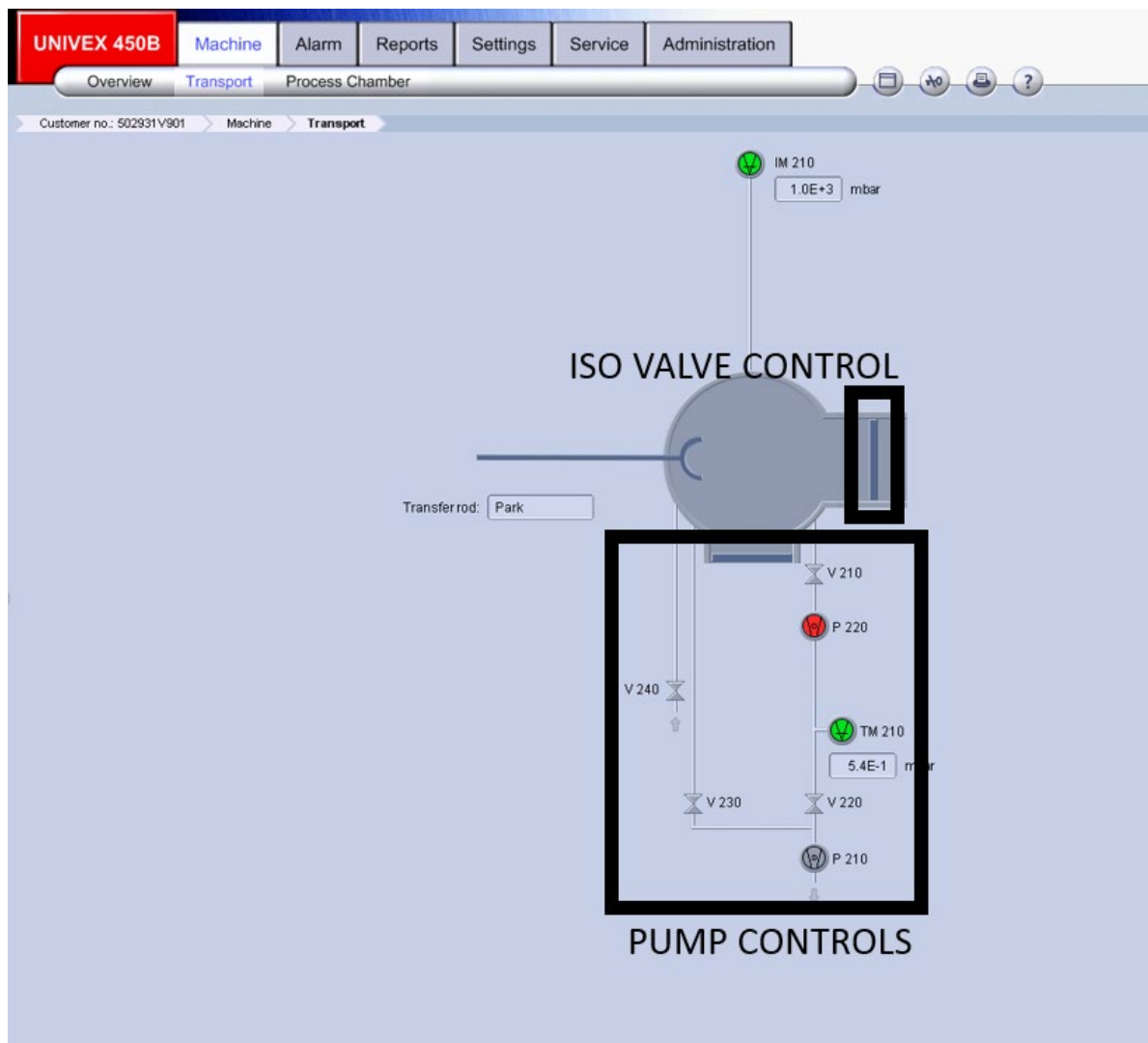
System layout as seen from the Machine → Overview Screen. Isolation valve is common to both the loadlock and process chamber screens.



Location of Process Chamber Controls as seen from the Machine → Process Chamber Screen.



Location of Loadlock Controls as seen from the Machine → Transport Screen.

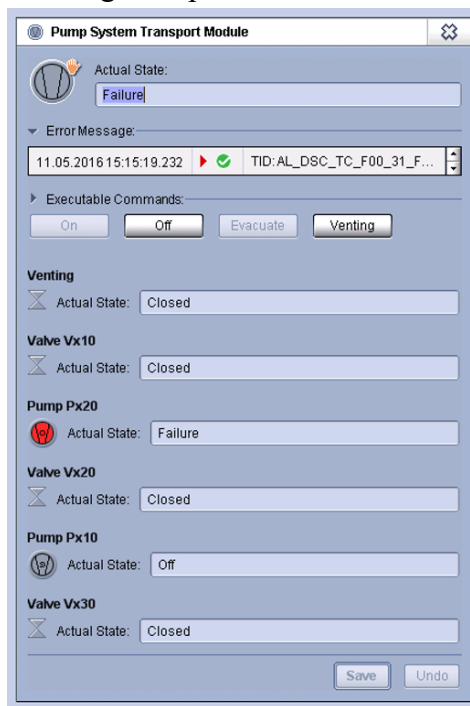


Operations Procedure:

1. Log into iLab to enable the system
2. Log on to the laptop computer (if needed).
 - a. Select user: univex
 - b. PW: univex
3. Click on the “Global” button that looks like a KEY at the top of the page and log in.
 - a. User Name: Admin
 - b. PW: admin



- c. The Key should have a strike through it
4. Mounting your sample on the chuck
 - a. Make sure the chuck is placed on a polypropylene (PP) donut with the shaft in the center of the donut. Doing this will help to eliminate the shaft from being bent and possible damage to your wafer.
 - b. Use kapton tape to mount small samples to a carrier wafer.
 5. Placing the chuck into the Load-Lock (LL)
 - a. Make sure the transfer arm is all the way to the left and the little yellow light on the sensor is lit (the green power light should always be lit).
 - b. Loosen (if not already loose) the black handle on the LL door and move it away from the door clamp.
 - c. Select the “Transport” screen, click below the LL chamber, another window should pop up. Click “Venting” to open the LL chamber.



d.

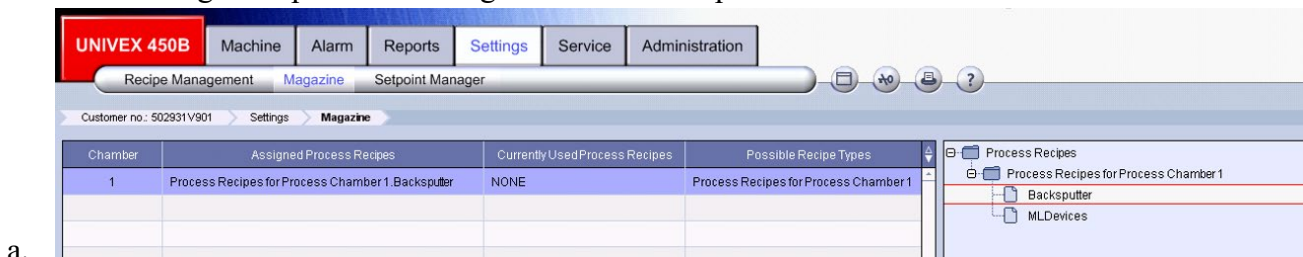
6. Once the LL chamber reaches atmosphere open the door.
7. Place the chuck onto the circular cutout in the fork.
8. Close the LL door and tighten the black handle.
9. Select the "Transport" screen, click "Evacuate" to pump the LL chamber.
10. Once the chamber pressure has reached the $10\text{E}-1$ mbarr range (on the IM210), loosen the black handle and move it away from the door
11. Wait until the pressure inside the transport has reached $10\text{E}-4$ before continuing to next step

Moving the chuck into the sputtering position:

12. Select the “Process Chamber” screen, click near the isolation valve on the LL chamber and click “open” to open the isolation valve into the chamber. (Note 1 applies here.)
13. Slowly slide the transfer arm round black control handle forward until it stops against the front plate. IT MUST BE ALL THE WAY AGAINST THE PLATE!!!! The little yellow light on the sensor should be lit (the green power light should always be lit). The yellow LED is lit when it senses that the transfer arm is in a home or loading position.
14. Select the “Substrate Stage” control box, another window should pop up, choose “Substrate Up”.
15. Wait until the little upward moving arrow on the chuck disappears to indicate the chuck has stopped moving.
16. Slowly withdraw the transfer arm moving the round black control handle backwards until it stops against the back plate. The little yellow light on the sensor should be on.
17. **VERIFY WITH THE FLASHLIGHT THAT EVERYTHING YOU EXPECT TO BE IN THE LOADLOCK IS IN THE LOADLOCK!!!!!! SEVERE EQUIPMENT DAMAGE CAN OCCUR IF THE MAGNET BECOMES UNCOUPLED AND YOU CLOSE THE ISOLATION VALVE ON THE ROD/SHAFT.**
18. Click near the isolation valve and select “Close” to close the isolation valve. The nominal pressure inside the chamber should be in the 10E-6 mbarr range (on the IM110), before proceeding to running a recipe.

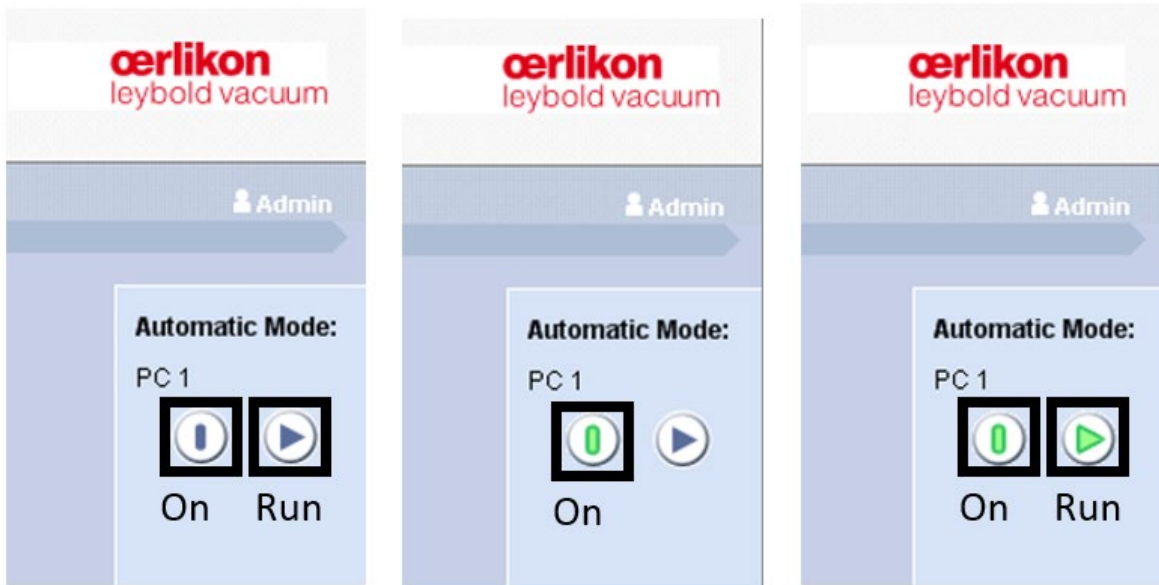
Running and completing a recipe:

19. Select “Settings” from the Navigation Terminal on the GUI.
20. Select “Magazine” from of the top of the Navigation Terminal.
21. “Clear” any existing process that are loaded in the Magazine (lower left corner)
22. From the right side of the GUI, under “Process Recipes” and expand the recipes box. Click/hold/and drag a recipe to the “Assigned Process Recipes” box.



23. Select “Machine” then “Process Chamber” from the Navigation Terminal on the GUI.
24. Select the “On” button (circle with a vertical line) from the “Operator’s Panel”. This will turn on the Automatic Mode. The vertical line should turn green.

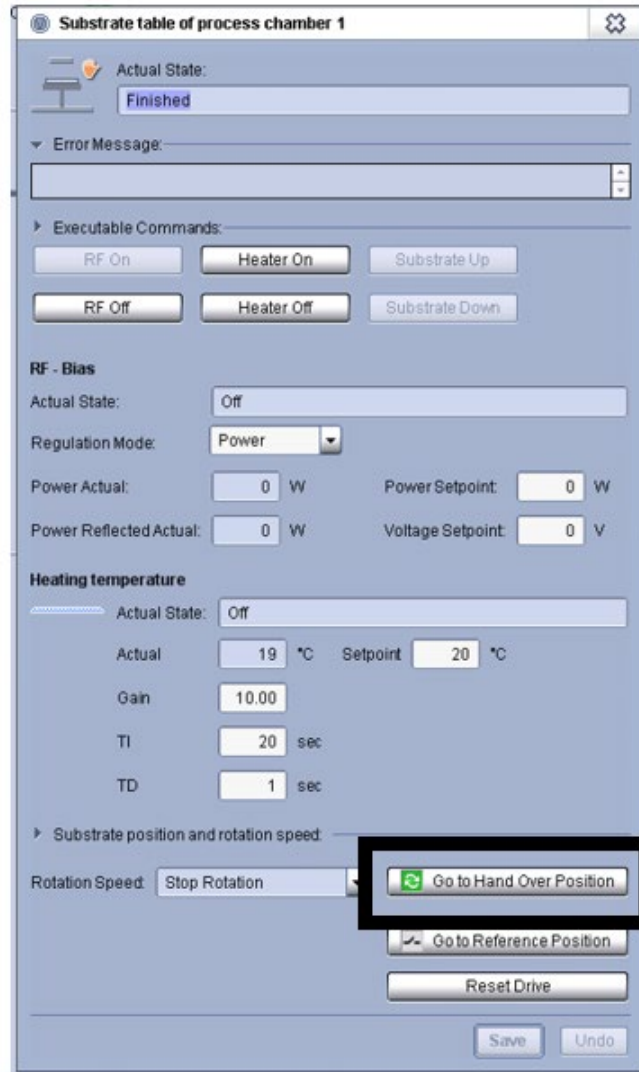
25. Select the “Run” button (circle with an arrow) from the “Operator’s Panel”. This will run the selected recipe in the Automatic Mode. The arrow should turn green.



26. After the recipe has finished, the “Run” button will go back to blue color (grayed out). Deselect the “On” button from the “Operator’s Panel”. Both icons should now be grayed out (disabled, Left most image above).

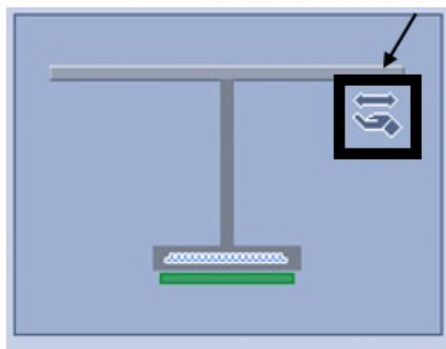
Moving the chuck into the Load-Lock:

27. From the “Substrate Stage” control box, select “Go to the Handover Position”, wait for the arrows to be highlighted in green.



28. Wait for the 'handover' icon to show up in the substrate controls screen

At Handover Position



29. Select the "Process Chamber" screen, click near the isolation valve on the LL chamber and click "Open" to open the isolation valve into the chamber. (Note 1 applies here.)

30. Slide the transfer arm round black control handle forward until it stops against the front plate. The little yellow light on the sensor should be lit.
31. Select the “Substrate Stage” control box, another window should pop up, choose “Substrate Down”. Wait until the little arrow on the chuck disappears to indicate the chuck has stopped moving.



a.

32. Slowly withdraw the transfer arm moving the round black control handle backwards until it stops against the rear plate. The little yellow light on the sensor should be lit.

33. VERIFY WITH THE FLASHLIGHT THAT EVERYTHING YOU EXPECT TO BE IN THE LOADLOCK IS IN THE LOADLOCK!!!!!! SEVERE EQUIPMENT DAMAGE CAN OCCUR IF THE MAGNET BECOMES UNCOUPLED AND YOU CLOSE THE ISOLATION VALVE ON THE ROD/SHAFT.

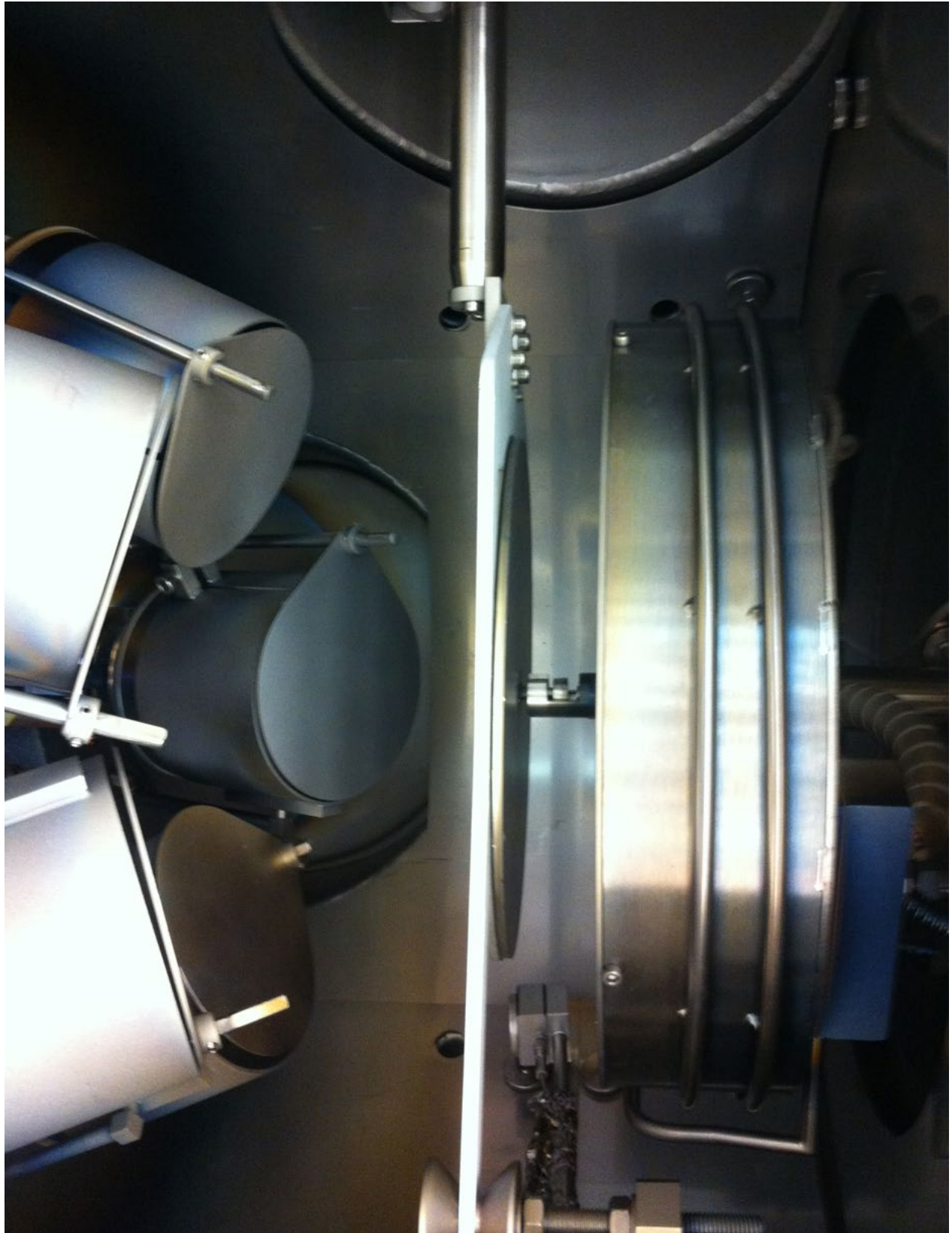
34. Click near the isolation valve on the LL chamber, another window should pop up. Click “Close” to close the isolation valve.

Removing the chuck from the Load-Lock:

35. Loosen (if not already loose) the black handle on the LL door and move it away from the door.
36. Select the "Transport" screen, click below the LL chamber, another window should pop up, click "Venting" to open the LL chamber.
37. Once the LL chamber reaches atmosphere open the door.
38. Lift the chuck out and place on to the polypropylene donut. Make sure the shaft is in the center of the donut. If you are doing another sample, place the other chuck inside on the fork.ba
39. Close the LL door and tighten the black handle.
40. Click "Evacuate" to pump the LL chamber.
41. Once the pressure has reached the 10E-1 mbarr range (on the IM210), loosen the black handle and push it away from the door.
42. Repeats other steps as necessary to process more wafers.
43. Disable System in Coral when completed

1. Condensed process for the SCSS:
 - a. Enable system in coral
 - b. Vent the loadlock to ATM
 - c. Mounting your sample on the chuck
 - d. Placing the chuck into the loadlock and select “Evacuate”
 - e. Wait for Loadlock pressure to reach 1E-4 or lower before opening isolation valve
 - f. Open Isolation Valve
 - g. Slide rod into chamber
 - h. Select “Substrate Up” – wait for substrate to move up.
 - i. Extract rod from chamber
 - j. VERIFY WITH FLASHLIGHT THAT EVERYTHING YOU EXPECT TO BE IN THE LOADLOCK (FORK ONLY) IS IN THE LOADLOCK!!!!
 - k. Close Isolation valve
 - l. Load Process in Magazine
 - m. Start process by selecting “On” and “Run” button
 - n. Allow process to run
 - o. Once process has completed – deselect “On” button
 - p. Position substrate at the “Go To Handover Position”
 - q. Open Isolation Valve
 - r. Insert Rod into chamber
 - s. Select “Substrate Down”
 - t. Allow substrate to move to down position
 - u. Extract rod from chamber
 - v. VERIFY WITH FLASHLIGHT THAT EVERYTHING (FORK AND PLATTER) YOU EXPECT TO BE IN THE LOADLOCK IS IN THE LOADLOCK!!!!
 - w. Close Isolation valve
 - x. Vent Loadlock and remove chuck
 - y. Close Loadlock door and “Evacuate” when finished.
 - z. Disable system in coral
2. A few notes:
 - a. The nominal pressure inside the LL & main chamber is in the -7's & -8's
 - b. Only authorized users are allowed to use the SCSS (those who have received training).

Handover:



Shorting and Arcing:

