Mask Aligner EVG 620
Notes for users

Generalities

UV light comes from top

![Diagram of UV light exposure](image)

Broad band exposure
(i 365 nm, h 405 nm and g 436 nm lines)

Mask size must be 1 inch higher than the wafer size
In order to have the best resolution in vacuum contact (< 1µm)

![Diagram of mask size](image)

To start
To turn ON the UV light (Monday morning) : turn OFF the key (electronic part to the right), then power ON from the Illumination Controller (to the left), when we hear ‘clic clic clic’ press START (the white button) ; check that the lamp light. Turn ON the key (the PC starts alone).

Caution : never turn off the UV light during the week, only on Friday afternoon.

Soft : EV620
Login = operateur
Password = cnrs

4 kinds of recipe
* topside.rcp :
alignment with the wafer top side by using the top objectives

* bottomside.rcp :
alignment with the wafer bottom side by using the bottom objectives

* flood.rcp : exposure without mask (useful for lift-off process)

* anodicbond.rcp : alignment of 2 wafers for the bonding machine
The “Topside4pouces.rcp” recipe

* Mask holder size : 5
* Substrate size : 4
* Separation : 50 µm (gap between mask and photoresist for alignment)

The mask move according to the Z axis and is fixed according to the X and Y axis

The wafer move in X and Y

* Process : Man. Top side
* Process mode : transparent
* Exposure mode : constant time

\[
\text{time (sec)} = \frac{\text{Energy}}{\text{Power}} \left( \frac{\text{mJ/cm}^2}{\text{mW/cm}^2} \right)
\]

where energy = exposure dose and power = UV power

* Contact mode : vacuum contact (choice between : proximity, hard contact, vacuum contact, V+H contact)

* Stop after contact : ✔ let you time to check the quality of the contact before to start the exposure, possible to go back with ‘undo’

* Contact force :
  WEC : 600 mbar (wedge compensation = flatness or planarity)
  Exposure : 1100 mbar

START : RUN, save change and execute the commands asked by the machine ; and each time press continue to go to the next step.

* Insert chuck and connect to vacuum : the substrate holder (4 inch for 4 inch wafers)
* Insert mask holder : the mask holder (5 inch for 4 inch wafers)
* Insert mask with load frame (plate to support the mask) and Chromium downward-facing
* Move tray in (rotation of the tray)
* Move stage in centre position : 5 on the 3 micrometric screws

maximum move is 10 mm at the centre : 5 ± 5 mm
*Adjust mask*: the purpose is of having $\theta = 0$

For this step: **Focus $Z_L = Z_R \approx 3.5$**

For this step, use the 2 **TOP objectives** to search and find alignments patterns at a coordinate $y = \text{constant} = 0$. On the screen you must have this kind of display:

With the $\theta$ micrometric screw adjust until to have $\theta = 0$ (patterns are aligned)
How to move objectives with the joystick
The joystick is used for the 2 objectives; to move one of them select it by pressing R or L.

* Move tray out (rotation of the tray)
* Remove load frame
* Insert substrate for WEC (put the wafer by centring it correctly) ; press continue and ensure that the wafer is well fixed by vacuum.
* Move tray in (rotation of the tray)

* Adjust substrate:
The goal is to align the wafer with the mask by using its border (curved part and flat) and/or the alignment marks of the first step if you are realizing the second step.

Before adjusting, verifying that the substrate is not glued to the mask. Move slightly the y axis and look the substrate moving relative to the fixed mask. If it happens, increase the separation to 80 µm or more (set, load and move to). And move again slightly the y axis. Come back to a separation of 50 µm.

Flat alignment
Usually the first level of the process : use θ for the rotation and x and y for the centring

for this step : Focus ZL = ZR ≈ 4.5
**Marks alignment**
For this second level of the process: use θ for the rotation and x and y for the centring to align the wafer with the mask.

![Diagram showing mask alignment patterns and wafer patterns.](image)

*Check contact mode*
For a vacuum contact, the value of the depression should be between -0.90 and -0.48 bar; if not press undo and try to do better.

$$-0.90 < D < -0.48 \text{ bar}$$

For a hard contact, use the black gauge ‘Hard Cont Pressure’ and set the value 0.3 / 0.4 bar.

*Exposure*
It is the opening of the shutter: do not look the UV light, use the filtering glasses.

*Move tray out* (if you have used the black gauge ‘Hard Cont Pressure’ do not forget to set the pressure to 0)

*Remove substrate and press continue* (for a second wafer to process) or **exit** (and follow the end procedure)
The “Bottomside4pouces.rcp” recipe

* Mask holder size: 5
* Substrate size: 4
* Separation: 50 µm
  (gap between mask and photoresist for alignment)

The wafer move in X and Y

* Process: Man. bottom. side
* Process mode: Crosshair
* Exposure mode: constant time

\[
\text{time (sec)} = \frac{\text{Energy (mJ/cm}^2\text{)}}{\text{Power (mW/cm}^2\text{)}}
\]

where energy = exposure dose and power = UV power

* Contact mode: vacuum contact (choice between: proximity, hard contact, vacuum contact, V + H contact)

* Stop after contact: let you time to check the quality of the contact before to start the exposure, possible to go back with ‘undo’

* Contact force:
  WEC: 600 mbar (wedge compensation = flatness or planarity)
  Exposure: 1100 mbar

START: RUN, save change and execute the commands asked by the machine;
and each time press continue to go to the next step.

* Insert chuck and connect to vacuum: the substrate holder (4 inch for 4 inch wafers)
* Insert mask holder: the mask holder (5 inch for 4 inch wafers)
* Insert mask with load frame (plate to support the mask) and Chromium downward-facing
* Move tray in (rotation of the tray)
* Move stage in centre position: 5 on the 3 micrometric screws

maximum move is 10 mm
at the centre: 5 ± 5 mm
* Adjust mask: the purpose is of having $\theta = 0$

**Bottom objectives**

For this step, use the 2 **Bottom objectives** to search and find alignments patterns at a coordinate $y = \text{constant}$ (for the 2 sides) that you must adjust (for example $Y_L = Y_R = 11.2$, or $12.3$ etc... which must approximately correspond to $y = 0$ on your mask). On the screen you must have this kind of display:

With the $\theta$ micrometric screw adjust until to have $\theta = 0$ (patterns are aligned)
How to move objectives with the joystick

The joystick is used for the 2 objectives; to move one of them select it by pressing R or L.

* Move tray out (rotation of the tray)
* Remove load frame
* Move tray in (rotation of the tray without wafer)

* Adjust microscope to mask

  for this step: **Focus ZL = ZR ≈ 7.5**

* Adjust Crosshair: at this step, you must adjust the colored crosses with your mask. By clicking and dragging put them as best as you can (change also their color, thickness and length) or move them with the arrows on the right on the screen. These crosses will represent the location of your mask which you will not see anymore at the next step.

* Move tray out
* Insert substrate for WEC (put the wafer by centring it correctly); press continue and ensure that the wafer is well fixed by vacuum.
* Move tray in
* Adjust substrate:

For this step you must NOT CHANGE THE FOCUS of the objectives, you must adjust the substrate only with the 3 micrometrics screws (θ for rotation and x and y for translation).

This step can be difficult and to facilitate it you must centre well the substrate on the waferholder and the first move to realize is a ‘y’ displacement.

Marks alignment
For this second level of the process: use θ for the rotation and x and y to align the wafer with the mask which is spotted by the colored crosses.

* Check contact mode
For a vacuum contact, the value of the depression should be between -0.90 and -0.48 bar; if not press undo and try to do better.

\[-0.90 < D < -0.48 \text{ bar}\]

For a hard contact, use the black gauge ‘Hard Cont Pressure’ and set the value 0.3 / 0.4 bar.

* Exposure
It is the opening of the shutter: do not look the UV light, use the filtering glasses.

* Move tray out (if you have used the black gauge ‘Hard Cont Pressure’ do not forget to set the pressure to 0)
* Remove substrate and press continue (for a second wafer to process) or exit (and follow the end procedure)

Remark: in a ‘bottomside’ recipe, a flat or a ‘wafer border’ alignment is not possible; the objective-tool hides and prevents a direct vision of the mask and the bottom objectives can not aim at the mask (we can not use the top objectives with a bottomside recipe).