

# STANDARD OPERATING PROCEDURE

## SEM ION MILL FISCHIONE 1060



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## 1. Scope

This document is intended to serve as a reference for the operation of the Fischione Ion Mill Model 1060 at the Nanomaterials Characterization Facility (NCF).

The document is under constant revision so always check for the most recent version.

## 2. Capabilities

This instrument is mainly used to ion mill thin sections for SEM observation but can be used as a polishing system to enhance the surface characteristics of specimens that will be observed by electron backscattered diffraction (EBSD) in a SEM. More detailed information about the system can be found in the user manual. Note that only Authorized users can have access to the manual.

The system can be operated with ion accelerating voltages as high as 6 keV for rapid milling, and down to as low as 100 eV for final sample polish. The tilting milling angle varies from 0 to +/- 10 degrees. The maximum size sample that can be accommodated is **1 in diameter x 0.59 in height (25 mm diameter x 15 mm height)**. Every time a sample is mounted, the system will check the height and position to adjust conditions.

## 3. Pre-Operation Checklist

3.1 Make sure that the system is found off upon arrival

3.2 Check that the tank is closed

**NOTE: DO NOT OPERATE THE TOUCH SCREEN AND OPERATOR CONSOLE AT THE SAME TIME, IT IS BETTER TO OPERATE THE INSTRUMENT USING ONLY OPERATOR CONSOLE ON THE PC – exceptions apply upon starting -**

## 4. Operation

4.1 Wear gloves.

4.2 Open the Ar tank. Check that the regulator has a reading of at least 200 psi.

4.3 Turn the instrument ON by pressing the switch (I) on the right lower back side.

4.4 Wait until the touch panel has fully loaded (penguin disappears) and you see the main console.

4.5 Locate the UTILITY TAB on the touch panel and press it to view the options contained.

4.6 Locate STARTUP button and press it. This will start a homing process and trigger the roughing pump. Gently push down the load lock lid. **If the system was not used for long time, the Load Lock usually vents after this step. In such case, pressing down gently the load lock lid will help maintain the vacuum and trigger the pump. If the system is stuck and the stage remains in chamber position call Staff to home the z position. Call Staff if incorrect shut down was done.**

4.7 Turn On the PC if not ON. **Log into the USER session not the ServTech session.**

**NOTE: the system will not function properly if the PC is turned On first. If this happens, reset the computer but do not turn off the instrument.**

4.8 Start the Operator Console Application. Wait until the console appears on the screen.

4.9 Locate the Log in option on the upper right side of the console. Log in using the credentials written on the sticker attached to the monitor (XMAT, password 1060).



- ⓐ The instrument graphic. This area is a visual representation of the instrument operation and is displayed at all times. The instrument graphic can be changed to display the instrument operation in a text format from the Service tab.
- ⓑ Timer, Load Lock, and Sample Position. This section is displayed at all times.
- ⓒ Tab-specific content. This section is unique to each tab (in the illustration above, the Main tab is displayed).
- ⓓ The active recipe area. This section displays the activated recipe; if no recipe is activated, this area is empty. This section is displayed at all times.
- ⓔ The status bar. This section provides high-level updates on the system status. This section is displayed at all times.

Figure 1. Operator Console on the PC.

- 4.10 If the Load Lock is under vacuum (at atmosphere – shown on screen), hit the “Vent” button in the software to load your sample - Load Lock section. **Buttons that appear colored in orange can be activated. Buttons colored blue are currently active.**
- 4.11 After venting is complete, open the chamber by lifting the cover up and rotating to the right to a rest position.
- 4.12 Mount your sample using an appropriate stub. Consider that maximum dimensions are: diameter 1 in (25 mm) and height 0.59 in (15 mm).
- 4.13 Return the cover to the centered position and click the “Vacuum” button, in the Load Lock section. Press down the lid of the chamber gently while the vacuum pump is pumping, this is to ensure a good seal.
- 4.14 Now that the sample has been loaded and is under vacuum, the setup of milling and polishing processes can begin. You can load recipes to see usual configurations, but **DO NOT SAVE/MODIFY** existing recipes. Plan your recipe following the next considerations (operate the C Tab shown in Figure 1):
- 4.14.1 Before any milling can begin, the system must be purged before the first use of the day. Use the up and down arrows to adjust the amount of time in minutes and seconds (C Tab Purge). Click “Purge” from the main tab. This will add this step to the Steps Window (wide light orange box at bottom left). Purging must be done for up to 15 minutes. **To remove any step in the Steps Window, right click on the step and click “Delete”.**
- 4.14.2 Adding a delay to the process is the same as the purge, use the up and down arrows to select the amount of time and then click on the “Delay” button add this to the Steps Window. Delay should last longer than purge.
- 4.14.3 The milling parameters of voltage, focus, beam angle, ion beam source (Left, Right), rotation, and time limit can be set using the assigned commands (see Figure 2). **At this step you have the option to enable one or the two guns.** Set your milling recipe using the up and down arrows assigned to each parameter tab.



Figure 2. Milling Commands for sample processing.

4.14.4 Click “Milling” (left panel – C Section shown in Figure 1) to add the milling step to your Steps Window = Process Recipe.

4.14.5 To remove the sample from the Chamber position when your milling step has finished, click the “Unload” button to add this task to the recipe. This action will activate a command for moving the sample to the Load Lock position upon completion of the process.

**Do not enable the Vent Lock, you will do this manually for safety.**



*Figure 3. Unload button to move the sample from Chamber to Load Lock.*

4.14.6 Once all steps have been added to your recipe, you can save it as a template for later use by clicking on “Save”.

4.14.7 Having your recipe in the Steps Window (see example recipe, Figure 7), click on the “Activate” (Figure 6) button to send all steps to the “Currently Active Recipe” window (lower left box).



*Figure 4. Buttons to Activate/Empty the Process Window.*

**4.15 Before you Start any process, you have to move the sample in to the chamber by clicking on the “Chamber” in the Specimen Position Section (Figure 5).**



*Figure 5. Specimen Position Options to Move the sample in and out of the chamber.*

4.16 Once you have a recipe in the Currently Active Recipe window, the **Start** button will become orange (to be activated). Click on “Start” (next to the Currently Active Recipe window), to initiate the recipe. The status of your process can be monitored by checking the timer on the top left side

(Section B , Figure 1). Now you will be able to observe the actions taking place inside the system (ion beam active, sample moving, etc) by observing the Chamber Diagram (Figure 6).

4.17 When the process is finished, the sample will return to the Load Lock.

4.18 If you are done for the day, remove the recipe from the “Currently Active Recipe” window by clicking “Empty” (Figure 4) button. You can delete the steps from the Steps window or save your recipe.

4.19 **Verify that your sample moved up to the Load Lock.**

4.20 Click “Vent” on the Load Lock section to remove the sample. Once the lock is ready to be opened, a messaging saying Lock at atmosphere will appear on the chamber diagram.

4.21 **Once the sample is removed, click on “Vacuum” to leave the system under vacuum. The instrument must remain under vacuum when not in use. See Figure 6 for reference.**

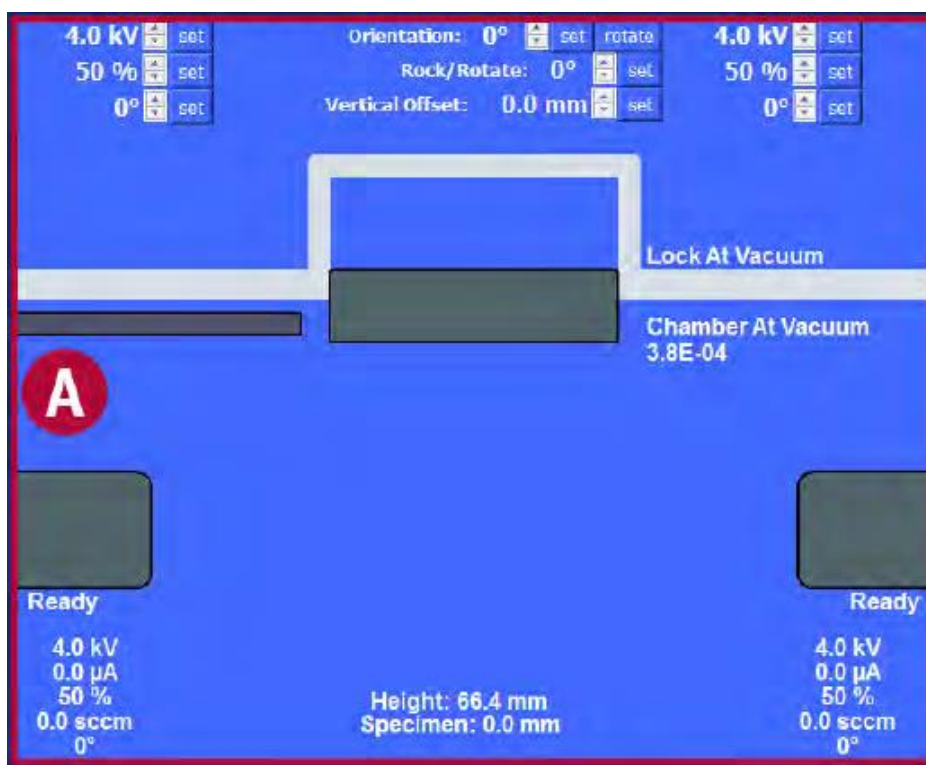
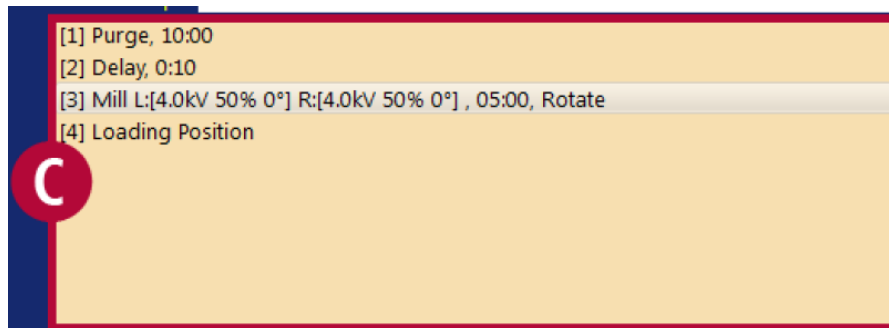


Figure 6. Chamber Diagram showing the sample stage parked in Load Lock position and under vacuum. Chamber appears also locked under vacuum.

4.22 Locate the SETUP tab below the Steps Window and click it.

4.23 Locate the Exit Console Button and press it. This action will take you out of the Operator Console.

- 4.24 On the touch panel navigate to the UTILITY tab.
- 4.25 Locate HOLD CHAMBER button and click it.
- 4.26 Now the turbo pump will reduce the speed. Wait a couple of minutes and then you have to turn off the system by pressing the switch on the back (O). No need to turn off the roughing pump.**
- 4.27 Shut down the computer if no other user is in line to operate the instrument.**
- 4.28 Close the Ar Tank.



*Figure 7. Example of a Recipe in the Steps Window ready to be transferred to the Currently Active Recipe window for making a process run.*