

# VPG200 – exposure with manual alignment point and click style

Version of 2017-08-08. Get the latest one at [cmi.epfl.ch/photo/files/vpg200/vpg200.exp.man.align.point.and.click.pdf](http://cmi.epfl.ch/photo/files/vpg200/vpg200.exp.man.align.point.and.click.pdf)

## 1. Introduction

This guide presents a step by step procedure on how to expose a design aligned with a pre-existing design on a substrate, a mask aligners task... .

It uses the **global alignment script** to manually find the wafer/substrate's coordinate system, then runs a job. Loading and unloading is done manually with **handler**.

## 2. Login on accounting PC

Login with you "CMI" account and password on the Zone 05 accounting computer. Select the "Heidelberg VPG200 – Laser lithography system".

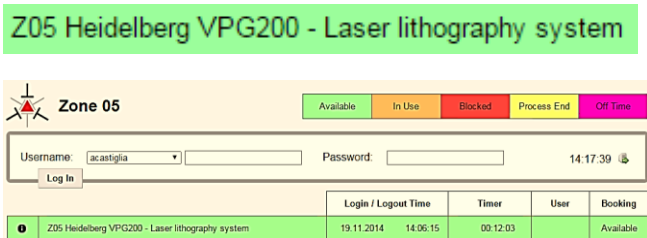


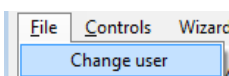
Fig 1: accounting interface

## 3. Start the software

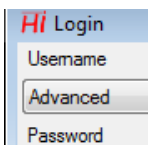
If no "Hi-Login" window present on vpg200, then start software (currently 1.8 Menu)



If software already running, make sure to change user to below account.

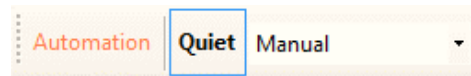


login Username **Advanced**, Password: " "



## 4. Set-up Automation and Mode

Set Automation mode to "Quiet" and "Manual".

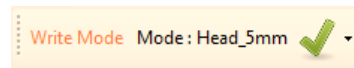


Otherwise, once we have done the global alignment, the stage will wafercenter and setzero and thereby mess up your alignment.

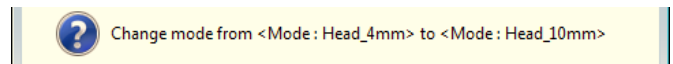
## 5. Change write mode

Change the write mode to "Head\_20mm" or "Head\_10mm" depending on the writehead you will use to write your design (Head\_5mm is not available/advisable for alignment, because the optical focus of this mode will interfere with the pre-existing features on the wafer and loose focus.).

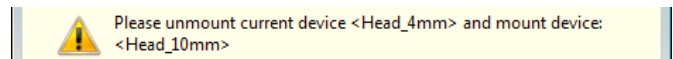
Select desired writehead in the "Write mode" list.



Click <yes> when the software asks for the confirmation to change mode.



Wait for "Please unmount current device..." message.



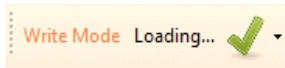
Only then physically change the writehead.

Failure to follow this sequence will put writehead in an undefined state requiring staff intervention.

When done changing writehead, click <ok> in the "Please unmount current device..." message.

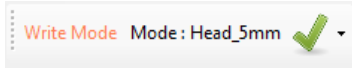
Wait for the new mode to be properly loaded.

**Wait:**



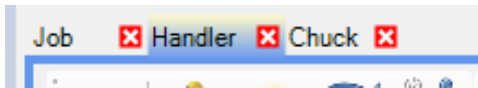
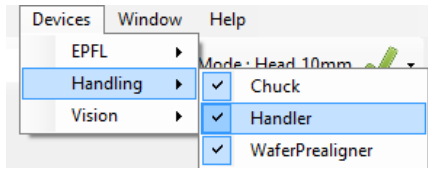
Parts are moved, intensity is calibrated, be patient.

**Proceed:**



## 6. Load substrate

Select the "Handler" tab.



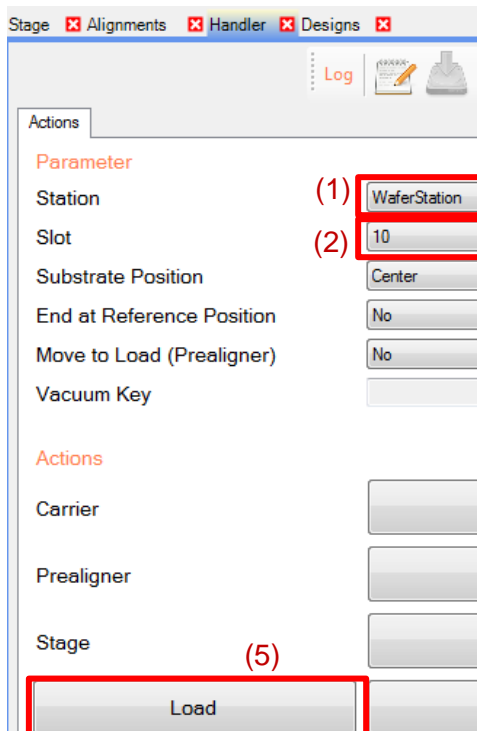
In Area "Actions", adapt "Parameter":

Select **station (1)**, e.g. "WaferStation", and **slot (2)**, e.g. "10"

In Area "Actions", adapt "Actions" [sic]:

For wafers, check (3) [x] the "Do Prealign".

Use (4) [x] "Center & Set Zero". This step is debatable as it can be done later manually with "CENTER" in SystemControl.

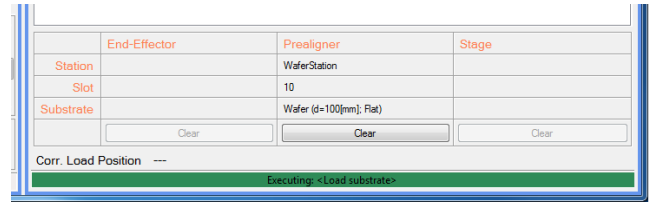


(3)  Do Prealign

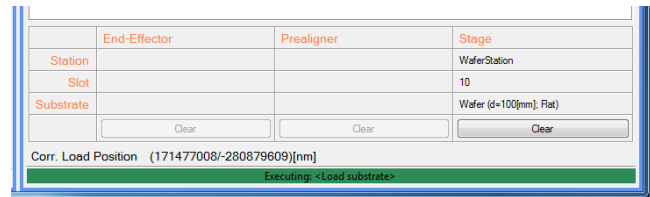
(4)  Center & Set Zero

Click (5) "Load" button. This will start loading the substrate.

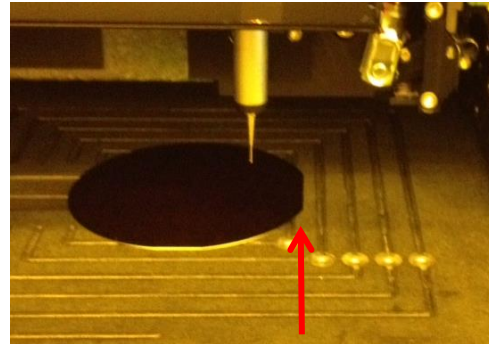
Substrate will go from Carrier to Prealigner:



then onto the Stage:

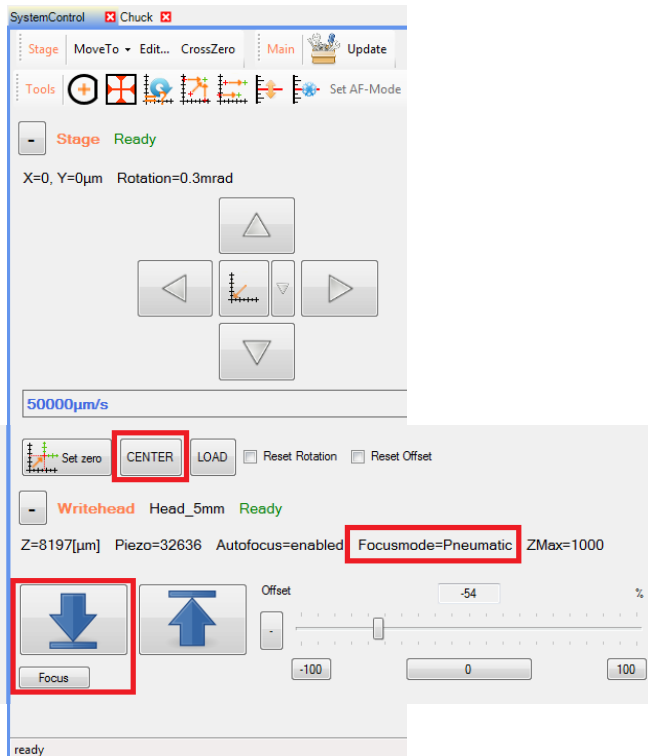


Wait for the machine to finish loading the substrate. Visually check that prealignment step correctly detected the primary flat (check on stage)



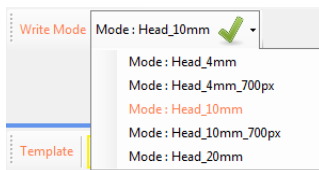
## 7. Move substrate under write head and focus

Use the “SystemControl” tab.

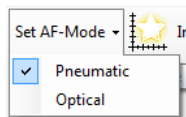


If not done with handler, click “**CENTER**” to move the wafer under the writehead, then tell the machine that the writehead is at the center of the coordinate system with “**Set zero**” which reset the coordinates, only an approximation.

Select the writehead you want:



Check that Autofocus is set to **pneumatic** (if using 10mm head). Change with “Set AF-Mode”



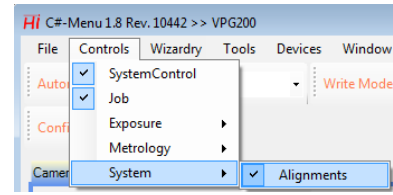
Move **writhead down and focus** on substrate

using “**down arrow**” using “**down arrow**”  Wait for “**ready**”. 

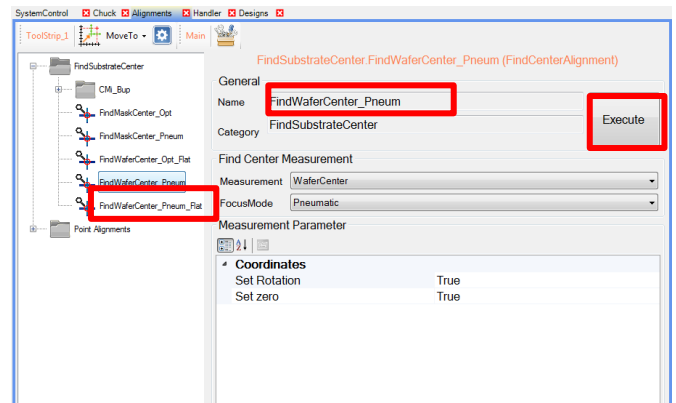
You are now focused on the substrate, near the origin.

## 8. Find the substrate’s origin

In tab Alignments (Controls>System>Alignments)

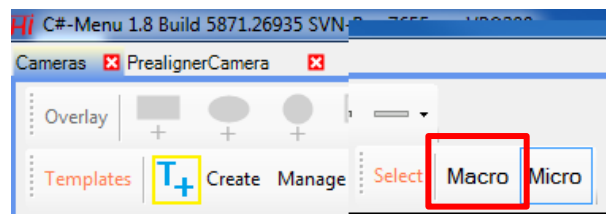


find the script, **FindWaferCenter\_Pneum\_flat**, then **execute** to find wafer center.

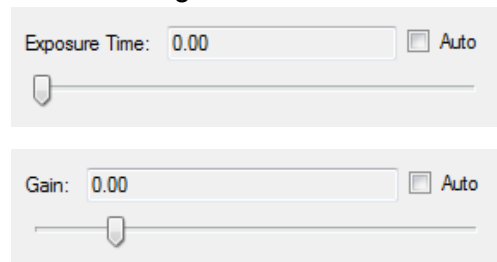


## 9. Find the first coordinate

On the “**Cameras**” tab, chose “**Macro**”.



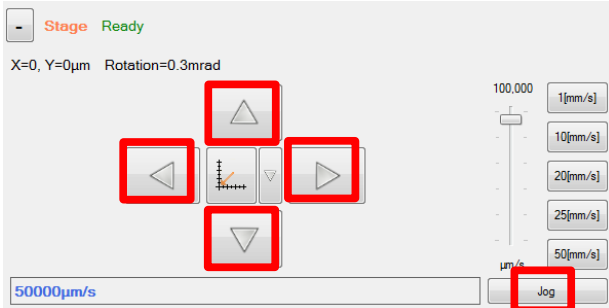
Check the “**Auto**” boxes for “**Exposure Time**” and “**Gain**” settings.




If there is no image, change back and forth from “Macro” to “Micro”, or change the “Lamp settings”.



Stage move arrows allow you to navigate on the substrate and find your alignment marks. (bottom left corner: **Jog** or **Step** modes). The vertical slider gives the speed in  $\mu\text{m/s}$  (Jog mode) or  $\mu\text{m}$  (step mode), and needs to be adjusted continuously.



find left (or any other) alignment mark/fiducial with

"move absolute"  and/or with


"stage move arrows" 

Click "Autofocus" (blurry line arrow sharp line).

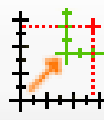


Contrast recognition scripts will be used to adjust the focus to get a sharp image. The optimal focus setting is stored.

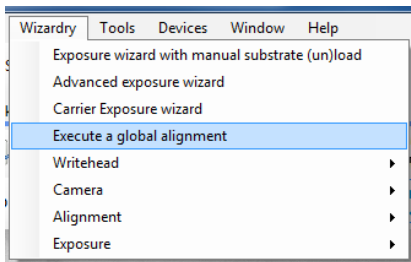
Switch to "Micro" camera. Click the "automatic focus" button to find the optimal focus setting for this camera too.

with "stage move arrows"  precisely position cross in center of your left alignment mark/fiducial



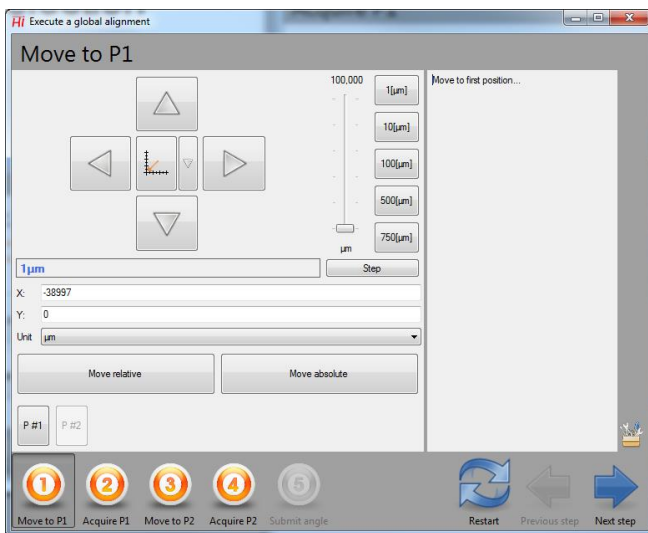
"set coordinates"  (to numeric value, which is taken from your layout)  
After this, the design on the substrate has now one point pinned down to the coordinate system of the stage.

## 11. global alignment script



You are already at first point, nevertheless you need to specify in the interface that you want to move to the first of two points **“Move to P1”**.

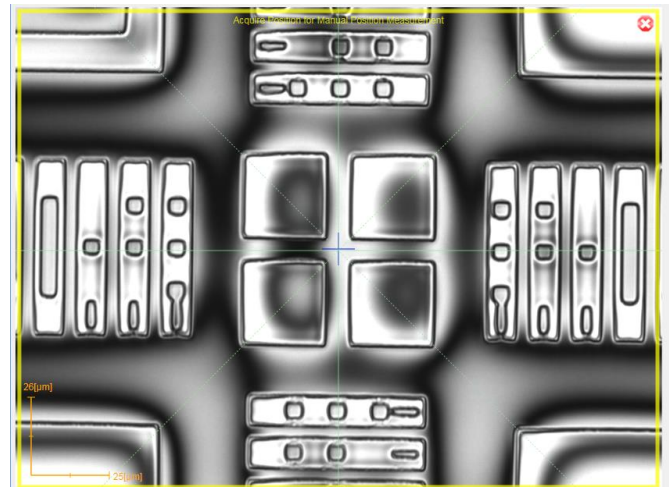
Enter the same coordinates, **“move absolute”** button, then next step/(**“Acquire P1”**).



Make sure camera **“Micro”** is selected, and that Measurement is **“Position manual”**, then **“(\*) Execute measurement”**



Clickety-click on the center with the mouse, some green spiderweb follows you as you digitize the point.



Repeat for second coordinate, e.g.:

**“Move to P2”**. Enter the coordinates, **“move absolute”** button,

You will probably see nothing.

Go to Macro lense, use navigation up and down to find the coordinates (usually a rotation problem, so left and right are useless).

Then next step/(**“Acquire P2”**).

After that you get the compensation for rotation.

**“Save and go to x=0 y=0”**.



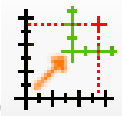
You have now completed the compensation of the rotation. However, this was done around (0,0) and not around the first point you digitized (left



coordinate). Therefore, the rotation compensation moved your coordinate system off the mark again, but only by a rotation. Regain control by digitizing the first point again.

Using "Move to P1 in "Execute global alignment wizard" to jump back to first coord, i.e. left alignment mark/fiducial.

With with "stage move arrows" precisely position cross in center of left alignment mark/fiducial

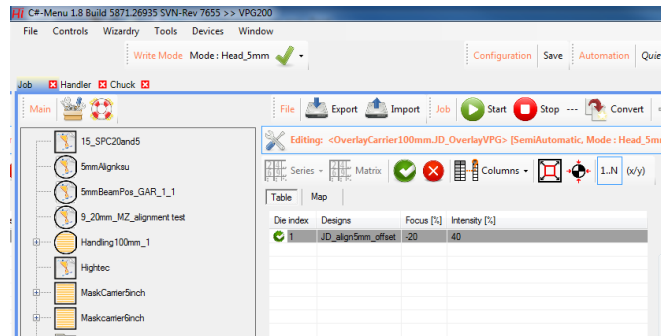


"set coordinates" (to numeric value, which is taken from your layout)

After this, the design on the substrate has now again one point pinned down to the coordinate system of the stage. Plus the previous step has compensated any rotation.

Jumping between "Move to P1" and "Move to P2" shows that the alignment is precise.

## 12. Create a job in the job interface.





Select a substrate (typically a wafer) and copy it outside carrier (Handling100mm, MaskCarrier5Inch, ... ). You may find it in the Templates>Exposurejobs/NewExposureJob area.

Or create a job using the "+" button, select "exposure job"

Drop it outside any of the carriers.

Give it your initials KSu\_jobname

Drag&Drop your design from "Design tab" into the design field.

Double click to change job from deactivated "red-X"  to activated "green-V" 

Set Focus and Intensity.

Important: Job properties: : reset coordinate: false

Start job with "play"  button.

Wait for job to start.

Wait for job to complete.

## 13. Unload substrate

Once the procedure is approved, move the writehead up using ↑.

Use the "handler" tab and click "unload" to take the substrate back in the cassette. Make sure the slot is truly empty. It should as you are the only one using the machine.

## **14. Logout**

The accounting system is billing usage time as long you are writing with the laser beam. You must still log out of the accounting computer after that.

## **15. System shutdown**

Do not ever shut the system down.

## **16. Known Issues**