

## Yale Main Campus Cleanroom

<b>SOP title</b>	Kurt J Lesker Thermal evaporator	<b>Prepared by</b>	Ida Sadeghi
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### 1. Purpose

This SOP outlines the proper operating procedure for the Kurt J. Lesker Company® PRO Line PVD 75 thermal evaporator to ensure user safety and optimal performance.

### 2. Scope

This SOP applies to all cleanroom members who operate the Kurt J. Lesker PRO Line PVD 75 thermal evaporator. The SOP does not take the place of thorough training. Please contact a staff member if you are unsure how to operate it.

### 3. Prerequisites

Users must have access to the cleanroom and have an FOM account.

### 4. Responsibilities

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Lauren McCabe	609-902-3834
Ida Sadeghi	617-528-8986

### 5. Precautions

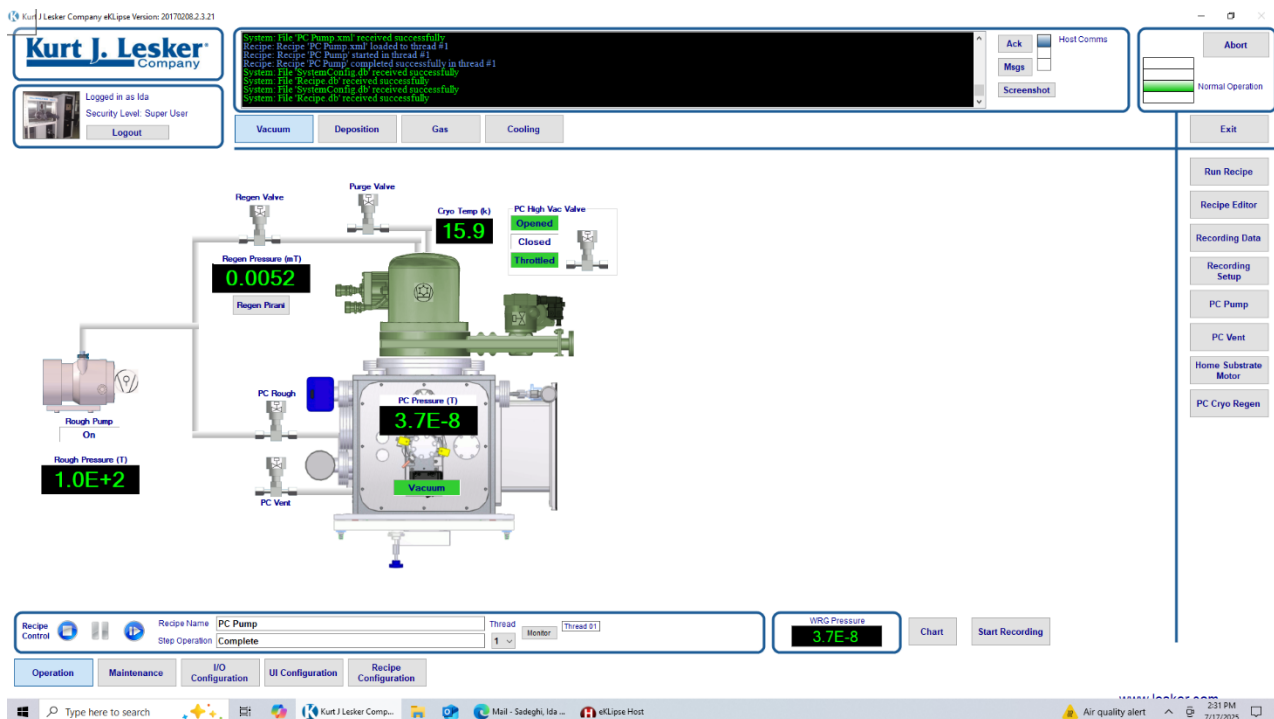
Please wear a coat or coverall and long gloves to avoid Indium contamination on your skin. Indium melts easily and starts to evaporate at relatively low temperatures (its melting point is 156.6 °C). At typical evaporation temperatures, Indium's vapor pressure increases rapidly, leading to a burst-like release of material. This results in material redeposition all over the chamber. This is why the chamber is lined with aluminum foil. Indium droplets formed on the feedthrough can short out to the chamber, inhibiting the deposition. This can be identified by measuring the resistance between the feedthrough and the chamber. If the resistance measures a value in the MΩ range, it means it is safe to operate. If a very small resistance in the order of Ω or kΩ is measured, it means the chamber needs a cleanup.

### 6. Procedure

The evaporator is dedicated to indium only due to the aforementioned chamber contamination. Do not attempt to replace the material.

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- Log in to FOM using your NetID and password.
- Log in to the Kurt J. Lesker software.
- Ensure the main chamber pressure is in the mid  $10^{-8}$  Torr range and the cryopump temperature is at or below 18 K before proceeding.
- To load your sample, go to the **Vacuum** tab and click on **PC Vent** to vent the chamber.



- Mount your sample onto the holder using screws.
- Click on **PC Pump** to begin pumping down the chamber. It will take a few hours for the chamber to reach E-8 Torr.
- Log out of FOM while the chamber is pumping down so you are not charged for the duration of the pump-down. Place a sign on the computer indicating that the system is in use.
- Log back into FOM once the chamber reaches the desired pressure.
- Click on **Run Recipe** to load a recipe. You can run the evaporator for either cleaning or deposition.

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- If running an Ar cleaning, open the O<sub>2</sub> and Ar gas bottles located at the back of the electronics rack. Choose the **Master recipe – Ion Source – Users**. This recipe uses mostly argon with a minor flow of oxygen. The software will then prompt you to select the sputtering duration and substrate rotation speed. Enter those values and click **Continue Load**. The substrate rotation speed is typically set to 20 RPM. After you are done with your process, close the valves on the gas bottles.



Kurt J. Lesker Company eSight Version: 20170208.2.3.21

Logged in as Ida  
Security Level: Super User  
Logout

System File PC Pump and received successfully  
Recipe Recipe PC Pump and loaded to thread #1  
Recipe Recipe PC Pump started in thread #1  
Recipe Recipe PC Pump Completed successfully in thread #1  
System File System Config and received successfully  
System File Recipe #0 received successfully  
System File Recipe #0 received successfully  
System File Recipe #0 received successfully

Ack Mugs Screenshot Host Comms

Normal Operation

Exit

Run Recipe  
Recipe Editor  
Recording Data  
Recording Setup  
PC Pump  
PC Vent  
Home Substrate Motor  
PC Cryo Regen

Recipe User Set Values

Recipe steps listed below require user values, enter these values into the "Values" column or accept the defaults already in place. Then click "Continue Load"

RecipeName	Step	Equipment Type	RecipeItemEquipmentName	RecipeItemEquipmentOperation	Value	Notes
Platen Motor Rotate 20 RP	3	Motor	Substrate Rotation_Speed	Set Value = n.r/n	20	Rotation speed
Master Recipe Ion Source ...	4	Recipe	Dwell	N Seconds	90	Cleaning Time

Continue Load Close

Rough Pump On  
Rough Pressure (T) 1.0E+2

Recipe Control  
Recipe Name PC Pump  
Step Operation Complete  
Thread 1 Monitor Thread 01  
WBG Pressure 3.7E-8  
Chart Start Recording

Operation Maintenance I/O Configuration UI Configuration Recipe Configuration

- If running an In deposition recipe, select the **Master recipe Src 1 (Thermal) – Users**. The software will then prompt you to enter the desired growth rate, thickness, and rotation speed. The rotation speed is typically set to 20 RPM, as before. Click **Continue Load** after entering the values.

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The screenshot displays the Kurt J. Lesker software interface. At the top left, the logo and version information (v4.0.0a Version: 20170208.2.3.21) are visible. The main window shows a 'Purge Valve' dialog box with a table of recipe steps. The table includes columns for RecipeName, Step, Equipment Type, RecipeItem/EquipmentName, RecipeItem/EquipmentOperation, Value, and Notes. The steps listed are: 'Piston Motor Rotate 20 RPM' (Step 3, Motor, Substrate Rotation\_Speed, Set Value = n.mn, 20, Rotation speed), 'Set1 (Thermal) Pre Conditi...' (Step 21, Source, Source 1 Final Thickness Setpoint, Set Value = n.mn, 2, Set Final Thickness (Å)), and 'Set1 (Thermal) Deposition' (Step 6, Source, Source 1 Rate Setpoint, Set Value = n.mn, 2, Å/sec). The 'Continue Load' button is highlighted. To the left of the dialog box, a 'Rough Pump' status indicator shows 'On' and 'Rough Pressure (T)' as  $1.0E+2$ . At the bottom, the 'Recipe Control' section shows 'Recipe Name: PC Pump' and 'Step Operation: Complete'. The 'Thread' dropdown is set to 'Thread 01'. The 'WBG Pressure' is displayed as  $3.7E-8$ . The 'Start Recording' button is visible. On the right side, a vertical toolbar contains buttons for 'Run Recipe', 'Recipe Editor', 'Recording Data', 'Recording Setup', 'PC Pump', 'PC Vent', 'Home Substrate Motor', and 'PC Cryo Regen'.

RecipeName	Step	Equipment Type	RecipeItem/EquipmentName	RecipeItem/EquipmentOperation	Value	Notes
Piston Motor Rotate 20 RPM	3	Motor	Substrate Rotation_Speed	Set Value = n.mn	20	Rotation speed
Set1 (Thermal) Pre Conditi...	21	Source	Source 1 Final Thickness Setpoint	Set Value = n.mn	2	Set Final Thickness (Å)
Set1 (Thermal) Deposition	6	Source	Source 1 Rate Setpoint	Set Value = n.mn	2	Å/sec

- Monitor your process to ensure it is running properly.
- Wait at least 15 minutes before unloading your sample, as it gets hot in the chamber near the source. The substrate itself is cooled while mounted on the substrate holder.
- To unload your sample, click **PC Vent**.
- After removing your sample, please place the holder back in the chamber and click **PC Pump**. Do not leave the chamber vented.
- Log out of FOM.