Heidelberg Instruments MLA 150
Quick Start Guide (Version 4, November 2025)

Allowed substrates

Wafers: 50 — 200 mm (2” — 8”)
Photomasks and plates: 75 — 200 mm (3” — 8”)
Pieces: square or rectangular; minimum size 5 mm × 5 mm

Sequence of operations

**If you get an error message, or the tool appears to behave abnormally, STOP.
Refer to the troubleshooting section on the reverse or contact staff.**

1. Copy your design file from *lab_xfer* to the appropriate folder (*gdsii*, *dxf* or *bmp*).
2. Click “New Job”, or load one and click “Restart Job”. Rename it in the format *netID_YYYYMMDD*.
3. Select the mode (*Standard* for a single exposure, *Series* for dose or focus tests).
4. Double-click under “Substrate Template” and select “_Automatic rectangular” for pieces, or the template with the appropriate size for wafers and masks.
5. If not running an aligned job, fill in the parameters for the “FirstExposure” layer:
   - “Laser”: 405 nm for most positive resists, 375 nm for SU-8 and nLOF.
   - “Focus Mode”: *Optical1* for pieces, *Optical1* or *Pneumatic* for wafers and masks.
   - “Design”: convert a design (see reverse) or load an existing one.

   If running an aligned job, the “FirstExposure” layer may be left blank. Add a layer, fill it in, and double-click under “Alignment Settings” to provide the location of markers for global alignment (four recommended). Select the layer that you want to expose (click on it to highlight it).
6. Click “Load Substrate”.
7. Open the window and turn on the light with the buttons at the front of the machine.
8. Check that the substrate backside is clean. If it isn’t, clean it thoroughly before loading it.
9. Place the substrate on the stage using the appropriate alignment tool (none required for pieces). **Avoid hitting the write lens** with the substrate, tweezers or alignment tool.
10. Enable substrate vacuum by pushing the switch on the operator console.
11. **Remove the alignment tool** and close the window.
12. Verify that the alignment tool has been removed. Click “Continue”.
    - If using a piece and the “_Automatic rectangular” template, the substrate is moved for pre-centering under the overview camera (left of the write lens, marked by a red-light circle). **Verify on the screen that the substrate is centered.** If pre-centering fails, set the center manually and verify it. If the piece won’t center, even manually, stop and call staff.
    - If using a wafer or mask, the substrate is moved directly under the write lens. **Verify that the substrate is under the lens** before continuing.
13. Click “Continue”. Wait for the autofocus and centering routine to finish. Verify that the substrate is in focus and the detected size is within 0.2 mm of the actual size (if not, see reverse).
14. Wait until the selected laser is ready.
15. If doing an aligned exposure, the alignment routine will start. Switch to the “Low Res Camera” then click “Move to first cross”. Center each cross, then click “Measure”, then “Accept Position”.
16. Set the dose and defocus. (If running a series, provide the ranges instead.) Select other options as needed. **Don’t change the focus mode.** Checking “Wait for Conversion” is recommended.
17. Click “Start Exposure”.
18. When the exposure is done, unload the substrate.
19. Open the window, disable the vacuum and remove the substrate.
20. Turn off the light and close the window.

Converting a design

1. In the Setup Job frame, double-click under “Design”. The Load Design frame will open.
2. Click “Convert Design”. The conversion software window will open.
3. Click the “New Job” icon. Name it including your netID or guestID. Click “OK”.
4. Under “Source File”, click “Add”, and select the appropriate file format. A file browser will open.
5. Select your design and click “Ok”. The file conversion settings window will open.
6. Select the appropriate structure and layer(s), the layer operations if required (click “View All” to display XOR), and optionally make an array of the design using “STEP” (click “Update To All” to transfer the same array settings to all layers). Click “Create Default”.
7. Click “VIEW” and check your design’s center, extent and patterns in the viewer window. Close the viewer with the red “Quit” button on the toolbar (not the “X” button on the window bar).
8. If appropriate, and if you understand what they control, modify the options in the cell page.
9. Click “Complete Tasks”, “Save”, and “Finish”. The conversion software will close.
10. In the Load Design frame, select the newly converted design and click “Load”.

Other modes

- DrawMode: for exposing simple shapes or .bmp images directly in the camera view. Useful for lithography over flakes and other irregular structures.
- Inspection: for finding the location of markers and structures with high precision. No exposure is performed. Useful for measurements relative to the center of the substrate.

Troubleshooting

If these procedures don’t fix your issue, contact staff or create a problem report in Nemo. Don’t use the tool if it is behaving abnormally. Never shut down or restart the tool’s computers.

User is logged out: log in to “User” with password “cnf”.

MLA150 Menu is not open: start it from the “MLAMenu” shortcut on the desktop.

GDS files with uppercase extensions won’t show up when selecting a source file during conversion. Select *All files (*)* in the filter box at the bottom, or rename the source file.

Piece is too large for the overview camera, resulting in an error message: Click “Ok” and move the mouse cursor over to the camera view. Click at the center of the substrate. Move around by steps with the stage controls to verify centering. Click “Accept position”.

“The autofocus is not working properly” error message: Unload your substrate and restart the software. Do not attempt an exposure: it will be out of focus.

Any other error message: acknowledge it, unload your substrate, shut down and restart the software.

Blank image on camera view: unload your substrate and restart the software.

Substrate out of focus, wrong size detected, wrong thickness detected: if using a wafer or mask, switch to pneumatic focus. If using a piece, try reloading, or remove the resist and recoat at a slightly different spin speed, or contact staff.

Substrate in focus but wrong size detected: proceed with alignment only, or contact staff.

Can’t find an alignment marker: switch to the overview camera and use the stage controls to find it.

Piece falls inside backside alignment slots in the chuck: Retrieve it with tweezers. Avoid scratching the chuck or its plexiglass backplate. If the piece is inaccessible, use the pneumatic clamp switch to release the pneumatic clamp, gently slide the chuck out, retrieve the piece and gently slide the chuck back in, then re-apply the clamp. **Do not hit the write lens with the chuck. Do not drop the chuck.**