

Clean Room E-beam Evaporator Standard Operating Procedure

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Stand-by Mode: Cryopump is running
Helium pressure in the
compressor is between 50-
100 psi
The chamber is under
rough vacuum (150-300
mTorr)
Valves are closed
(Roughing, Foreline, Vent,
Hi-Vac all closed)

*Please ensure that the system is in stand-by mode
before you begin and when you leave.*

Initial Start-up

1. Turn ON the electrical knife switch on
the wall (upper right).



- Turn ON the main and 120 V bus breakers located on the unit.

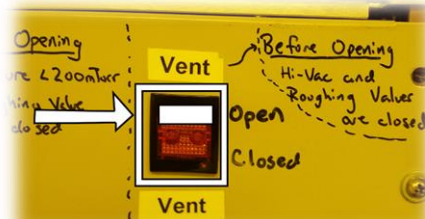


- Switch on the power to the Varian pressure gauge.



Venting the Chamber

- Open the vent valve using the switch located on the instrument panel.



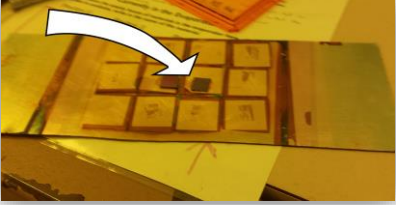



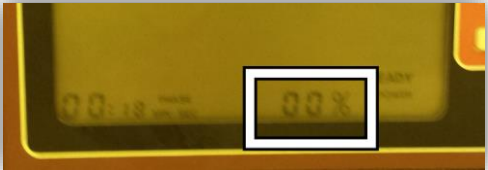
- Wait 2-3 minutes until you hear the pop of the chamber coming to atmospheric pressure.

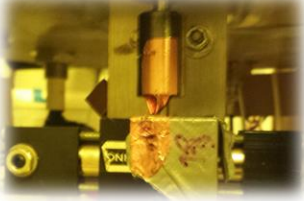

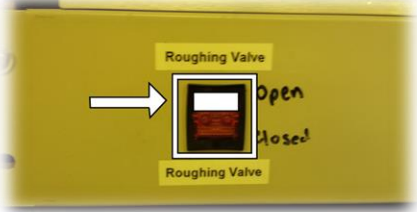

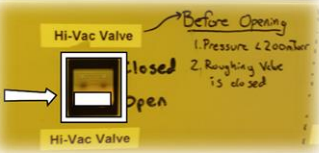

- Turn OFF vent valve before opening the chamber.



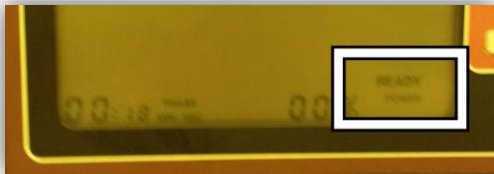











- Lift the chamber hood using the handle in front.




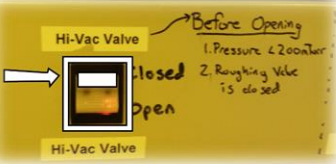
Loading Samples

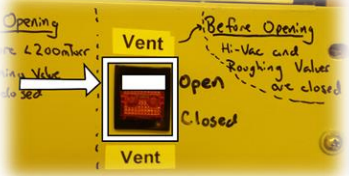
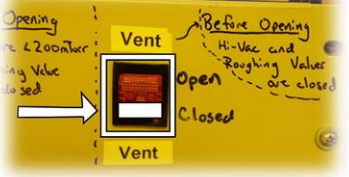

<p>8. Place sample(s) on mount and source material(s) in pocket(s). Fill the pocket or crucible <u>at least half-full</u> of evaporation material.</p>	
<p>a. The material pocket indexer is the knob located at the bottom of the chamber. Only turn this clockwise (CW).</p>	
<p>b. To switch between materials, turn 1 full rotation. Alignment marks indicate when the pocket is lined up.</p>	
<p>9. Check crystal monitor life before you begin.</p>	
<p>a. Turn on the Inficon crystal monitor display</p>	
<p>b. Push "1", which acts as the XTAL life button.</p>	
<p>c. The lower right corner should read the XTAL life. 1% indicates a new crystal.</p>	
<p>d. Replace if the crystal reads above 30%, or if it states "XTAL fail".</p>	
<p>10. Check visibility through the view-ports. If you cannot see through the windows while the chamber is open, replace the microscope slides.</p>	

<p>11. Close the shutter. Note the shutter control is located at the bottom of the chamber.</p>	
<p>Pump-down</p>	
<p>12. Close chamber.</p>	
<p>13. Turn on the rough pump using the toggle switch on the wall. This located on the wall between the evaporator and the samco.</p>	
<p>14. Wait 15 seconds</p>	
<p>15. Open the Roughing Valve</p>	
<p>16. Wait until the pressure drops below 150 mTorr (should take ~5-10 minutes)</p>	
<p>17. When the chamber is below 150 mTorr</p>	
<p>a. Close Roughing Valve</p>	
<p>b. Open Hi-Vac Valve</p>	
<p>c. Turn OFF the rough pump</p>	

<p>18. Wait approximately 2 hours for the chamber to pump to $< 1 \times 10^{-5}$ Torr.</p>	
<h2>Deposition</h2>	
<p>19. Turn on the ionization gauge by flipping the filament switch up. The switch will return to the middle position automatically.</p>	
<p>20. Turn on the crystal monitor and program it for your specific parameters.</p>	
<p>a. Push the "PG" button to get to the program menu.</p>	
<p>b. Scroll down using the "E↓" button to density.</p>	
<p>c. Enter the density using the numeric keypad.</p>	
<p>d. Enter values for the z-ratio and tooling factor in a similar fashion.</p>	
<p>e. Push "PG" again to exit program menu.</p>	
<p>f. Monitor should now say "READY" in the lower right-hand corner.</p>	
<p>g. Press the "zero button" (2) to zero</p>	
<p>h. When ready to start taking measurements, push the "Start" button.</p>	

<p>21. Turn on the power on breaker on the front of the Telemark ST Power Supply, then turn on the control power on the ST controller.</p>	 <p>The top photograph shows a red power breaker switch on the front panel of the Telemark ST Power Supply, with a white box highlighting it and an upward-pointing arrow. The bottom photograph shows the Telemark ST Controller with a white box highlighting the 'CONTROL POWER' switch and an upward-pointing arrow.</p>
<p>22. Turn on source (Green on button under source). This turns on the filament.</p>	 <p>The photograph shows the 'SOURCE' section of the Telemark ST controller. A white box highlights the green 'ON' button, with a white arrow pointing to it from the left.</p>
<p>23. Wait 20 seconds, turn on HV. <u>The meter will read 0V.</u></p>	 <p>The photograph shows the 'HIGH VOLTAGE' section of the Telemark ST controller. A white box highlights the green 'ON' button, with a white arrow pointing to it from the left.</p>
<p>24. Slowly turn up the voltage until the value reads 9.0 ± 0.02 kV. Do NOT turn up the voltage too quickly or you risk causing arcing in the system.</p>	 <p>The photograph shows the 'HIGH VOLTAGE' section of the Telemark ST controller. A white arrow points to the 'VOLTAGE' knob, which is being turned clockwise.</p>
<p>25. Make sure that the display select switch under source is switched to EMIS (emission). This should read 0 mA.</p>	 <p>The photograph shows the 'SOURCE' section of the Telemark ST controller. A white box highlights the 'EMIS' position of the display select switch, with a white arrow pointing to it from the left.</p>
<p>26. Turn on the sweep controller. Adjust the frequency and amplitude for your desired pattern.</p>	 <p>The photograph shows the 'SWEEP CONTROLLER' section of the Telemark ST controller. A white box highlights the 'ON' button, with a white arrow pointing to it from the left.</p>
<p>27. Slowly turn up emission current to around 7-10 mA. Check to see that the beam is centered in the pocket.</p>	 <p>The photograph shows the 'SOURCE' section of the Telemark ST controller. A white arrow points to the 'EMISSION' knob, which is being turned clockwise.</p>

<p>28. Make sure that the beam is hitting the center of the pocket. It is often easier to adjust the position by switching the sweep control mode to “manual” (right position) and then moving the beam position, then switching back to “triangle” (center position, unlabeled) or “spiral” (left position).</p>	
<p>29. Increase the current until the source starts evaporating. This will vary based upon the material.</p>	
<p>30. After 1-2 nm has been evaporated as shown on the crystal monitor, open the shutter by turning the shutter knob underneath the chamber clockwise.</p>	
<p>31. When finished with deposition, slowly turn down the emission current, then turn off the high voltage (HV off) and finally the filament (source off). <i>If another deposition is to take place, turn the crucible using the indexer to the desired</i></p>	
<p>32. When finished with all depositions, turn off control power, wait 10 minutes, and then turn off the ST Power Supply main breaker.</p>	
<p>33. Turn off ionization gauge filament by pressing down on the filament switch</p>	
<p>Unloading and Shut-down</p>	
<p>34. Close the Hi-Vac Valve.</p>	
<p>35. Wait to let the system cool down before venting. Cool down time should be equal</p>	

<p>to the time that the filament was turned on.</p>	
<p>36. Vent the chamber (will take about 2-3 minutes)</p>	
<p>37. When chamber reaches atmospheric pressure, turn the vent valve off, open the chamber and remove samples.</p>	
<p>38. Close the chamber, rough chamber down to 150-300 mTorr.</p>	
<p>39. Close the roughing valve, turn off the rough pump, turn off the 120V bus, turn off the main breaker, and turn off the knife switch breaker on the wall.</p>	
<p>40. Change the sign on the evaporator to read "chamber empty"</p>	