

Operation Instructions for the Oerlikon Electron Beam Evaporator



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Description:

The Oerlikon 450B evaporator is an electron beam vacuum deposition/thin-film coater system. This unit has an eight-pocket crucible system for deposition of multiple films without the need to open the chamber. It is also equipped with two thermal (RPS 5002) sources that use high-current (400A) heating through tungsten filaments to evaporate alloys and custom metals. The system is equipped with a Kaufman & Robinson (KRI) ion source. The ion source may be used during the deposition of thin films to enhance the film's properties (density, refractive index) and generally improve the overall quality of the film.

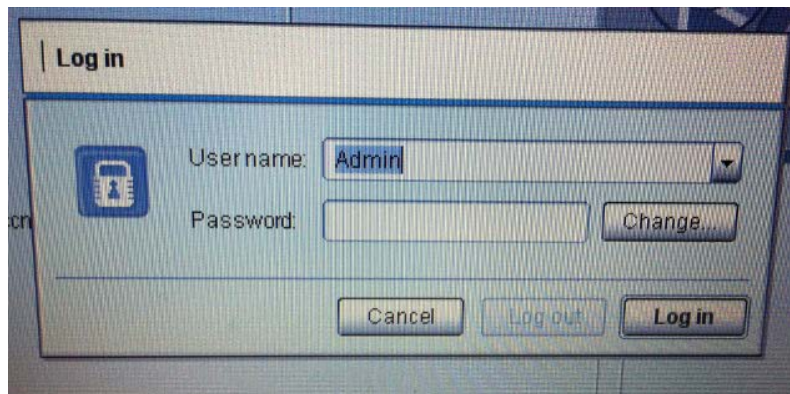
Metals Available for E-beam Evaporation: Ti, Au, Al, Pt, Cr, Ni, Pd

Gases: Argon and O₂

Operation Instructions:

1 – Enable System in Coral

2 – Login to system software (key):



Username: Admin

Password: admin

3 – Find the pumping screen on the system software and select “VENT”

- Never select “OFF” or “REGEN” as this will cause the cryo pump to heat up

4 – Allow system to vent to ATM - open door and verify the next 5 tasks

5 – REPLACE Window Film

- Remove wire retaining clip
- Use 4” wafer to cut out new window film
- Install in system – insert clip to keep film in place
- Dispose of old window film in “Metal Reclaim” Bag next to system

6 – ENSURE SYSTEM IS CLEAN

- Obtain “Metal Reclaim” Vacuum cleaner and vacuum out any debris from inside the system.
- Be sure not to vacuum the source material

7 – Verify Film Thickness Crystal Monitor:

Sensor #	1	2
Crystal #	--	--
Status	ON	OFF
Freq	5891228.81	5970657.56
Life	89.12%	97.07%
Rate	-0.00	--
Thick	0.501	--
CQ Count	--	--
CS Total	--	--

- Sensor should be replace if lifetime is < 30%
 - o **Be EXTREMELY CAREFUL when replacing sensor** (if needed)
 - o Sensors are stored in “EVAP MATERIALS” N2 Purge Cabinet
 - o NEVER TOUCH new sensor with your hands
 - o Place old sensor in the container

8 – Remove sample holder from system

- **Do NOT Bump Film Thickness Monitors!!!!**
- Carefully hold sample holder – turn 4 spring clips 90 degrees to remove
- Insert Your Sample onto the sample holder and install

9 – METAL VERIFICATION

- You must verify ALL Metals that you are going to use
- There must be at least 50% remaining metal in the crucible
- Use the Pocket selector to verify metals
- Use the up/down joystick next to the Emission control to select the metal (black arrow) you need to verify (Ex. Titanium)



- Push the joystick to the right and hold until the name of the metal appears. The system will show "SEARCH" until it finds the correct pocket





- If you let go – the system will think there is a pocket jam error (menu/quit – 3x to clear error – ONLY AT ATMOSPHERE – this should never be done unless the system is vented)

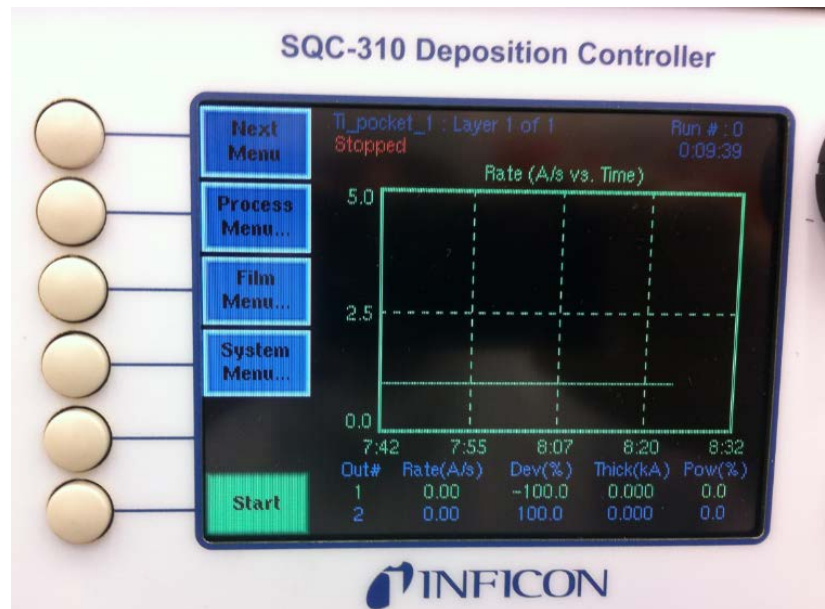
10 – Close System Door and latch – verify software has acknowledged the door is closed

11 - Find the pumping screen on the system software and select “EVACUATE”

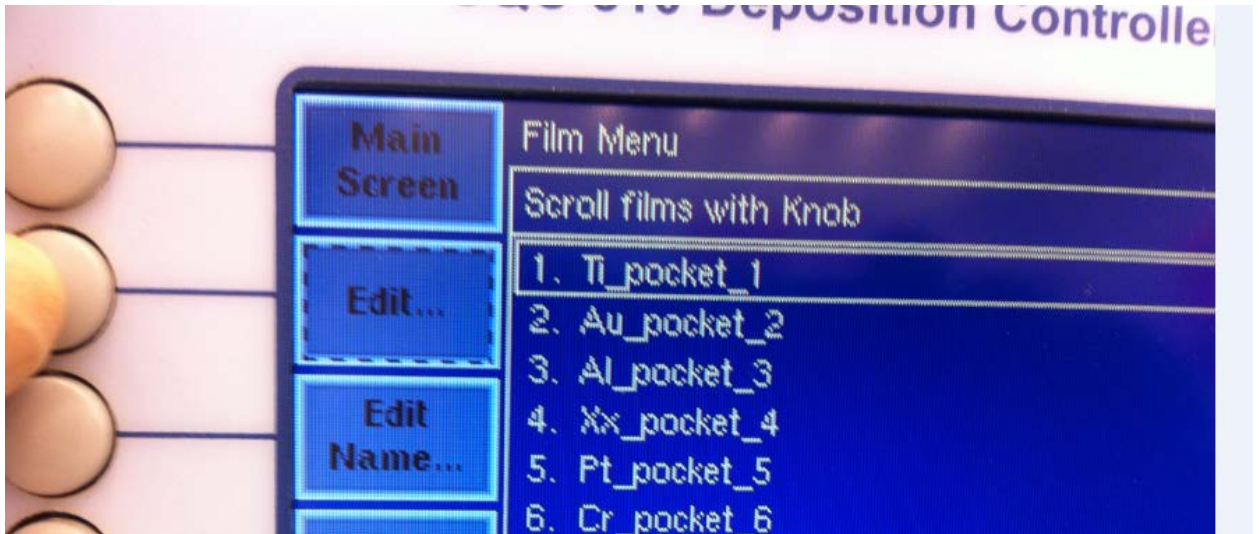
- Allow the system to pump down to 2.0 E-6

12 - Program the deposition controller

- Select “Process Menu”



- Select the metal you wish to deposit using the spin wheel



- Select "EDIT"
- Select "Layer 1.1"



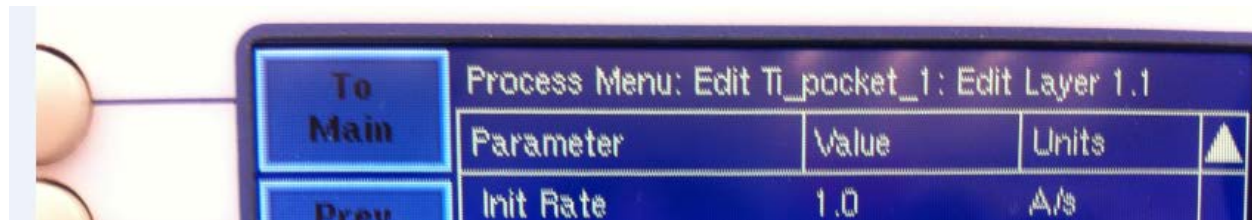
- Select "EDIT" again
- Users are to change the following 4 parameters:
 - o Initial Rate - Deposition rate in Angstroms/sec
 - DON'T EXCEED 3 A/Sec
 - o Final Thickness – this is the film thickness that you want the system to deposit – Take note the units are kilo Angstroms (kA).
 - o Max. Power – Use Excel spreadsheet to determine the actual power needed for the deposition rate desired. Look at two or more to determine actual power and then add 3 to 4%.
 - o Verify "Ramp" is turned to DISABLE



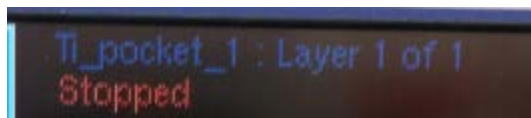
13 – Fill out Excel Spreadsheet:

- Fill in Date, start time, metal, deposition rate (A/sec), thickness (nm)
- Will need to record power (%) and current (mA) once deposition has started

14 – Select “To Main” to load the process desired



- Confirm that the correct process has been selected (example – Titanium)

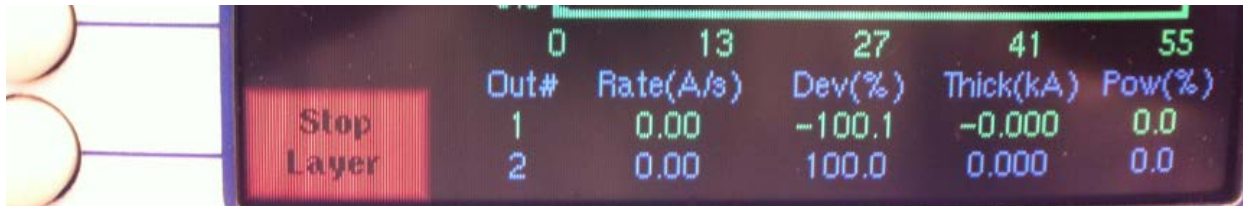


15 – Once Pressure has reached 2.0×10^{-6} – select “Start”. The system will automatically do the following steps:

- Rotate to the desired metal pocket
- Turn on the HV and perform a “rise” step to start the melt
- Complete a “Soak” step to heat the metal



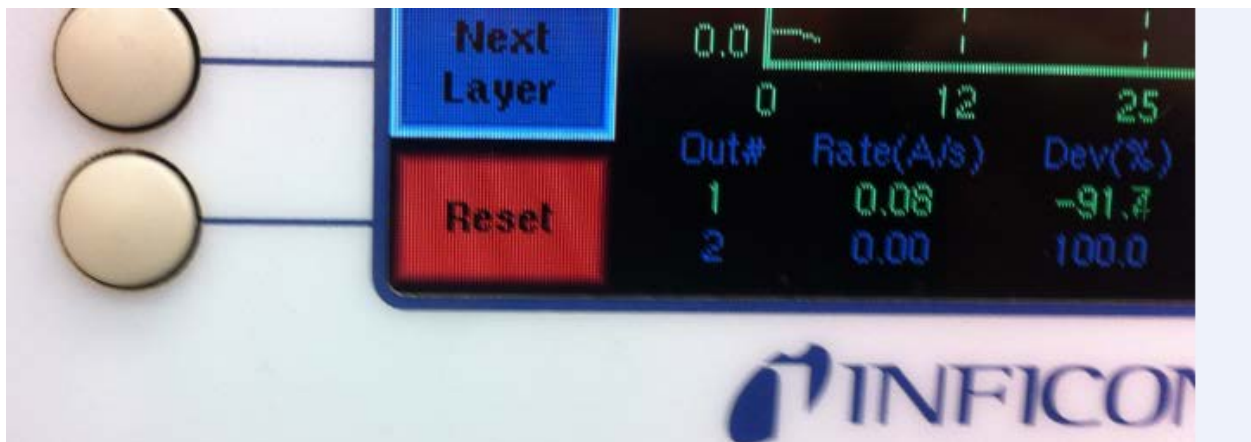
16 – Monitor beam during entire deposition to ensure the e-beam is in the middle of the metal crucible. Once the deposition starts – you can ABORT the process if needed by selecting the “Stop Layer” button (the start button changes to abort once you select Start).



If you “Stop Layer” you will need to “Reset” the system in order to turn off the HV and Current. In order to do this – you need to change pages in the deposition controller by selecting the “Next Menu” in the upper left screen.



The “Reset” button will now appear – This turns OFF the High Voltage and Filament.



17 - Record Power (%) and current (mA) in the excel spreadsheet

4/9/2015	11:30 AM	2:00 PM Dave Heemstra	Ti	10 nm, 1 A/s, power 4.2%, 39.8 mA
4/9/2015	11:30 AM	2:00 PM Dave Heemstra	Au	10 nm, 1 A/s, power 40.1%, 404 mA

- 18 – Wait 7 min between metal depositions (repeat steps 12 – 17)
- 19 – Wait 10 minutes after last deposition for system to cool prior to venting
- 20 – Vent System and remove sample – place sample holder back in system when done
- 21 – Pump system down by selecting “Evacuate” from main system software
- 22 – Disable System in Coral and complete run data collection