

# Karl Suss MA6 Mask Aligner Standard Operating Procedure

## QUICK GUIDE



### PROCEDURE OVERVIEW

1. Load mask and substrate
2. Alignment
3. Exposure and unloading

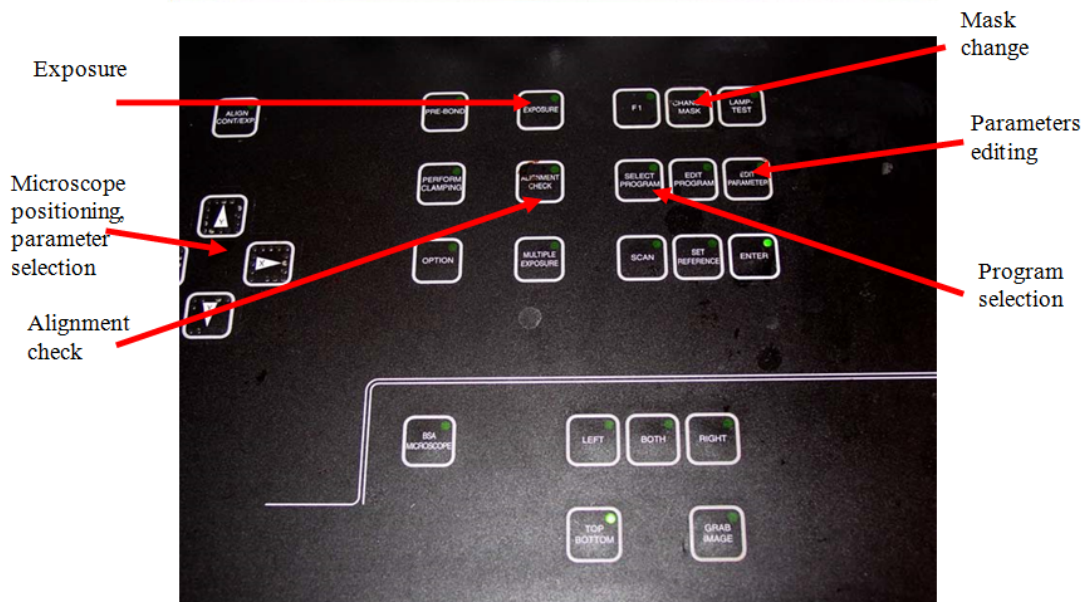
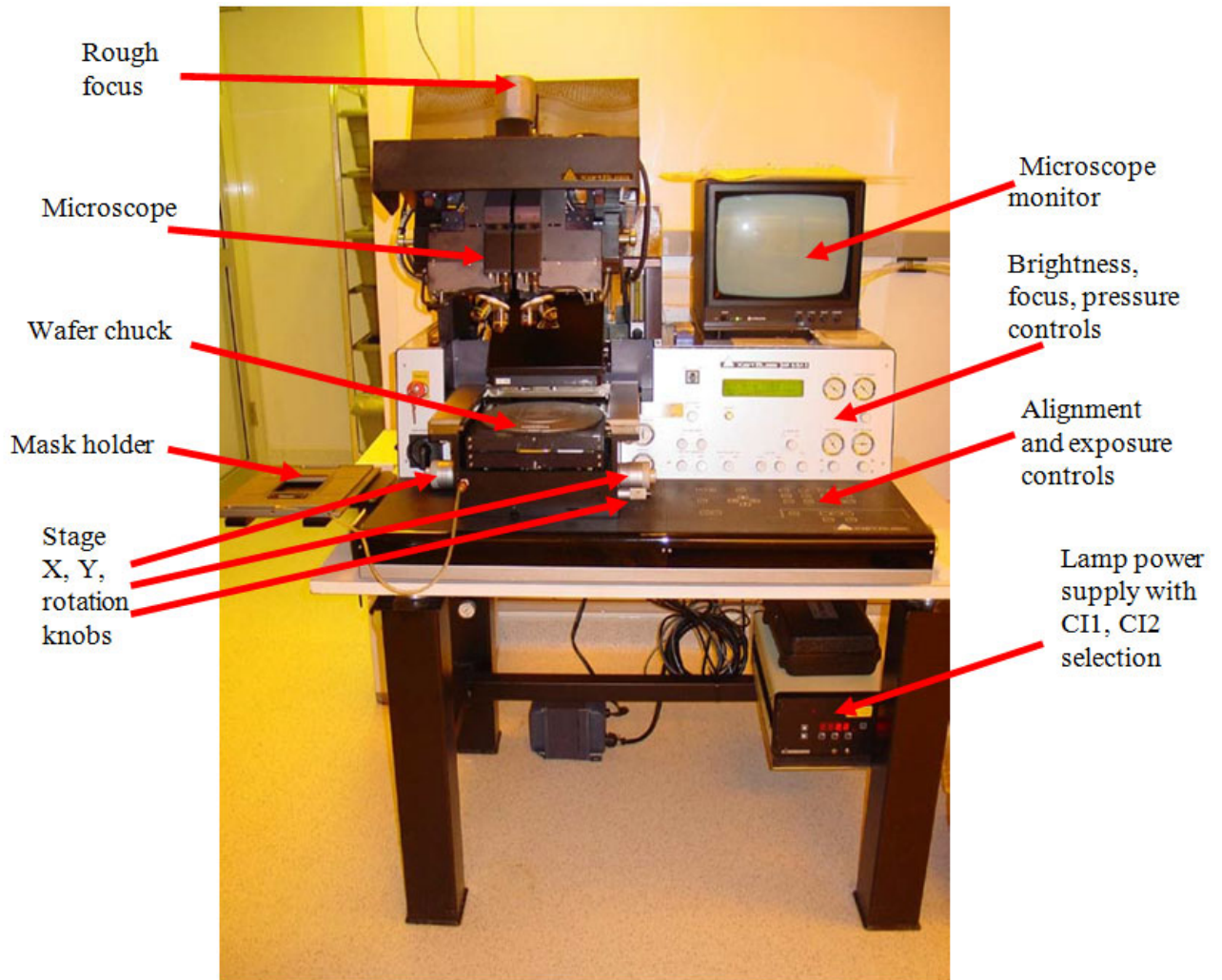


### CRITICAL PRECAUTIONS AND COMMON MISTAKES

- Check that lamp is on. If not, contact staff
- Check that stage is homed (x = 10, y = 10, rotation centered)
- In general, mask has to be bigger than the sample


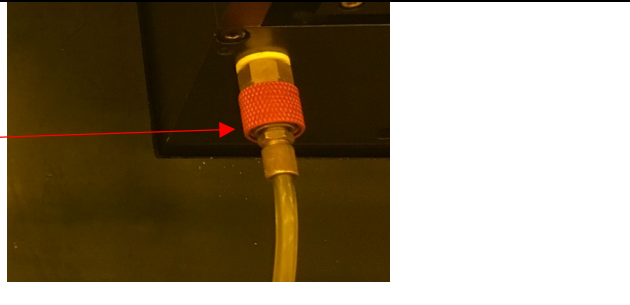
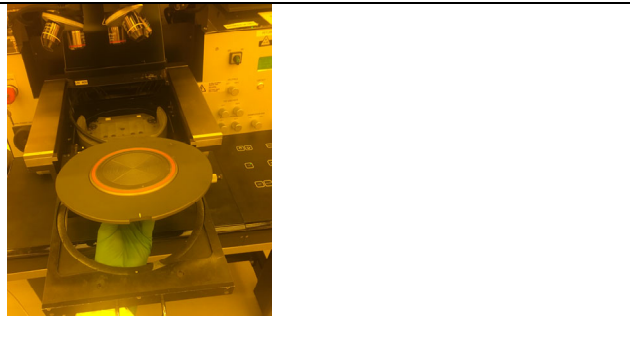
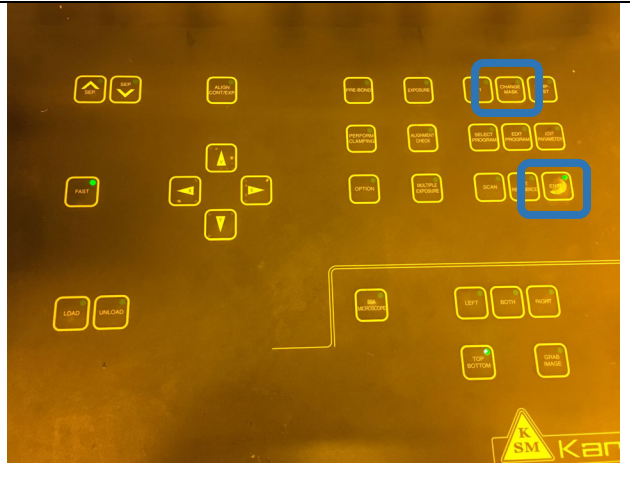
### Tool condition for the next user

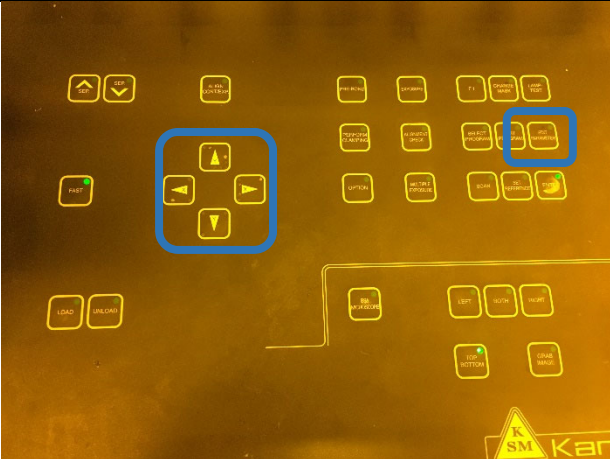
- Leave MA6 and the TV monitor on.
- Home the stage (X and Y = 10, rotation on center)



# FULL PROCEDURE

## A) Load mask and substrate:

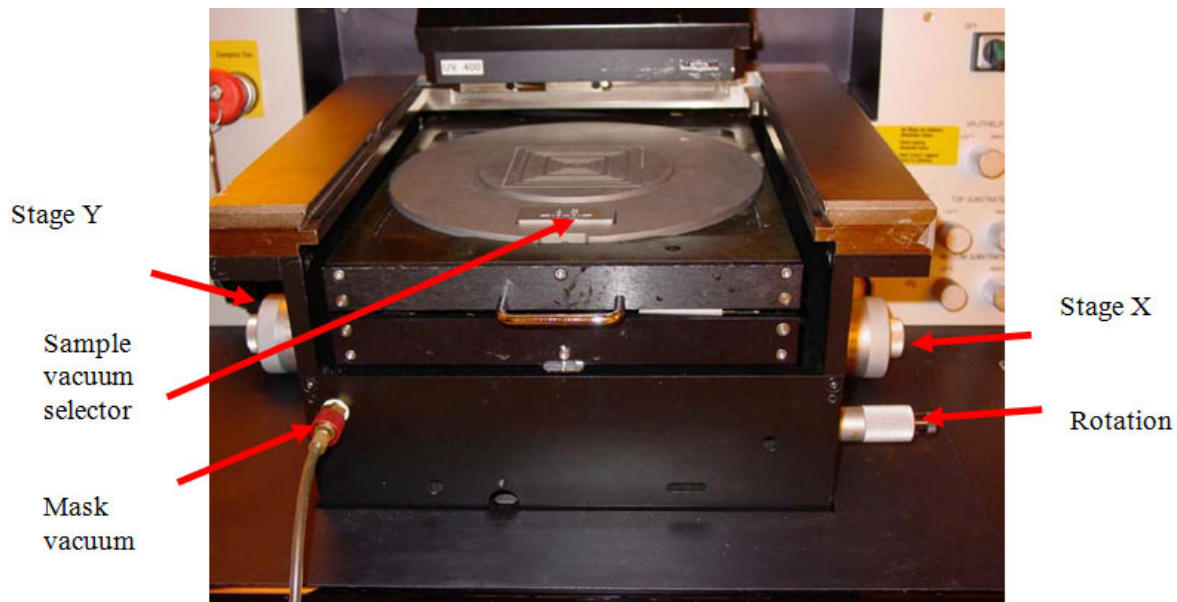
<ul style="list-style-type: none"> <li>If MA6 is not already in the "change mask" mode, press "<b>change mask</b>". Pull the mask holder out carefully if it is clamped in the aligner and put it on the left compartment.</li> </ul>	
<ul style="list-style-type: none"> <li>Choose the appropriate mask holder. To change mask holder:             <ol style="list-style-type: none"> <li>Push in the red ring and remove current mask holder. Place it on the rack</li> <li>Take new holder, put it on the tray and plug in the vacuum hose.</li> </ol> </li> </ul>	
<ul style="list-style-type: none"> <li>To change sample chuck:             <ol style="list-style-type: none"> <li>Pull the slide out</li> <li>Push the current holder up from the bottom side of the slide</li> <li>Place the necessary holder onto the slide with the notches properly aligned</li> <li>Push the slide back in</li> </ol> </li> </ul>	
<ul style="list-style-type: none"> <li>Put the mask on the holder. Do not use the clip to hold the mask. Instead, press "<b>enter</b>" to turn on the vacuum</li> <li>Slide in the mask holder into the tool frame until the holder is flush with the frame, and press "<b>change mask</b>".</li> </ul>	

<ul style="list-style-type: none"> <li>• Press <b>“Edit parameters”</b> to set up your program <ul style="list-style-type: none"> <li>a. Use left/right arrow keys to move between different categories, use up/down keys to change values within category</li> <li>b. Choose appropriate exposure time, exposure type, alignment gap</li> <li>c. For basic exposure on Si: Hard contact, with HC wait = 5 sec, Align gap = 50</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>• When done modifying the parameters, press <b>“Edit parameters”</b> again to get back to loading.</li> </ul>	
<ul style="list-style-type: none"> <li>• To load the wafer: <ul style="list-style-type: none"> <li>a. Press <b>“load”</b> and pull the wafer loading chuck out.</li> <li>b. Press <b>“enter”</b> to turn on the vacuum. If your sample does not cover all vacuum holes, MA6 will report “a loss of vacuum”.</li> <li>c. Press <b>“enter”</b> to acknowledge that and proceed without vacuum.</li> </ul> </li> </ul>	<p>Regardless of the size of your sample, <b>always place it into the center of the chuck</b> and make sure that it covers all open vacuum holes.</p>
<ul style="list-style-type: none"> <li>• Slide the chuck back. Press <b>“enter”</b> again to confirm.</li> </ul>	

B) Alignment (optional, if no alignment, skip to part C: Exposure)

<p>1. <b>Focus.</b></p>	<p>Two knobs under "top substrate" on the lower panel are for fine focusing.</p> <p>The big 2" aluminum knob on top of the microscope body is for coarse focusing.</p>
<p>2. <b>The positions of the objectives</b> can be adjusted with the key</p>	<p><b>X(left), X(right), Y(up), Y(down)</b></p> <ul style="list-style-type: none"> <li>a. Pressing the "fast" key with the previous keys makes movement faster.</li> <li>b. The distance between objectives can be adjusted by the two 1"-long aluminum knobs on the side of the microscope housing.</li> <li>c. If your sample is small, choose which objective you</li> </ul>

	would like to use and move it to the center.
3. <b>The gap (Z value) between the substrate and the mask needed for alignment can be adjusted</b>	<ul style="list-style-type: none"> <li>a. Use the key SEP(up) and SEP(down).</li> <li>b. The gap can also be set by "Al. Gap" in "edit parameter".</li> <li>c. To change "Al. Gap", press "edit parameter", and use the X-arrow key to select and the Y-arrow key to change.</li> <li>d. "Fast"+"Y-arrow" enables changing with larger steps.</li> <li>e. Pressing and holding the Y-arrow key makes the parameter go faster, too.</li> </ul>
4. <b>Align the substrate to the mask using the three knobs (X, Y, and rotation).</b>	When properly aligned, press "alignment check" to bring the substrate in to contact (contact mode was chosen in previous steps.)
5. Reference points can be stored thus the stage will automatically drive between them allowing the alignment to be checked at different locations.	<ul style="list-style-type: none"> <li>a. A capturing option is provided to further improve alignment accuracy at the high magnification.</li> <li>b. Using this options one can: <ul style="list-style-type: none"> <li>(i) Focus on the mask, capture the image of the mask, and then</li> <li>(ii) Switch focus to the substrate surface and align the substrate fiducials to the virtual mask fiducials on the stored image.</li> </ul> </li> </ul>



C) Exposure and unloading:

<p>1. <b>Press "exposure" to bring the wafer into contact</b> (if not in contact already) and expose.</p>	<p>Wait until the exposure is done; follow the instructions on LCD display.</p>
<p>2. <b>Pull the wafer loading chuck out completely and unload your sample.</b></p>	<p>If for any reason you need to unload the wafer before the exposure, press "unload" to pull the chuck out.</p>
<p>3. <b>If you need to change the mask, press "change mask" and follow the instruction on the LCD display.</b></p>	

D) Finishing up:

<p><b>When done, you must:</b></p>	<ul style="list-style-type: none"> <li>• Home the stage X, Y and rotation</li> <li>• Leave MA6 and the TV monitor on.</li> </ul>
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**Version history**

<i>Draft</i>	<i>Date</i>	<i>Author</i>	<i>Notes on changes</i>
v.0.1	December 7, 2017	Roman	Small changes to initial draft
V2	10/29/2018	Roman	Adding more images