EV620 Instructions

The EV620 is capable of three processes:
1) Top Side Alignment – standard contact lithography aligning the mask to the same side you are printing on
2) Bottom Side Alignment – contact lithography aligning the mask to the opposite side you are printing on
3) Flood Exposure – exposing the whole wafer without using a mask

General Instructions
1) Do not use the tool without staff training.
2) Do not touch the lamp power supply.
3) All EV620 parts are to be in the rack or in the proper place in the tool. At no time should the parts be placed anywhere else.
4) Clean up after you are done your work.
5) UV protective eyewear is recommended during exposure.
6) Be gentle on all hardware.

System Reboot
From time to time the system may lock up. If that is the case, simply reboot the system and try again.
1) The computer is located in the cabinet in the bottom right side of the tool. Turn off the computer by pressing the power button on the front.
2) Turn off the key switch (#1) on the upper right of the tool for about 10 seconds and then turn it back on. DO NOT turn off the main power switch (#2), as this will extinguish the lamp. If the main power switch is turned off, you should contact staff to reignite the lamp.
3) Turn the computer back on by pressing the power button on it again.
4) When the computer has finished rebooting, double click the EV620 icon to run the software.
5) Log in using the username “operator” and the password “ev620”. Note that the username and password are both case sensitive and need to be in all lower case letters.

Recipe Names
Users may save their recipes with the following requirements on the recipe name:
1) Recipe name must include their user name or PI
2) Recipe must not begin with a 0 (zero).
EV620 Overview

1 – EVG 620 Main Power Switch
2 – Key Switch
3 – Trackball
4 – Joystick (Twist to focus)
5 – EV620 Keypad
6 – Hard Contact Pressure Adjustment
7 – X Position Caliper
8 – Theta (Θ) Position Caliper
9 – Y Position Caliper
10 – UV Filter Mount
Recipe Options

<table>
<thead>
<tr>
<th>Maskholder Size:</th>
<th>Leave at the default values no matter what substrates and masks you are using.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MaskholderThickness:</td>
<td></td>
</tr>
<tr>
<td>Substrate Size:</td>
<td></td>
</tr>
<tr>
<td>Substrate Thickness:</td>
<td></td>
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</tbody>
</table>

<p>| Proximity: | Space in microns between the mask and the wafer during the exposure. This value is only used for the proximity exposure process and can be adjusted during wafer alignment. Good values are around 10 – 20 microns. |</p>
<table>
<thead>
<tr>
<th>Separation:</th>
<th>Space in microns between the mask and the wafer during the alignment process. Setting this too low will make the mask and wafer scrape together during the alignment. Good values are in the 30 – 50 micron range. This value can be changed during the wafer alignment.</th>
</tr>
</thead>
</table>
| Process: | Top Side – for exposing an image on the same side of the wafer as the alignment marks  
Bottom Side – for exposing an image on the opposite side of the wafer from the alignment marks  
Flood Exposure – for exposing the whole wafer to UV light without a mask  
μ-Contact Printing – Contact staff if you wish to use this option  
NanoImprint – Contact staff if you wish to use this option |
| Process Mode: | Transparent (Only option) – uses top optics to look through mask to see the wafer and to align the wafer to the mask. The mask alignment marks must be designed to have a clear window around a Chrome mark (clear field).  
Bottom Side | Transparent – Identical to top side alignment but using the bottom optics. Can be used when exposing transparent substrates. Alignment accuracy is lower than with other modes.  
Overlay – Video image of the first set of alignment marks is stored and overlaid on top of a live image of the second set of alignment marks. The ‘lock and key’ type alignment marks give the best accuracy in this mode.  
Crosshair – Graphical cross hairs are placed on top of the first set of alignment marks. The second set of marks is then aligned to these graphical cross hairs. Accuracy is best if both sets of alignment marks are identical.  
Top Side / Flood Expose |
| **Exposure Mode:** | Continuous – Exposes wafer for the time listed in the *Bond/Exp Time* field.  
Interval – Exposes wafer for the time listed in the *Bond/Exp Time* field, pauses for the time listed in the *Delay* field, and repeats that process the number of times listed in the *Expose Interval* field.  
Constant Energy – Measures the lamp intensity and varies the exposure time to give the same exposure dose.  
Sector Exposure – Allows you to perform an exposure matrix by entering in multiple exposure times. |
|---|---|
| **Contact Mode:** | **Soft Contact** – Mask and wafer are pressed together with a preset force.  
 **Hard Contact** – Mask and wafer are pressed together with higher variable force. Contact pressure is adjustable using the Hard Contact Pressure Adjustment Knob (#6).  
 **Vacuum Contact** – Do Not Use  
 **V+H Contact** – Do Not Use  
 **Proximity** – Wafer and mask are held in close proximity to each other but not touching. Approximate space between mask and wafer is set in the *Proximity* field. |
| **Expose / Bond:** | Delay Before Exposure – Allows you to set a delay before the tool performs the exposure  
Sector Exposure Settings – Allows you to enter 8 different exposure times for performing an exposure matrix on the wafer. If you want to perform less than 8 you still need to enter in 8 times, but you can click exit the exposure mode by holding the joystick button for 2 seconds. |
| **WEC Interval** | This allows you to set options on how often the planarization is performed. Contact staff for a further discussion of how to use this setting. |
UV Filter Option

We have available a UV filter that blocks all wavelengths below 350nm for improved imaging of SU-8 and KMPR photoresists from Microchem. These materials are strongly absorbing below 350nm, which can lead to poor resist profiles. The filter will help to reduce 'T-topping' of the resist as well as improve the process window for these materials.

The filter is slid into the holder at the bottom of the lamphouse. Handle the filter gently and try to avoid getting marks in the middle of the plate. Be sure to remove the filter when you are finished.

The filter reduces the total energy of the lamp, so exposure times will need to be increased approximately 30 – 50%.
Running Recipes

*Log into the CAC.*

*Load the proper size wafer chuck into the tool.*

To change the chuck, remove the current chuck by lifting it out of the tray and pulling off the vacuum tube. Place it into tool rack being careful not to push anything out of the back of the rack. Attach the vacuum tube to the new chuck and lay it into the tray. Press the vacuum tubing into the groove in the tray.

*Home the tray*

Home the stage by moving all of the calipers to 5. All calipers are to be read on the **RED** scale only. The calipers have an approximate range of travel of 0 – 10 on the **RED** scale.

*Open & Run the Recipe*

Choose “*File, Open…*” and select the recipe you want to run. The recipe will be minimized at the bottom of the screen. Open the window and verify the settings are correct. Press the *Run* button to start the recipe.
Changing the Mask holder

At the recipe prompt, remove the mask holder currently in the tool and verify all O-rings are in their proper places. If not, replace the O-rings or contact staff. Place the mask holder into the storage rack. Place the correct size mask holder into the tool with the text on it forward, making sure it is flat and level in the tool.
Top Side Alignment

*Insert Maskholder and Press* <Continue>
Change mask holder as detailed in the previous section. Make certain that the tray is homed and the correct size wafer chuck is loaded.

*Insert Mask with Load Frame and Press* <Continue>
Place the correct size load frame on the wafer chuck, locating the two pins in the load frame in the matching holes in the wafer chuck. Place the mask Chrome side down on the load frame with the mask label on the right.

*Move Tray In*

*Adjust Mask and Press* <Continue>
Using the joystick (#4), move the optics to locate the alignment marks on your mask. Once you have located one of the alignment marks, use the Theta adjustment caliper (#8) to adjust the rotation of the mask so that both alignment marks can be seen at the same time. Do not use the X and Y calipers to move the mask but instead use the joystick to move the optics in those directions.

The position of the optics can be stored for later automatic movement of the optics the next time you use the mask. Click the *Store Pos* button to open a dialogue box that will allow you to save the position. The name of your stored position must include your user ID. To recall a stored position, click the *Load Pos* button and select it from the list. In general the recalled position will not exactly where your alignment marks are due to slight differences in how the mask is sitting on the load tray but it should be close.

*Mask Vacuum Error*
There are three possible reasons for this error:
1) The calipers were not homed at the start of the recipe.
2) You have not logged into the tool on CAC.
3) One of the O-rings under the mask holder is missing.
Answer “No” to exit and unload the mask. Identify and correct the problem and try again.

**Move Tray Out**

*Remove Load Frame and Press <Continue>*
Remove the load frame from the wafer chuck and place it in the storage rack.

*Insert Substrate for WEC and Press <Continue>*
Place the wafer on the chuck with the flat aligned with the two white alignment fingers.

**Move Tray In**

*Adjust Substrate and Press <Continue>*
Using the calipers, move the wafer around until you locate the alignment marks. Take care not move the calipers past their range of travel. If you feel increased resistance turning the caliper, stop and back the caliper up. The wafer may be put into contact with the mask by pressing the Separation/Contact button. **When the button is RED or the light is on, you are in separation.**

At this step, you may go to the recipe screen and adjust the exposure time, contact mode, and separation or proximity distances.

**Move Tray Out**

*Remove Substrate and Press <Continue> or <Exit>*
Press <Continue> if you want to expose more wafers or <Exit> if you want to unload the mask. When it asks you if you want to unload the mask, always click “Yes”!

*Insert Load Frame and Move Tray In*

**Move Tray Out**
Remove your wafer and return the mask load frame to the rack.

*End of Process*
Click on <Exit> again to return to the recipe screen.
Bottom Side Alignment

*Insert Maskholder and Press <Continue>*
Change mask holder as detailed in the previous section. Make certain that the tray is homed and the correct size wafer chuck is loaded.

*Insert Mask with Load Frame and Press <Continue>*
Place the correct size load frame on the wafer chuck, locating the two pins in the load frame in the matching holes in the wafer chuck. Place the mask Chrome side down on the load frame with the mask label on the right.

*Move Tray In*

*Adjust Mask and Press <Continue>*
Using the joystick (#4), move the optics to locate the alignment marks on your mask.

The position of the optics can be stored for later automatic movement of the optics the next time you use the mask. Click the *Store Pos* button to open a dialogue box that will allow you to save the position. The name of your stored position must include your user ID. To recall a stored position, click the *Load Pos* button and select it from the list. In general the recalled position will not exactly where your alignment marks are due to slight differences in how the mask is sitting on the load tray but it should be close.

Mask Vacuum Error
There are three possible reasons for this error:

4) The calipers were not homed at the start of the recipe.
5) You have not logged into the tool on CAC.
6) One of the O-rings under the mask holder is missing.

Answer “No” to exit and unload the mask. Identify and correct the problem and try again.
Move Tray Out

Remove Load Frame and Press <Continue>
Remove the load frame but do not load a wafer.

Move Tray In

Adjust Mask and Press <Continue>
Using the joystick (#4) adjust the optics until both alignment marks are in sharp focus.

Adjust Crosshair / Adjust Overlay and Press <Continue>
Crosshair method – Adjust the position and size of the crosshairs until they are over the mask alignment marks.

Overlay method – You can adjust the amount of image overlay and invert the overlay if required.

Move Tray Out

Insert Substrate for WEC and Press <Continue>
Place the wafer on the chuck with the flat aligned with the two white alignment fingers.

Move Tray In

Adjust Substrate and Press <Continue>
Using the calipers, move the wafer around until you locate the alignment marks. Take care not move the calipers past their range of travel. If you feel increased resistance turning the caliper, stop and back the caliper up. The wafer may be put into contact with the mask by pressing the Separation/Contact button. **When the button is RED or the light is on, you are in separation.**

At this step, you may go to the recipe screen and adjust the exposure time, contact mode, and separation or proximity distances.

Move Tray Out
**Insert Substrate and Press <Continue> or <Exit> to unload Mask**
Press <Continue> if you want to expose more wafers or <Undo> if you want to unload the mask.

<Maskcheck> - pressing this button will prompt you to move the tray in without a wafer and return you to the “Adjust Crosshair / Adjust Overlay and Press <Continue>” step.

**Insert Load Frame and Move Tray In**

**Move Tray Out**
Remove your wafer and return the mask load frame to the rack.

**End of Process**
Click on <Exit> to return to the recipe screen.