

MJB 3 Mask Aligner Operation

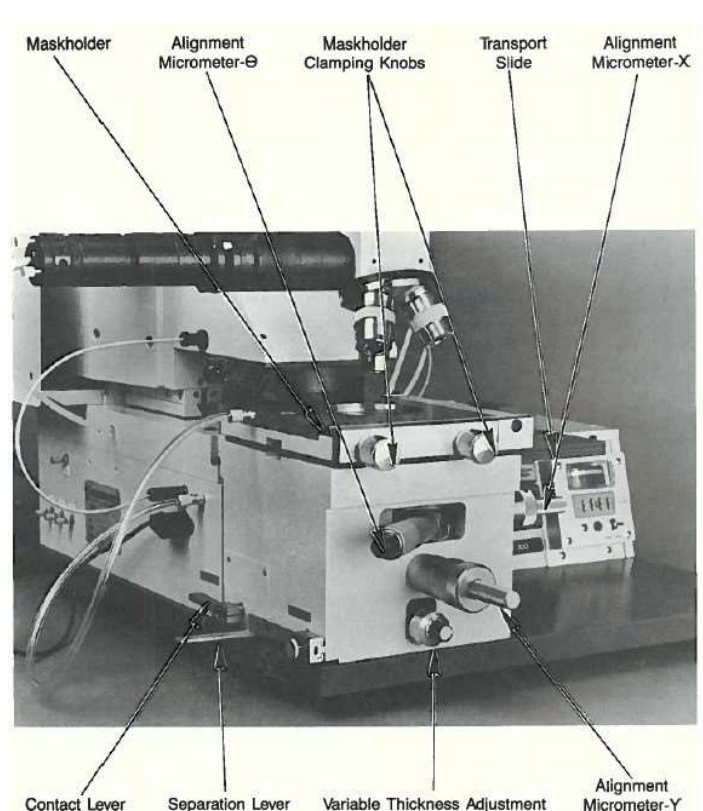
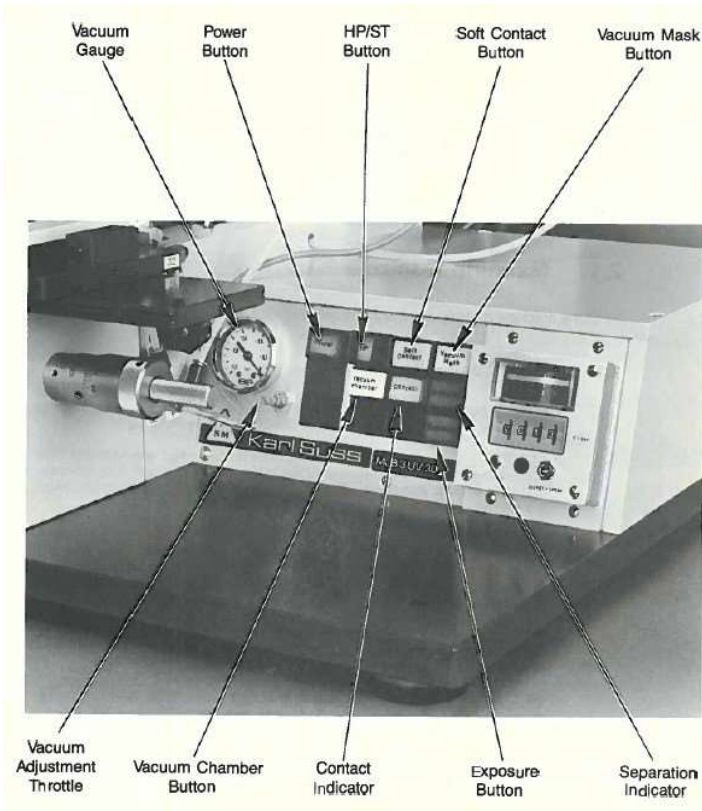
Overview

This document describes the operations, parts, and materials required to perform UV contact lithography using the Carl Suss MJB 3 mask aligner.

- Exposure methods are flood, soft contact, and hard contact
- Mask sizes: Up to to 4" (3" x 3" exposure area)
- Wafer size: Up to 4" (3" x 3" exposure area and 4" wafers will have limited range for alignment)
- Sample size: 3" x 3" max
- Wafer/sample thickness: 0-4.5 mm
- Alignment resolution of a few micrometers and micrometer-sized features are reliably achievable with this tool
- Channel 2 is set for 7 mW/cm² at 405 nm (equates to ~3.85 mW/cm² at 365 nm)

Restrictions & Precautions

- Invisible high energy UV light may damage your eyes or skin if the machine is not used as intended. Always wear UV protective safety glasses when using the system.
- Never look directly at the UV light.
- Never turn off the machine power, which shuts off the required cooling nitrogen supply to the lamp and thus can result in tool damage.
- The UV lamp contains mercury which is a health hazard if the bulb breaks or explodes. If this occurs, immediately clear the area and contact the staff.
- If mask and wafer are in contact (CONTACT light on), DO NOT adjust the stage micrometers!



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Operation

1. Mask Loading:

- a. Select the proper mask holder. If necessary, remove the mask holder from the tool by loosening the knurled screws on the mask holder frame, then place the mask holder upside-down on the aligner table (vacuum vane up).
- b. If a different mask holder than the one connected is needed, carefully disconnect the plastic tube from the installed mask holder, and connect it to the desired mask holder.
- c. Place the mask onto the mask holder, with the chrome side facing up (brown side).
- d. Press the 'Vacuum Mask' button to turn on the mask vacuum.
- e. Nudge the mask to ensure that the vacuum is on.
- f. Flip the mask holder over, slide the mask holder into the tool, and finger-tighten the knurled screws on the mask holder frame.

NOTE: Be careful not to accidentally press the 'Vacuum Mask' button during the rest of the tool operation, as this will cause the mask to drop from the frame, possibly damaging the mask, your sample, or the tool.

2. Sample Loading:

- a. Unlock the z-height adjustment knob by rotating the black locking switch on knob to the up-position.
- b. Lower the sample stage by turning the z-adjustment knob clockwise. One revolution is 150 micrometers. Lower by at least the thickness of your sample.
- c. Make sure that the Contact Lever on the left-hand side of the machine is at the 'Release' position.
- d. If it is not already there, gently slide the chuck transport to the right until it stops. If it does not move, DO NOT force it! Ensure that the Contact Lever is completely in the 'Release' position.
- e. Check that the stage adjustment micrometers for x, y and theta are roughly centered.
- f. Select a sample chuck and load the chuck onto the transporter, aligning the notch on the chuck with the pin on the chuck transport.
- g. Place your sample on the chuck, ensuring that all of the vacuum holes are covered. Do not use tape to cover any of the vacuum holes.
- h. Carefully slide the chuck transport to the left until it stops.
- i. Bring the sample into contact with the mask by rotating the Contact Lever to the 'Contact' position. The 'Contact' indicator will illuminate. If strong resistance is encountered while moving the lever, return to the 'Release' position and lower the z-adjustment knob several rotations. Then repeat Step 2.i..
- j. While holding the Separation Lever in the 'Contact' position, turn the z-adjustment knob counter-clockwise until it is finger-tight.
- k. Move the Contact Lever to the 'Release' position.
- l. Turn the z-adjustment knob one-half turn counter-clockwise.
- m. Move the 'Contact' lever to 'Contact'. This has corrected any wedge error between the sample and the mask.

3. Alignment and Exposure:

- a. Select the contact mode:
 - i. For soft contact, press the 'Soft Contact' button.

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- ii. For hard contact, make sure that none of the exposure mode buttons (HP/ST, Soft Contact, or Vacuum Chamber) are selected.
 - b. First Layer Exposure:
 - i. No layer alignment is necessary for the first layer exposure, although you may need to center your pattern on your sample (see Steps 3.c.iv – 3.c.ix).
 - ii. Set the exposure time using the dial timer on the front of the tool. The inner dial sets the scale (seconds, 10 seconds, etc.) for the outer dial which sets the multiplier.
 - iii. Press the 'Expose' button, and move clear of the microscope. The microscope and shutter housing will move forward, and the exposure will take place automatically.
 - c. Layer Alignment and Exposure:
 - i. Verify the microscope light source is on.
 - ii. Focus the microscope onto the mask, and adjust the microscope light source intensity if necessary.
 - iii. Locate the mask alignment mark using the microscope manipulator rod to position the microscope. The two brake buttons on the bottom of the rod release the microscope to travel left-right and front-back.
 - iv. Place the sample in separation by moving the Separation Lever to the 'Separation' position (toward the operator). The 'Contact' indicator will turn off and the 'Separation' indicator will turn on.
 - v. Align the sample to the mask by using the x, y, and theta micrometer control knobs.
 - vi. If the alignment mark is out of the range of travel of the control knobs, unload the sample (Step 4) , reposition either the sample or the mask, and start again from Step 2.
 - vii. Check that the alignment is correct by moving the Separation Lever to the 'Contact' position. If necessary, adjust the sample position, making sure to place the tool back in 'Separation' before moving the sample.
 - viii. Set the exposure time using the dial timer on the front of the tool. The inner dial sets the scale (seconds, 10 seconds, etc.) for the outer dial which sets the multiplier.
 - ix. Press the 'Expose' button, and move clear of the microscope. The microscope and shutter housing will move forward, and the exposure will take place automatically.
4. Sample Unloading:
 - a. After exposure, wait until the shutter housing has moved back to the home position.
 - b. Move the Contact Lever to the "Release" position.
 - c. Turn the z-adjustment knob two turns clockwise.
 - d. Slide the chuck transport to the right and remove your sample.
5. Mask Unloading:
 - a. Loosen the two knurled screws on the mask holder frame.
 - b. Slide the mask holder out of the frame, and place upside-down on the aligner table.
 - c. Press 'Mask Vacuum' to turn off the mask vacuum and then remove your mask.