

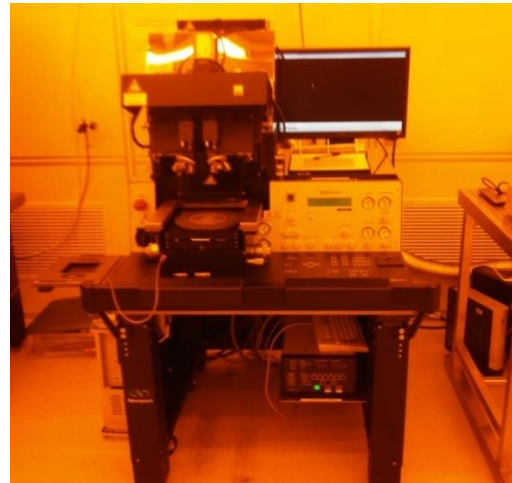
SUSS MASK ALIGNER MA6/ BA6 STANDARD LITHOGRAPHY SOP

Revised April 2020

Overview: This SOP will go over how to use the machine for basic exposures. This will include commonly used controls and frequently modified settings of the machine.

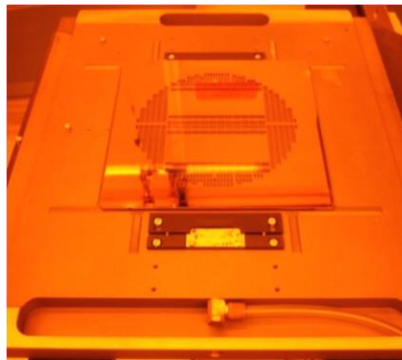
PREPARATION AND PRECAUTIONS

1. Log into the tool in your FOM account.
2. Ensure that the mask aligner is **ON**. The aligner is usually left in **CHANGE MASK** mode. It is from this state that the SOP operates from.
3. Complete **Photoresist Coating SOP** before moving on this SOP. If you are interested in using backside alignment (aligning to features on the back of your wafer) then consult the **SUSS Aligner Backside SOP**.

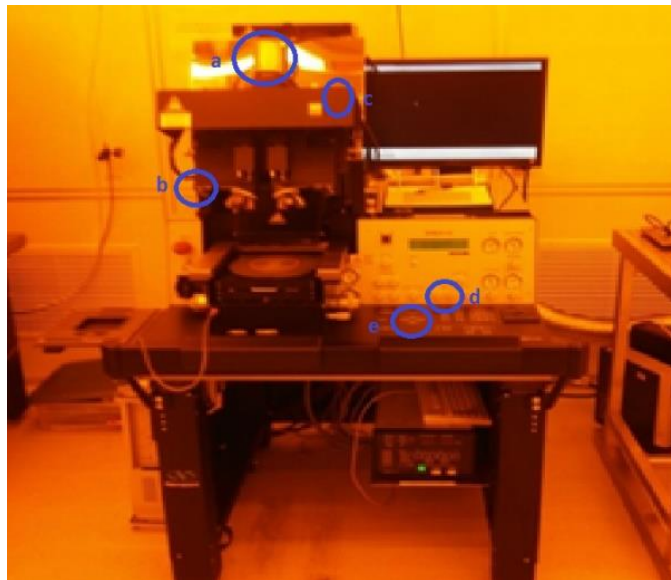


PROCEDURE

1. Place the photomask on the mask holder located to the left of the machine. The photomask should be placed feature side up (reddish side up). Press the photomask up and to the left so that it rests against the screws to ensure proper placement.
2. Press the **ENTER** key to activate the photomask vacuum that will ensure it is held into place. Also, press down on the metal clip below the photomask causing the black bar to spring up and help lock the mask into place.
3. Take the photomask assembly, flip it over, and move it into the SUSS Aligner as shown in the picture. Once it is in place press the **CHANGE MASK** button to inform the machine that there is a photomask in the aligner.

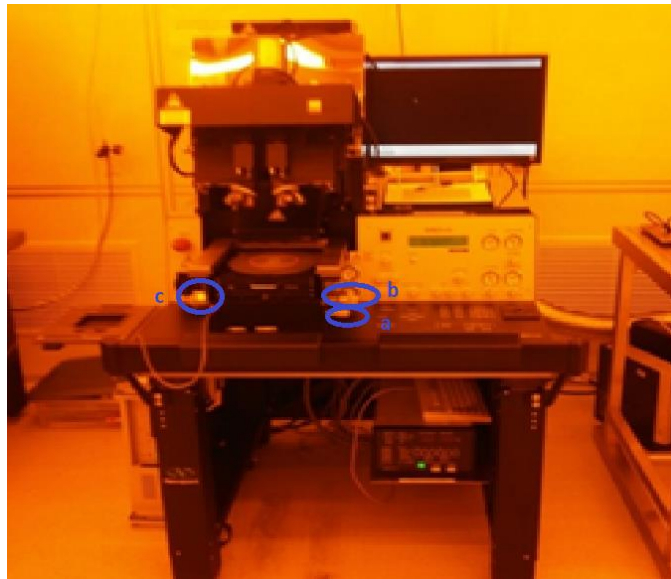


4. Press the **LOAD** button to begin the loading procedure for your wafer. Pull out the slide located under the photomask assembly.
5. Locate the three small pins on the wafer holder. Place the flat of your wafer against the two pins at the bottom and move the wafer up against the last one on the left. Once the wafer is in position, push the assembly into the machine and press the **ENTER** button.
6. The aligner will go through a process where it will force the wafer and mask into contact before separating the two by a small amount. Once this is done we can begin aligning the wafer. We will now go over some of the alignment controls, but if this is a first exposure or one that is not aligning to existing features – then skip ahead to **Step 9**.
7. Alignment is done in two steps, first we have to find our alignment mark in the photomask and then in the wafer. This step will show and describe all of the controls to help locate the alignment marks in the photomask:



- a. This knob on the top of the machine allows us to change the focus on the front side alignment microscope. Your first task should be to make sure the photomask is in focus on the screen by adjusting this knob.
- b. This small knob located just above either microscope will allow us to move the microscope independently in the horizontal direction. Use this to help in finding the alignment mark.
- c. This knob on top of the microscope assembly will rotate the two microscopes with respect to each other.
- d. These knobs will adjust the light level for the microscope allowing us the best possible view.
- e. These controls will move the entire microscope assembly in one piece.

8. Alignment is done in two steps, first we have to find our alignment mark in the photomask and then in the wafer. This step will show and describe all of the controls to help locate the alignment marks in the wafer:



- a. This small knob on the right of the machine will allow us to rotate our wafer without moving the photomask.
 - b. This large knob located on the right of the machine will move the wafer in the horizontal direction.
 - c. This large knob located on the left of the machine will move the wafer in the vertical direction.
9. Now that our wafer is aligned (if necessary), we are ready to set up the exposure. You will want to press the **EDIT PARAMETERS** button shown below.
 10. The key feature here that we will need to change is the exposure time. Press the left and right button until that parameter is being edited. Use the up and down button to enter in the correct exposure time.

NOTE: The Suss Aligner is usually set to expose at $12.1\text{mJ}/\text{cm}^2$ per second. Check the datasheet of the photoresist that you are using to calculate the exposure time. At the time of this writing, the **Shipley 1813** recommends $115\text{ mJ}/\text{cm}^2$, so we will use an exposure time of $115 / 12.1 = 9.5$ **seconds**. You may find a slightly longer exposure time necessary depending on the age of the resist and your spin recipe. You can also reference the log sheet and see what times other users have used for your photoresist. Press **EDIT PARAMETERS** again when you have the correct value.

11. Now we should be ready to start the exposure. Hit the **EXPOSURE** button to start the sequence. Be sure not to look at the light during exposure because it can be potentially damaging to the eyes.

12. Once the exposure is complete, the aligner will notify you that it is safe to pull out the wafer assembly and retrieve your wafer. Do so and push the assembly back into place.
13. Before we retrieve our mask we have to make sure that the machine is returned to its default settings so the next user can easily use the machine:
 - a. Rotate the knobs on either side of the stage so that they read a value of 10-0 as shown in the picture. This is the midpoint of the translational motion of the wafer and will ensure that the next user will have a full range of motion in any direction.
 - b. Adjust the wafer rotation using the small knob next to the stage. Look to the tab below the wafer loading handle and try to leave it parallel to the machine (as in the first picture).
 - c. Lower the light levels using these knobs to ensure long life for the light bulbs.
14. Press the **CHANGE MASK** button and remove the mask assembly and place it over to the left side of the machine. Press **ENTER** to release the vacuum and pull the arm back below the photomask until it locks into place. Retrieve your photomask and proceed to the **Photoresist Development SOP**
15. Logout from the tool in your FOM account.