

Karl Suss Mask Aligner (KSM)

Operational Procedures

Revised 08/16/2001

- 1) Turn on the N2 tank in the outside corridor before entering the clean room.
- 2) Log in and record usage in the logbook.
- 3) Hit the power on the main machine.
- 4) Flip the two switches that control the air pressure and N2. The air pressure should be at 2bar. The N2 pressure should be at about 1bar. Adjust with knobs accordingly to meet the specifications listed by each gauge.
- 5) Flip on the black switch on the UV light. When it says “rdy”, hit the black “start” button. It will try to fire the UV light. Eventually, it will succeed, and the word “cold” will appear. Wait until the machine warms up, then the “cold” will be replaced by a number.
- 6) Hit “Ch1” to select channel 1. You may need to hit it twice to see the power reading.
- 7) Turn on the light to the microscope (switch it from 0 to --). Leave the light at as low a power as you can to still see the sample.
- 8) Turn on the vacuum with the switch on the wall.
- 9) There are two mask-holding plates (square), and 2 sample-holding plates (round). The sample-holding plates may be exchanged by pulling the mounted one up and out of their sitting position, and replacing it with the other one. The mask-holding plates may be exchanged by simply removing the tube that is connected to them, and attaching it to the other one.
- 10) Put the mask on the mask-plate holder, on the side of the mask-plate holder that does NOT have the big square depression on it. The chrome or emulsion side of the mask should face out. Center the pattern on the mask that you want to write. (Note that this doesn’t necessarily mean exactly centering the mask!). Attach the mask to the mask-holding plate by hitting the “mask vacuum” button. It will light up. Note: Make sure that the vacuum line to the mask holder has been opened prior to pressing the “mask vacuum” button.
- 11) Slide the mask holder with attached mask into the mask position, with the mask facing downwards, and the tube sticking out away from the aligner. Tighten the two clamps that hold it into place.
- 12) Mount the sample on the sample-holder. Center it, and try to cover as many holes as possible. (These are vacuum holes, but they do not suck a vacuum until after the mask is being lowered towards the sample.) Slide the sample holder with sample in under the mask.
- 13) Change out the microscope objective for better resolution.
- 14) A lever on the left of the mask aligner brings the mask ALMOST into contact. The lever moves up, and swings 180 degrees over and the “Contact” light will light up. You are probably NOT in contact, but close to it.
- 15) Bring the mask down into contact fully, by adjusting the knob on the front of the aligner, while looking through the microscope. This knob has a “lock” on

it, which should be taken off before you try to adjust the knob. The unlocked position of the lock is “up”. Note: Keep turning the knob until you are met with resistance and stop. Do not try to turn the knob any further or you will break the mask, sample, or the fine adjustment mechanism.

- 16) The lever on left side of aligner has two buttons, which can move the microscope in x and y directions, depending upon which button is pushed. This lever does NOT control the mask or the sample, so you can use this lever even when the mask is in contact.
- 17) While you’re in contact, DO NOT MOVE THE SAMPLE. If you have brought the mask into contact, and want to move the sample, a second lever on the left side of the aligner, right by the contact lever, moves horizontally, and causes the mask to move slightly out of contact with the sample. You may also need to adjust the fine contact knob to produce mask-sample separation if the separation lever does not function properly.
- 18) If you need to do alignment, first do it with the mask out of contact for rough alignment.
 - (A) A knob on the right bottom of the aligner has “x” sample movement.
 - (B) A knob on the front bottom of the aligner has “y” sample movement.
 - (C) A knob on the front bottom of the aligner has “rotation” sample movement.
- 19) When the alignment is finished, bring the mask down into contact with the sample.
- 20) To do “soft contact”, hit the “soft contact” button, before you bring the mask down into final contact.
- 21) To do the “hard contact”, hit the “HP” button and then the “vacuum chamber” button after you have already brought the mask into contact.
- 22) Set the exposure time with the knob on the front near the light panel. The big clear dial is used to set the time. The small black dial has the units of the time.
- 23) Hit the expose button
- 24) Hit the HP button if you did a hard contact
- 25) Take the mask out of contact using the lever on the left.
- 26) Pull out the sample
- 27) Pull out the mask-holder with mask and hit “mask vacuum” to remove the mask.
- 28) Shut off UV lamp and the light and close the vacuum valve.
- 29) Wait 5 minutes. Then shut off the N2 and air pressure switches and the main power switch

Lamp Power and Light Intensity Notes

There are three channels. CI1, CI2, and CP. CI stands for "constant intensity", and "CP" stands for "constant power".

When you first turn the machine on, the display tells you the "idle" power of the lamp. This is set to 275 Watts. This is the power that the lamp is getting when it's NOT exposing—when it's just sitting idle!

The "DS" button is used to toggling between displaying the lamp power and the exposure intensity. The machine comes on in the "power" mode. If you push the "DS" button (which stands for "data select", then the display stops displaying the idle power, and reads "0". The display is now ready to display the intensity (in mW/cm^2) of the channel you select. If you push the "DS" button again, it goes back to reading the power.

If you use CI1 or CI2, then you will be using constant intensity. You can set the intensity that you want, by holding down the CI1 or CI2 buttons for a few seconds. It will enter a programming mode, in which you can select the intensity by pushing on the up and down arrow keys. Note: Only the super user can adjust the intensity levels on the machine due to problems with the KSM overheating.

If you use CP, then you will be delivering a constant power to the lamp. You can set the power that you want by holding down the CP button and then changing the value with the up and down arrows.

If you use CI, then you want to make sure that the machine does not overheat. In order to maintain constant intensity, especially for long exposures, it requires ramping the power delivered to the UV lamp. If the lamp begins to overheat then the machine has exceeded the maximum power to the lamp and you will have to immediately switch to CP mode. CP mode is the preferred mode and should be used in most instances.

The KSM has 275Watt bulb. The idling power should therefore be 275 Watts. When you do your exposures, you should not drop below 250 Watts delivered to the bulb, and never go above 375 Watts delivered to the bulb. If you go below or above these values, then the bulb will burn out a lot faster. If you go below 200 Watts, then a warning continuous beep will occur. If this should happen, it means that you have adjusted your intensity or power too high or too low. Go back and change the intensity or power setting so that the power delivered to your lamp falls within an acceptable range.

NOTE: Channel 2 should never be used for any circumstance.