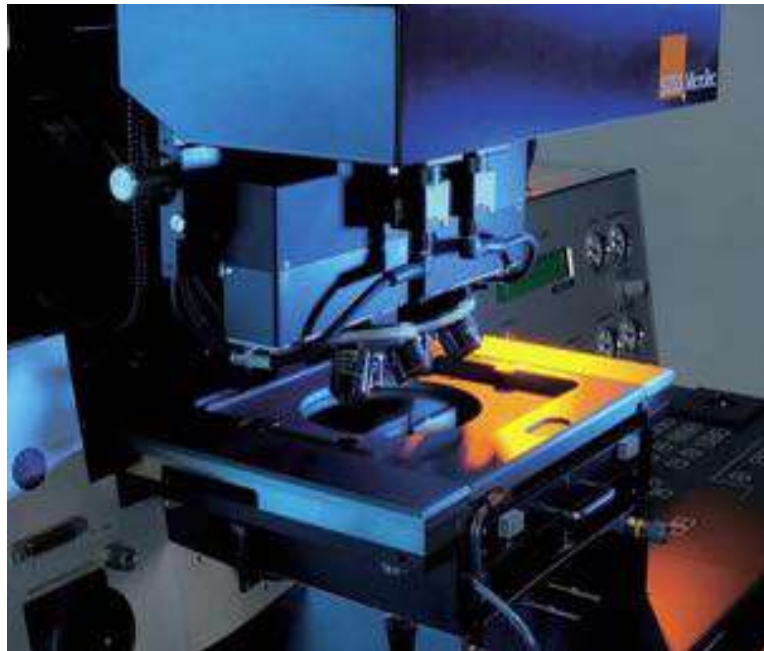



Karl Süss MA6 Mask Aligner Standard Operating Procedure


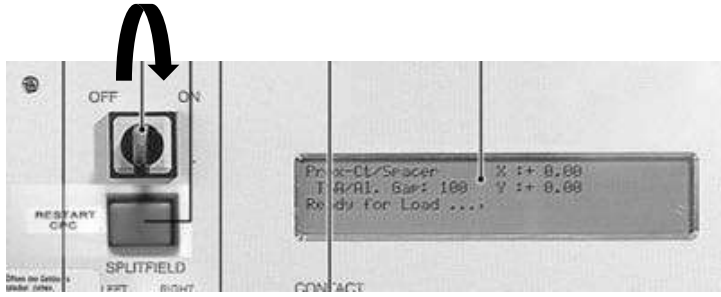


These instructions are intended for reference only, and will *not* replace the thorough training required for proper system operation. Contact a clean room staff member with questions or to report a system problem.

For ease of reading, LCD messages are bolded in **red** text. Operator actions, buttons to press, and knobs to turn are italicized and capitalized in *BLACK* text.

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<p>1.</p>	<p>Enable the tool in BADGER.</p>	
<p>2.</p>	<p>VERIFY SYSTEM STATUS. When you first approach the tool, the lamp should be on, indicated by the appearance of the number 0.0 in the LIGHT INTENSITY field, and a nominal lamp wattage in the LAMP POWER field. The CP button should be lit, as well. Initially, the green key on the front control panel should be in the off position.</p>	

		 <p>CP button</p> <p>LIGHT</p> <p>INTENSITY</p>
<p>3. TURN ON TOOL.</p>	<p>Turn on the MA6 power switch by rotating the green key on the control panel clockwise.</p>	

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4. INITIALIZE MACHINE.

Press the *LOAD* button to initialize the machine. The LCD on the main operator's panel should read **Ready for Load ...**, when the tool is in its quiescent state.



5. INSTALL MASK.

To continue, press the *CHANGE MASK* key. The display message will be

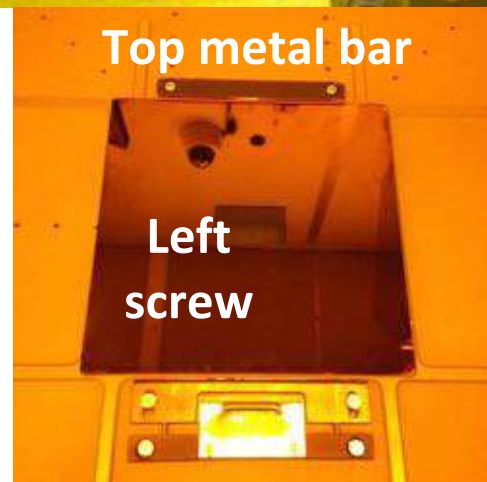
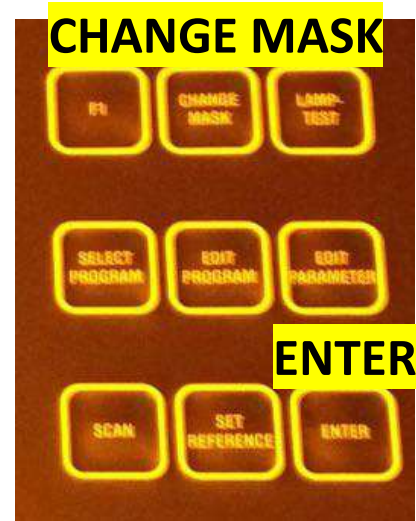
Change Mask – Press ENTER to toggle mask vacuum: [OFF/ON].

Ensure mask vacuum is off (use the *ENTER* key to toggle the vacuum state).

Remove the mask chuck from the stage area and turn it face up on the small table to the left of the tool.

Install and mechanically clamp the mask using the left screw and top metal bar on the mask chuck. Toggle the vacuum state to “ON” by pressing the *ENTER* key.

Re-install the mask chuck into the stage area, and press the *CHANGE MASK* key to complete mask installation. The display will return to the **Ready for Load ...**, state.





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6.	<p>LOAD SUBSTRATE. Press the <i>LOAD</i> key. The display message will change to Pull slide and load substrate onto chuck. Pull the sample holder out until it stops, and change sample chuck if necessary. Load your sample carefully, and apply the vacuum by pressing the <i>ENTER</i> button. Test that your samples does not significantly move around on the chuck by poking at it with tweezers. Push the sample holder back into the machine. Press <i>ENTER</i> to confirm, as instructed. Display will change to Performing WEC! Please Wait ... as the mask makes contact with the sample underneath. The display will then change to</p>	
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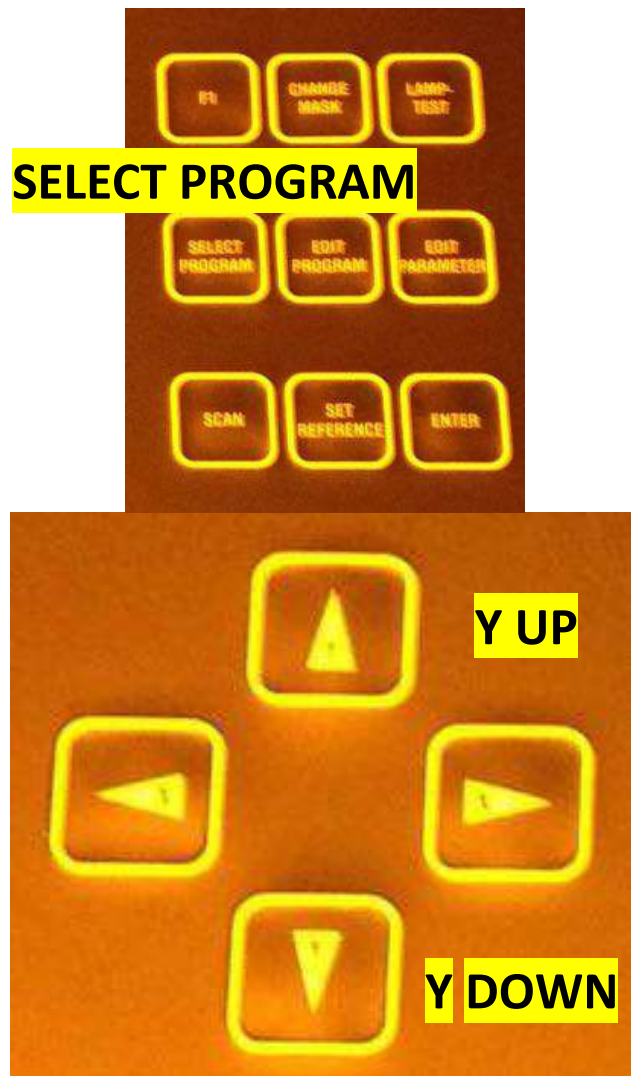
Microscope moving.



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	Please Wait ... , and finally Align substrate .	
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7. **SELECT EXPOSURE PROGRAM.**
- Begin by pressing the *SELECT PROGRAM* button. The display message will change to **Exposure Type:[exposure selection]**, where *exposure selection* is the contact mode to be used in your process. Use the Y UP/DOWN keyboard keys to cycle through contact choices. Only **Soft**, **Hard**, and **Prox** (shorthand for proximity) contact types are available to users. Press *SELECT PROGRAM* to confirm your contact mode selection and to exit this operation mode.
- Flood-E** is the only noncontact mode currently available. Please contact the super user or





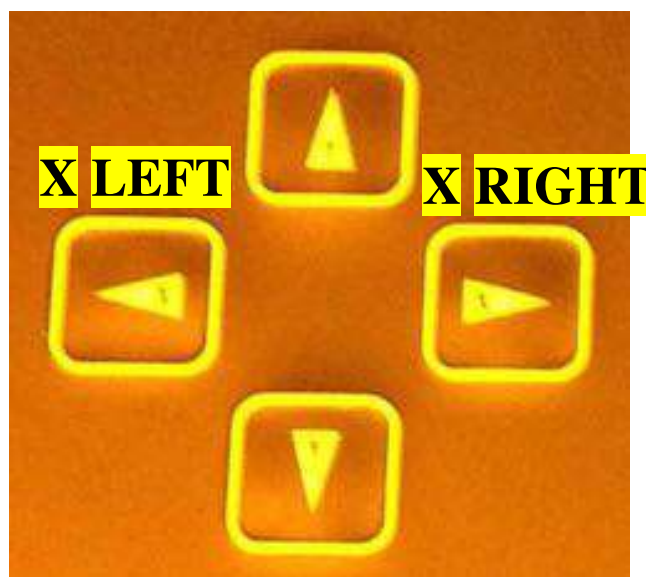
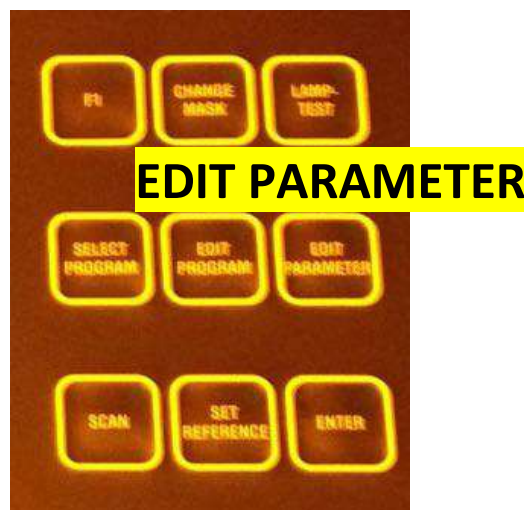
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	cleanroom staff for further information.	
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8. SET EXPOSURE PARAMETERS.

The display will subsequently show **Align Substrate**. Next, press the *EDIT PARAMETER* button to bring up a display of exposure parameter options. Use the X *LEFT/RIGHT* keys to step through the choices. Set **Exp. Time[s]**: to the desired exposure time value using the Y *UP/DOWN* keys. Accept the defaults for other selections (if you want to change the Alignment gap, **Al Gap [um]**:, from its default value of 100 microns, please contact the super user or cleanroom staff first).

Following selection of your exposure parameters, confirm your

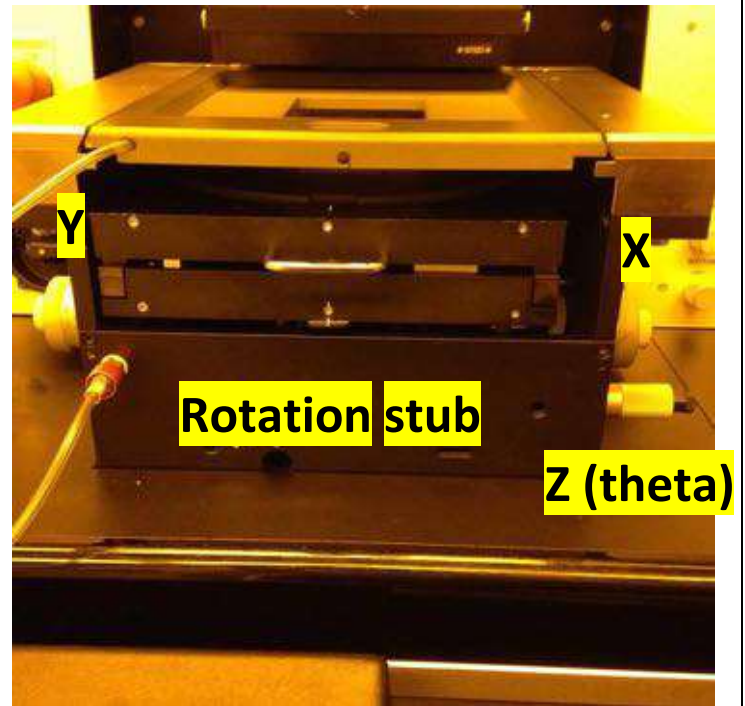


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	choices by pressing <i>EDIT PARAMETER</i> . The display message will return to Align Substrate .	
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9. **ALIGN.**
 Use the stage X, Y, and Z (theta rotation) micrometers to adjust the sample positioning. Use the keyboard's *X LEFT/RIGHT* and *Y UP/DOWN* keys to move the microscope for viewing sample placement. You can press the *FAST* button to enable faster microscope movements.

Note the little rotation stub which indicates the degree of rotation of the stage. Before loading the sample, the solid white line of this piece should fact out towards the user. This position indicates 0 degrees of rotation.



10. EXPOSE.

When alignment is complete, switch the lamp power supply over to CH1. The tool is only calibrated in CH1, to a static intensity of 12mW/cm².

Subsequently, press the *EXPOSURE* button. The display will show **Microscope moving**
Please wait ..., then the z axis (indicated by the **Z [um]** value) will gradually decrease until the mask comes into contact with the sample. A timer counts down the exposure time. For safety reasons, do not look at the UV light during the exposure; instead, glance at the lamp power supply box, and jot down the LIGHT INTENSITY and LAMP POWER values.

Wait for all exposure



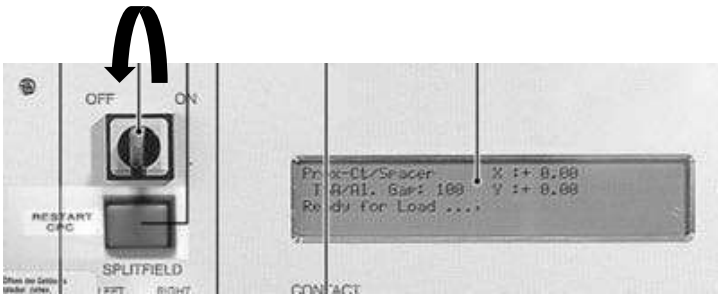
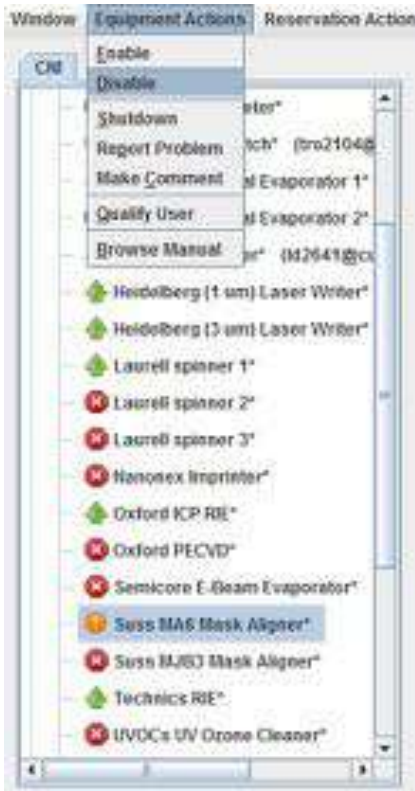
EXPOSURE

actions to complete (i.e. the UV light apparatus retracts, the microscope moves back to the down position, all mechanical parts stop moving, etc.), and for the display message to change to **Pull slide and unload exposed substrate**. Pull the slide out to retrieve your sample; the vacuum will automatically release. Remove your substrate and push the sample tray slide back in. The display will return to the **Ready for Load ...** state. After you finish your exposure(s), go back to CP mode on the lamp power supply.



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11.	MASK REMOVAL. Press <i>CHANGE MASK</i> to enter this mode. Release the mask holder from the machine and position it face up on the small table to the left of the	
	machine. Press the <i>ENTER</i> button to toggle mask vacuum off. Slide the mask away from the left screw and remove it from the holder. Return the holder to its place in the stage assembly. Press <i>CHANGE MASK</i> again, and – perhaps after a brief complaint about loss of mask vacuum, which you can ignore – the display will return to Ready for Load	

<p>12. CLEAN UP.</p> <p>Clean up any debris. Be sure to take your sample and mask with you. Turn the green key to the system to the off position.</p>	
<p>13. BADGER LOGOUT.</p> <p>Don't forget to disable the tool in badger after you're done.</p>	

REFERENCES:

- [1] <https://www.inrf.uci.edu/wordpress/wp-content/uploads/sop-dry-karl-suss-ma6notebook.pdf>



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- [2] <https://louisville.edu/micronano/files/documents/standard-operating-procedures/maskaligner-ma6a6-extended-sop-2>
- [3] <http://nanolab.berkeley.edu/labmanual/chap4/4.14ksaligner.pdf>
- [4] https://static1.squarespace.com/static/57b26cc76b8f5b7524bf9ed2/t/580975cf9f7456c1aec2b5ae/1477014992598/SussMA6_SOP_CU_Mar2016.pdf