VPG200 – exposure with script alignment for batch processing

Version of 2016-07-04. Get the latest one at cmi.epfl.ch/photo/files/vpg200/vpg200.align.batch.manual.pdf

1. Introduction

This manual presents the procedure to create an alignment script with the VPG200. Step 4 to step 6 are only needed the first time to teach your alignment crosses, coordinates and procedure. Consecutive alignments can be done in batch mode.

2. Login & System Initialization

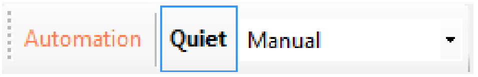
- Conversion of the second layer (to be aligned and exposed) can be done in advance using x-convert.
- Login for "Heidelberg VPG200 – Laser lithography system" on the zone 5 accounting computer.

	Z05 Heidelberg VPG200 - Laser lithography system

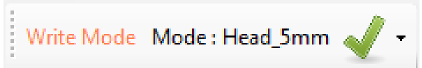
- Starts the VPG200 Menu and login with "Advanced" account. Password: "ret…"

3. Set-up Automation and Mode

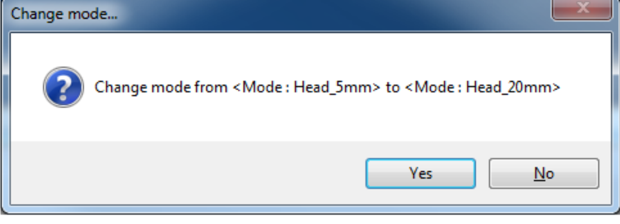
- Set-up Automation mode to "Quiet" and "Manual".



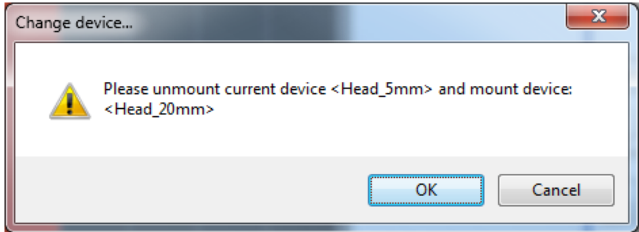
- Select the writehead you will use to write your design in the "Write Mode" list. Head_2mm is not available for alignment!



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



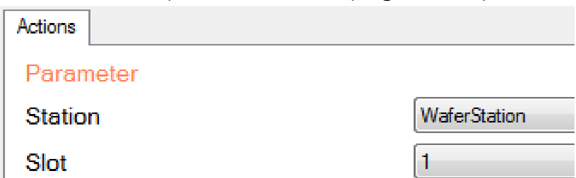
- Wait for "Please unmount current device…" message and then physically change the writehead.
- When done, click <ok> in the "Please unmount current device…" popup window.



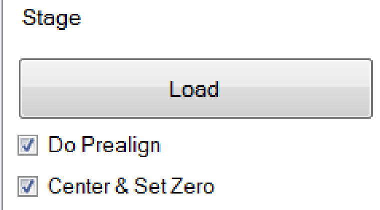
- Wait for the new mode to be properly loaded.

4. Wafer loading and centering

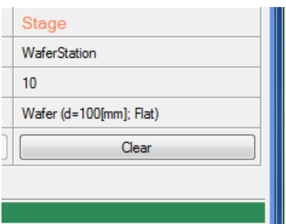
- Load your wafers in the station for wafers. Main flat should align at the back of the cassette.
- In the menu, select the "Handler" tab.
- Under "Parameter", select the station (e.g. WaferStation) and the slot (e.g. slot 1).



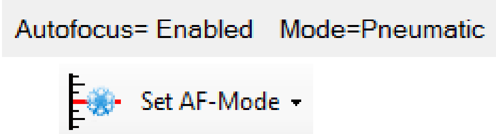
- For wafers, activate the "Do Prealign" and "Center & Set Zero" check boxes, and then click on <Load>.



- Wait for the machine to load the substrate. Visually check that prealignment is correctly detecting the flat in the "Prealigner camera" tab. Wafer position can be seen at any time at the bottom of the "Handler" tab.



- Now select the “SystemControl” tab.
- Check that Autofocus is set to pneumatic. Change with “Set AF-Mode” if necessary.

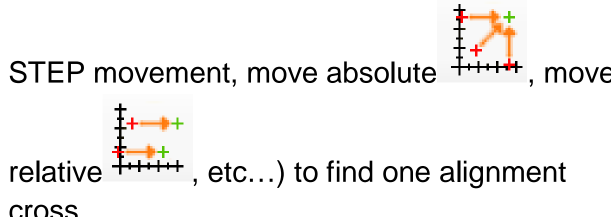


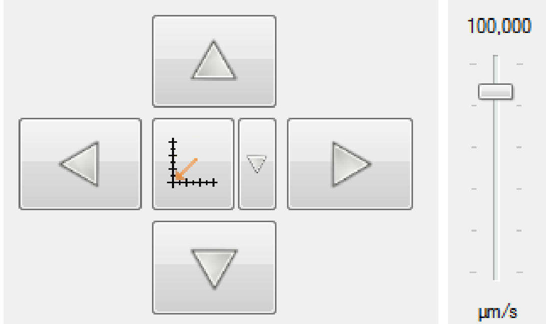
- Use “down arrow ↓” to focus down on the wafer. Wait for **“ready”.**

- Click on the “WaferCenter” button.

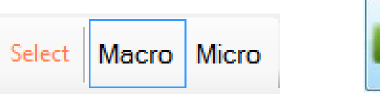
- Wait for completion.

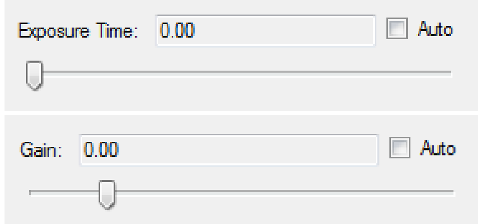
5. Camera Settings and Template

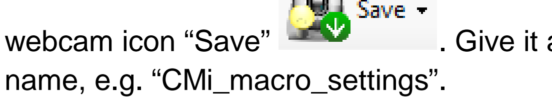
- Use the stage navigation controls (JOG or STEP movement, move absolute , move relative, etc…) to find one alignment cross.



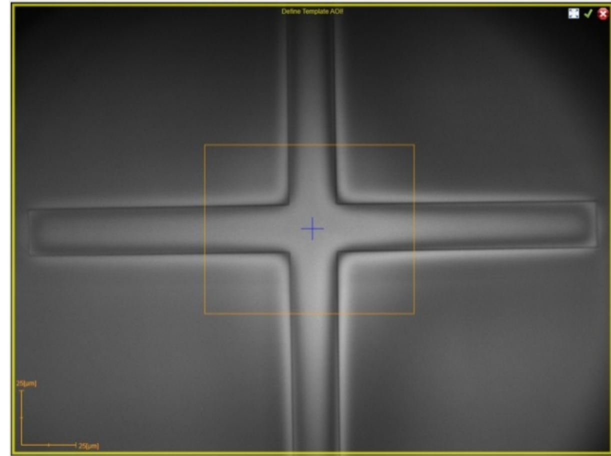
- In the “Cameras” tab, select “Macro” camera. Click the “Autofocus” button. The focus is adjusted to achieve a sharp image. Check the “AUTO” box for exposure time and gain settings.



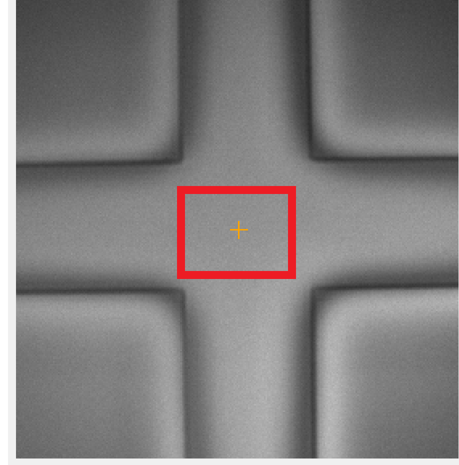


- Save the camera settings by clicking on the webcam icon “Save” . Give it a name, e.g. “CMi_macro_settings”.
- Center the cross on the camera window.
- Click the “T+” button to create a template.

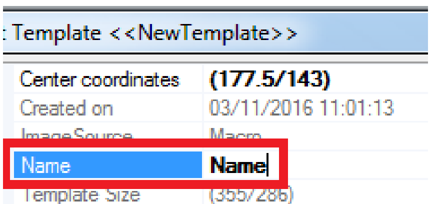
- In the camera window, adjust the area of interest (AOI) around your alignment mark. The AOI should be sufficiently small (typically 1/5 of the field of view) to be detected properly during the scan over the wafer.



- Acknowledge with the mouse middle button.
- Position the “arrow” for center coordinate manually.



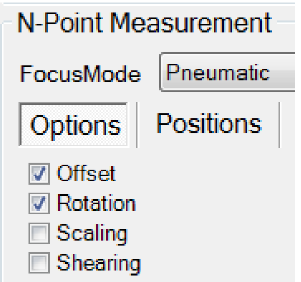
- Give a name, e.g. “CMi_macro_template”



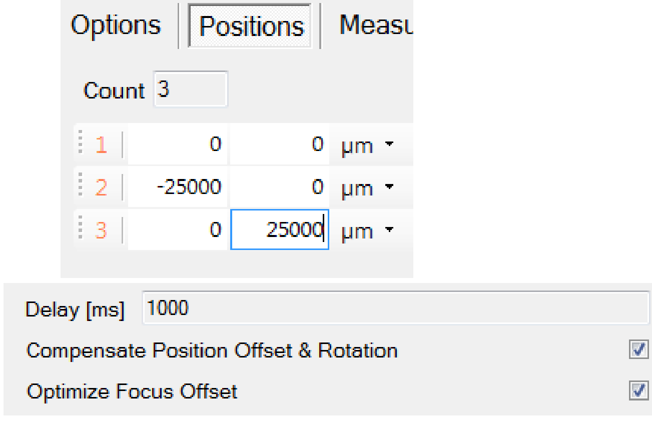
- Switch to “Micro” camera. Click the “Autofocus” button. The focus is adjusted to achieve a sharp image. Check the “AUTO” box for exposure time and gain settings.
- Save the camera settings by clicking on the webcam icon “Save” Save . Give it a name, e.g. “CMi_micro_settings”.

6. Alignment Script Creation

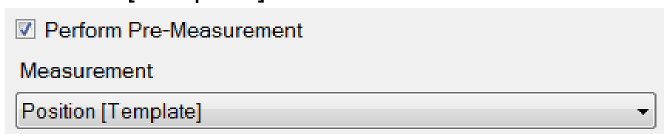
- Move to the “Alignments” tab.
- Click “Add” → N-point alignment.
- Change the name of the procedure, e. g. “CMi_alignment_script” and move it in the “alignment” sub-directory.
- Set Focus Mode “Pneumatic”.



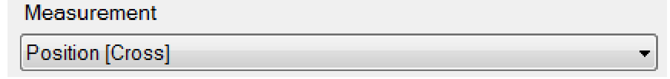
- In the **“Options”** tab, choose the alignment corrections that will be applied when writing the layouts. Standard are “offset” and “rotation”.
- In the **“Positions”** tab, enter your crosses coordinates. Double-click on “Count” to change the number of positions. Check the “Compensate position offset” and “Optimize focus offset” options.



- In the **“Pre-measurement”** tab, activate the checkbox to perform pre-measurement, choose “Position [Template]” measurement.



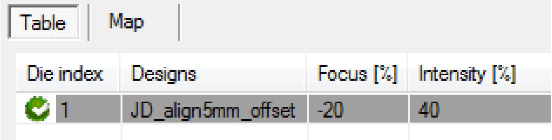
- Under “Devices”, select “Macro” camera and select your saved “Macro” camera settings, e.g. “CMi_macro_settings”.
- Under “Image Processing”, recommended :
  - Allowed center deviation: 5%
  - Correlation threshold: > 75%
  - Debug level: “Standard” for high-contrast images (reflecting metal), Detailed for low-contrast image (etched silicon)
  - Smooth options : False
  - Repetitions: 3
  - StepAway: False
  - Template: find your template, e.g. “CMi_macro_template”
- Under “Parameters”, proximity search options should be 7 “Rings” with 65% “Search Overlap”.
- In the **“Measurement”** tab, choose the “Position [Cross]” or “Position [Manual]” method, depending on the quality of your alignment features.



- Under “Devices”, select “Micro” camera and select your saved micro-camera settings, e.g. “CMi_micro_settings”.
- Under “Image Processing”, make sure the “AreaOfInterest” parameter is correctly set around the cross. It is wronf by default!
- Recommended parameters:
  - EdgePercentage: 50%
  - Repetitions: 3
  - StepAway: False
  - UseManualFallback: True
- At any time, pressing “EXECUTE” Execute will test the procedure. If the procedure succeeds, a prompt window will ask to “APPLY” the correction.
- Click <Apply> if the procedure worked.

7. a. Exposure Job (wafer on stage)

- In the “Job” tab, create a new job in the “Mode X mm” directory corresponding to your writehead.
- Choose the number and size of fields (typically one field).
- Double click to change job from deactivated “red-X” to activated “green-V”.
- Set focus & intensity parameters.
- Find your design in the “Designs” tab. Drag and drop to the design field in the job tab.

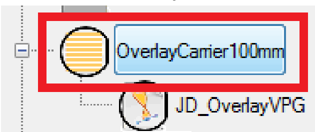


- !Important: In Job properties, set the option “reset coordinate” to false!
- Start job with Start button.
- Wait for job to complete.
- Once the procedure is approved, move the writehead up using “arrow up ↑”.

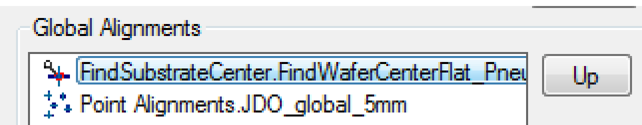
- Use the “Handler” tab and click <unload> to take the substrate back in the cassette. Make sure the slot is truly empty.

7. b. Exposure Job (batch from the WaferStation)

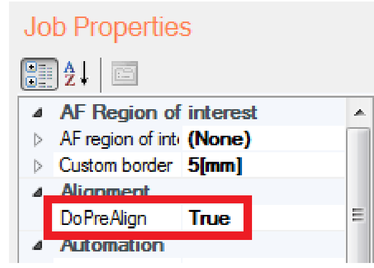
- Before starting an exposure batch with alignment, set-up “Automation mode” to “Quiet” and “Semi-automatic”.
- If the alignment script has been successfully tested, drag & drop the job created in section 7.a to the “Overlay Carrier”.



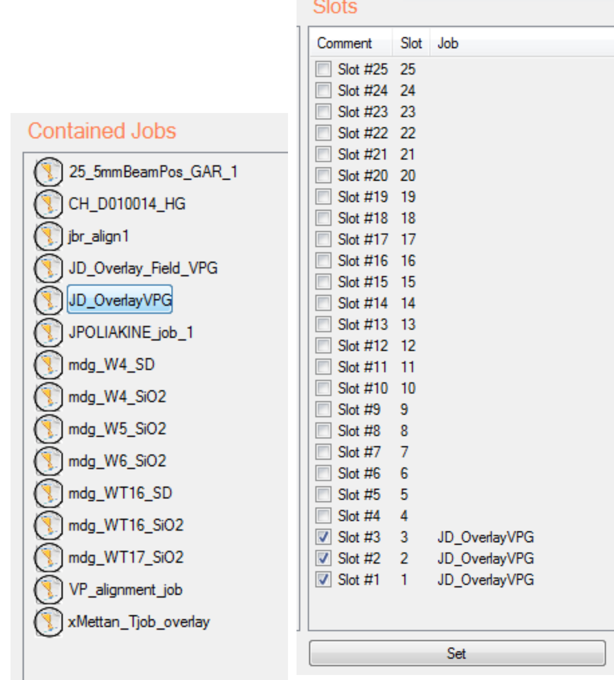
- In the global alignment window, drag and drop the “FindWaferCenterFlat_Pneum” and your alignment procedure, e. g. “CMi_alignment_script”, from the “alignment” tab. Respect the order, find wafer center is executed first!



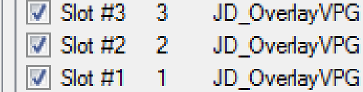
- In Job Properties, set “Do PreAlign” to True.



- A second alignment procedure can be added for each field (field alignment) in the appropriate location.
- Select your job in “contained jobs”, assign the job to carrier slots by pressing <SET>.



- Activate the checkbox to define which slots are going to be processed.



- Start the “Overlay Carrier” process by selecting the overlay carrier and pressing the Start button.
- Wafers are unloaded automatically at the end of the exposure.