

Operation of the Denton Vacuum Metal Evaporator System – Wean 6302
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The metal evaporator system in Wean 6302 has two resistively heated sources, a heated sample stage, and a rotating sample mount. The sources are adjustable to accommodate various deposition boats. Please use the rotating mount even if you wish to deposit onto a stationary sample to conserve deposited metals. Also, please make a record of the date and time of each deposition in the evaporator log book, along with your name and contact information. Identify the metals deposited, deposition parameters (pressure, power, etc.), and note any unusual behavior of the system.

BE SURE to wear polyethylene or powder-free latex gloves when handling samples inside the chamber. DO NOT TOUCH ANY PART OF THE CHAMBER INTERIOR WITH BARE SKIN, AND KEEP YOUR HEAD OUT OF THE CHAMBER. With gloved hands, wipe the seal around the chamber door with a methanol-soaked Kimwipe at least once per use to ensure a good seal.

Unless the system will be used more than three times per week, it should be completely shut down after every use, turning off the power, gas, and cooling water. The chamber should be left under vacuum. The following procedure (adapted slightly from the Denton manual) should be followed for to start the system up from a full shutdown.

Keep in mind that no instructions for this system can be complete and predict all possible problems with the system. Make sure you are fully familiar with the operation of the system before attempting to operate it, and THINK about what the system is doing throughout the process so that unexpected behavior can be diagnosed.

A. Manual start-up from full shutdown.

1. Turn on the water supply on the wall behind the unit. Open the air supply valve on the wall. Check to be sure the Drierite is blue in color; if not it should be changed immediately. Open all valves on the nitrogen regulator and check that the pressure is ~5 psig.
2. Depress the SYSTEM CONTROL ON switch. This is the main power for the unit.
3. Depress the VENT valve switch to open the vent and vent the chamber. Again, check the nitrogen regulator to ensure the pressure is at ~5 psig during venting.
4. Pull GENTLY on the chamber door handle so the chamber will open when it reaches ~1 atm. You may now install your samples. Close the door when you are finished.
5. Depress the SYSTEM CONTROL OFF switch to turn off the main power. Turn the mode select knob to the MANUAL position. Now depress the SYSTEM CONTROL ON switch to turn power on again.

6. Depress the MECH PUMP switch. This will power up the roughing (mechanical) pump. Check the level of the oil and the side of the mechanical pump when it is running. Abort the deposition and add more oil if needed. Use only Fisher rotary pump oil (Maxima C, catalog # 01-257-4A).
7. Turn the thermocouple gauge switch to the FORELINE position.
8. When the FORELINE pressure goes below 50 mTorr, depress the BACK valve switch. Then depress the HI VAC PUMP switch. This will power up the high vacuum (turbo) pump. Wait until the NORMAL OPERATION light illuminates (it's on the lower panel below the main control board), indicating the pump is up to speed.
9. When the FORELINE pressure goes below 100 mTorr, depress the BACK valve switch (closing the backing valve), and depress the ROUGH valve switch (opening the roughing valve).
10. Turn the thermocouple switch to the CHAMBER position.
11. When the CHAMBER pressure goes to less than 350 mTorr, depress the ROUGH valve switch (closing the roughing valve), depress the BACK valve switch (opening the backing valve), and depress the HI-VAC valve (opening the high vac plate). The thermocouple gauge reading should quickly descend below 10 mTorr.
12. Switch the high vacuum gauge on by pressing the ON/OFF switch. If the meter does not respond, depress the black RESET button near the gauge, wait a few minutes, and try again.
13. Once the pressure reading on the high vacuum gauge is below 3×10^{-6} Torr, you may begin the deposition.

B. Depositing metals.

Metal deposition parameters will vary greatly depending on the type of boat and metal to be evaporated, and will not be listed here. Please check the log book for some recent suggestions. Material parameters such as density and z-ratio can be found on page 5-22 of the Inficon XTC/C Controller Operating Manual.

1. Turn on the thin-film deposition controller by depressing the white button on the controller console.
2. Depress the PROG button on the keypad to display the deposition parameters. Scroll through each parameter by depressing the DOWN ARROW, modifying parameters as necessary. Typically, the density, z ratio, final thickness, and deposition rate will need to be changed for each use. You may also wish to change the rise/soak times and power levels depending on the metals to be used. When the parameters have been entered, press PROG a second time to return to the real-time display.

3. Check to be sure the crystal is functioning properly by depressing the LIFE button. A percentage between 0~100% should be displayed. Please record this number in the log book. If the words XTAL FAIL appear, or the percentage is close to zero, you will need to change crystals as described in the Inficon Manual.
4. Turn on the FIL/GLOW POWER switch on the front panel. Turn the FIL ADJUST switch all the way to the left (zero). Select the desired source (right or left) using the filament selector switch.
5. To begin the deposition, press START on the controller console. When the word "DEPOSIT" is displayed on the screen, open the shutter using the SHUTTER CONTROL underneath the controller console. When the final thickness has been reached, the power should shut off automatically.
6. If you'd like to deposit a second film, you may do so now by repeating steps 1-4. Otherwise, turn off the controller by depressing the white power switch on the controller console. Turn off the FIL/GLOW POWER switch as well.
7. WAIT at least 30 minutes before venting the system to remove your samples.

C. Venting the system.

1. Turn off the high vacuum gauge by depressing the ON/OFF switch.
2. Depress the HI-VAC valve switch (to close the high vacuum plate). WAIT 5 seconds before continuing to allow the valve to fully close. The BACK valve should remain open.
3. Depress the VENT valve switch to open the vent. Again, check the nitrogen regulator to ensure the pressure is at ~5 psig.
4. Pull GENTLY on the chamber door handle so the chamber will open when it reaches ~1 atm.
5. Depress the VENT valve switch to close the vent valve. You may now remove your samples using clean tweezers and gloves.
6. Should you wish to perform more depositions immediately after the first one, you may pump down the chamber (A) by turning the mode select knob to AUTO PUMP. The computer and interlock will perform the pumping automatically. After deposition (B), you may vent the system (C) by turning the knob to AUTO VENT.

D. Full system shutdown.

The system should be shut down completely if it will not be used again within a day. After venting the system, close the chamber door and follow these instructions.

1. Rotate the mode select knob to AUTO PUMP to pump down the system. Wait until the thermocouple gauge reads a CHAMBER pressure of less than 10 mTorr.
2. Rotate the mode select knob to MANUAL.
3. Depress the HI-VAC valve switch to close the high vacuum plate.
4. Depress the HI-VAC power switch to turn off the turbopump. Wait 10 minutes.
5. Open the MECHANICAL PUMP VENT (small black switch underneath the console) to allow the air to enter the system for a second or two. LEAVING THE MECHANICAL PUMP VENT open, depress the MECH PUMP power switch to turn off the mechanical pump. After the hissing stops, you may release the MECHANICAL PUMP VENT.
6. Turn off the air and water supply on the wall and shut off the nitrogen regulator using the large knob. Turn off the system power by depressing the SYSTEM CONTROL OFF switch. Check your log book entry to be sure it is complete, and clean up after yourself.