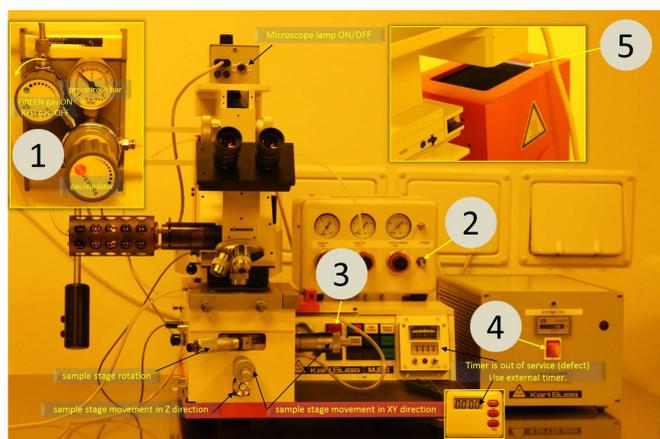


Karl Suss MJB3 mask aligner

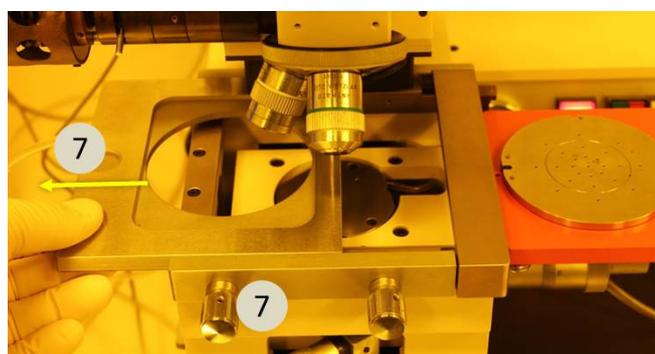
Version: September 17, 2020

Manual mask aligner for optical lithography, 300W Hg light source, 405nm wavelength, Resolution 500nm, Accuracy 500nm, Max. 2 inch wafer size.



Start up machine

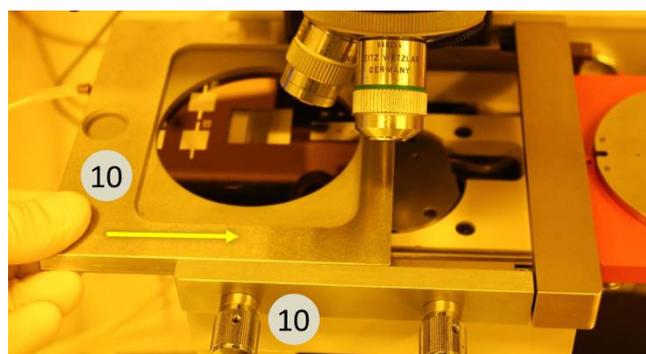
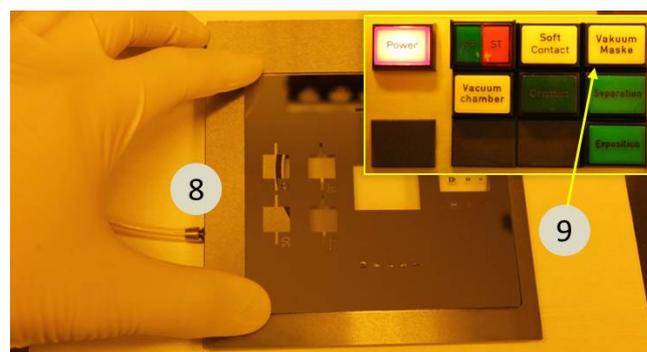
1. Open N₂ gas valve (set on 4 bar).
2. Turn ON control gas. The pointers should indicate to the correct gas pressure (red marks).
3. Turn ON the mask aligner.
4. Turn ON the power supply.
5. Control the lamp. Only when the UV light is ON, then the mask aligner is ready for operation.



Load Mask

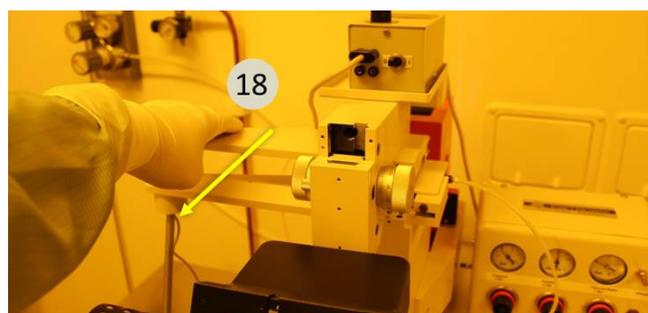
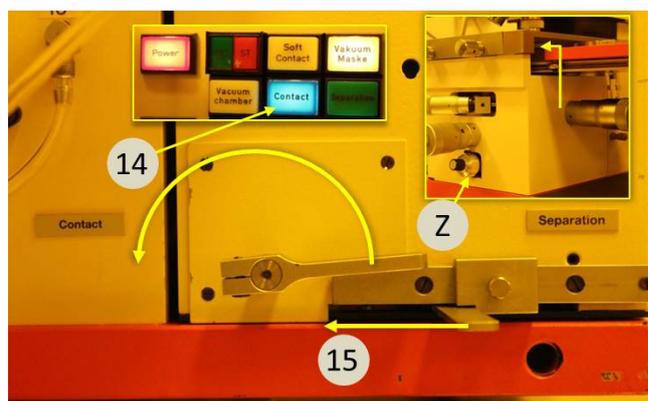
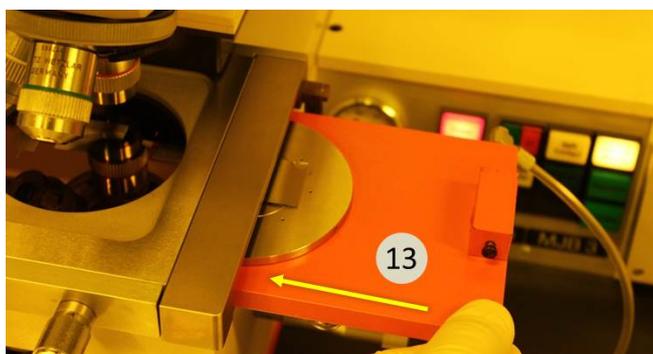
6. Inspect the mask. Make sure it is clean. Remember to orient the mask such that the chromium (brownish) side will face down during exposure.

7. Loosen the 2 thumb screws on side of the mask frame and slide out the mask holder.
8. Place the mask holder on a dry cleanroom wipe then properly locate the mask on the mask holder correctly (the brownish chromium side up words).
9. Turn ON “Vakuum Maske” bottom, to fix the mask on the holder. Check if the mask is well placed and the vacuum holding it tight in position.
10. Return the mask holder carefully to its position. Tighten the 2 thumb screws.



Load Substrate

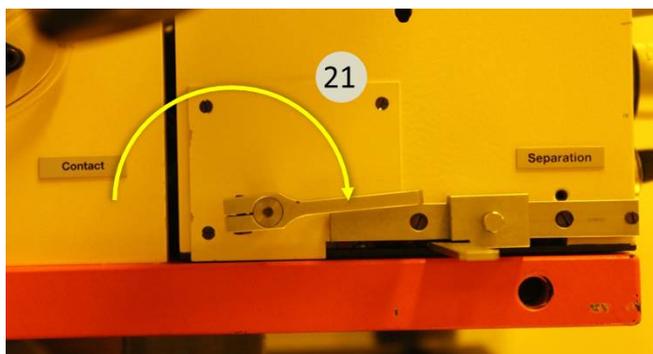
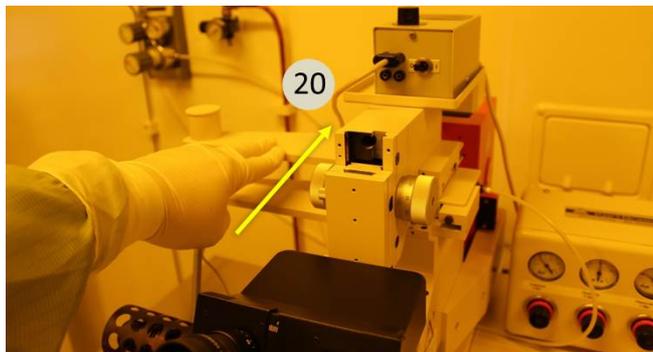
- Slide the substrate holder all the way to the right hand side.
- Place substrate on the vacuum chuck, press the black button on the handle to vacuum fix the substrate when substrate holder slides in.
- Slide the substrate holder all the way in (to the left hand side).



Exposure

- Turn very carefully the contact lever 180 degree backward, during that check the distance between the substrate and the mask. It should be less as possible so that the substrate is almost in contact with the mask. This distance can be manually controlled by the Z direction movement controller. Finally "Separation" button will automatically ON.
- Push Separation lever all the way backward ("Separation" button will automatically OFF and "Contact" button will automatically ON).
- Check or set the desired exposure time (in seconds).
- Turn ON (press) "Exposition" button.
- The mirror housing will move forward until the shutter is open and expose the substrate. If the mirror housing jammed? support it by sliding it toward you until the lamp shutter is open, keep holding, directly start timer.





19. When the desired exposure time is over: Pull separation lever all the way forward you. The lamp shutter will close.

20. The mirror housing will move automatically backward, if not? support the movement by sliding the mirror housing backward.

21. Turn the contact lever 180 degree forward you.

22. Slide out the substrate holder and unload substrate.

Unload mask

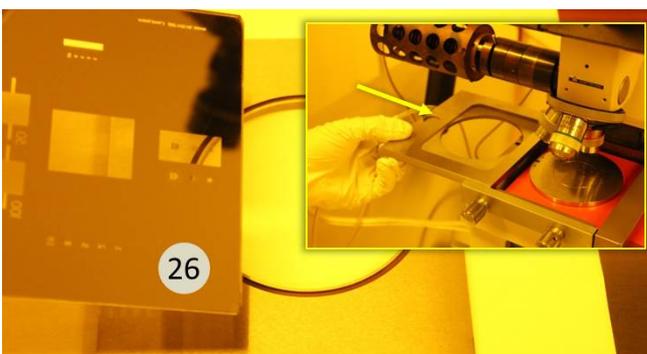
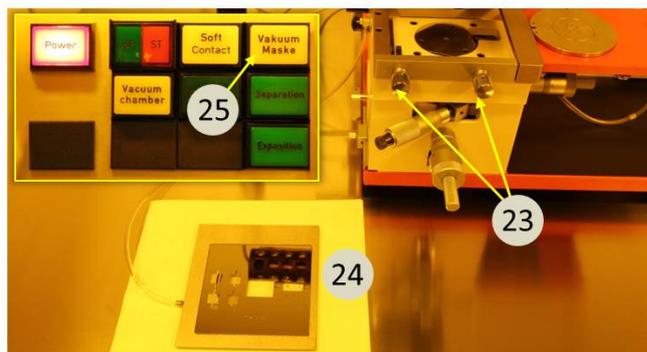
WARNING: Do not turn OFF the “Vakuum Maske” button unless the holder is upside on the table. Failure to do so can lead to mask damage.

23. Loosen the thumb screws on the side of the mask frame.

24. Slide out the mask holder all the way, turn mask holder and place the mask holder on a dry cleanroom wipe.

25. Turn OFF “Vakuum Maske” button.

26. Remove mask, clean mask and store properly.



Turn off machine

27. Turn OFF the power supply.

28. Turn OFF the mask aligner.

29. Turn OFF control gas.

30. Close gas valve.



Clean the working station after use

ATTENTION

WARNING : The mask aligner emits UV light. Exposure of UV light on unprotected skin can cause severe burns. Looking directly into the UV light source can cause temporary or permanent blindness. Users are required to wear UV protective glasses when operating the mask aligner. These glasses are located on top of the mask aligner.

WARNING : If a dangerous situation is evident (smoke, fire, sparks, etc.), or if the sound of shattering glass is heard emitting from the lamp housing, **ONLY** if it is safe to do so, the user should turn off system, lamp controller, and vacuum pump or unplug the tool or/and leave the cleanroom immediately. The user should notify all other cleanroom persons within the cleanroom to evacuate. Do not attempt to open the system or inspect the arc lamp! Mercury vapor may be released if the arc lamp breaks. Opening the lamp housing will expose you to this vapor. The user should then contact proper emergency personnel.

NOTE : If any issues with the machine were observed, the user must **REPORT** the problem and giving a detailed summation of the issue observed.

MEASURING THE UV INTENISTY

1. The output UV intensity should be measured and recorded when the lamp has been turned on. Make sure that the lamp has warmed up before taking the UV measurement by waiting 15 minutes.
2. Turn on the power to the Karl Suss UV intensity meter and probe. The probe should have a label on the side marking it as a 365nm probe.
3. Place the UV probe on the stage and move the stage into contact position by moving the contact lever on the left-hand side of the tool counterclockwise to the CONTACT position. The CONTACT light will illuminate. Then press the HP/ST button and the VACUUM chamber button both buttons should illuminate - to apply vacuum to the back of the probe. This will hold the sensor in place during exposure.
4. Set the exposure time to 10 seconds and press the EXPOSURE Button. The mirror housing will move forward and expose the sensor.

5. Record the UV meter value. Units are in mW/cm^2 .

6. This process should be repeated with the photo-mask placed over the 365nm UV probe for experimental calculations to determine the through mask intensity.

NOTE: Make sure that the silver disc is not covered by any darkened area of the mask. If any part of the mask covers the silver disc area, then the measured value will be lower than the actual UV intensity.

7. Calculate the exposure time by dividing the desired exposure dosage, which should be in mJ/cm^2 by the UV intensity measured through the mask in mW/cm^2 .

NOTE: Make sure to record both the measured intensity and calculated time in your lab notebook. The measured intensity will change over time, resulting in a change in exposure time.

Make sure to record both the measured intensity and calculated time. The measured intensity will change over time, resulting in a change in exposure time.

Calculate the exposure time by dividing the desired exposure dosage (dose of $150 \text{ mJ}/\text{cm}^2$), which should be in mJ/cm^2 , by the through mask UV intensity measured in mW/cm^2 .