HEIDELBERG
iNSTRUMENTS

Quick Guide

MLA100
Maskless Aligner

Attention for MLA100 sample preparation

1. No wet sample, resist should be dry enough
2. Sample size >5*5mm^2
3. Random size should be shape of rectangle or square
4. Resist should be relatively uniform, no thick resist on the edge (remove thick resist if needed)
5. Backside of the wafer should be totally clean
6. When loading the wafer, put the wafer at the center as possible as you can. Make sure the wafer covers the center of the stage

Job Setup

As mentioned before (*Wizard Description*), the MLA100 provides an exposure wizard that guides the user through the steps needed to perform an exposure. The following subchapters build a sequence of actions that have to be executed one after the other. To use the wizard efficiently, follow the instructions given in this chapter. The following figure is a "panel map" showing the way through the wizard panels.

```
┌─────────────┐
│ Setup Job   │
└─────────────┘
       │
       ▼
  ┌──────────────┐
  │ Select Job   │
  └──────────────┘
       │
       ▼
  ┌──────────────────┐
  │ Select Substrate │
  │ Template         │
  └──────────────────┘
       │
       ▼
  ┌──────────────────┐
  │ Load Design      │
  │ (Convert Design) │
  └──────────────────┘
       │
       ▼
┌─────────────┐      ┌──────────────┐
│ Load        │      │ First        │
│ Substrate   │      │ Exposure     │
└─────────────┘      └──────────────┘
       │
       │             ┌──────────────┐        ┌──────────────┐
       │             │ Alignment    │───────▶│ Alignment:   │
       ▼             └──────────────┘        │ Exposure     │
┌─────────────┐                              └──────────────┘
│ Exposure    │──────┤
└─────────────┘      ┌──────────────┐
       │             │ Series       │
       │             └──────────────┘
       │
       │             ┌──────────────┐
       │             │ Draw Mode    │
       │             └──────────────┘
       │
       ▼
┌─────────────┐
│ Unload      │
│ Substrate   │
└─────────────┘
```
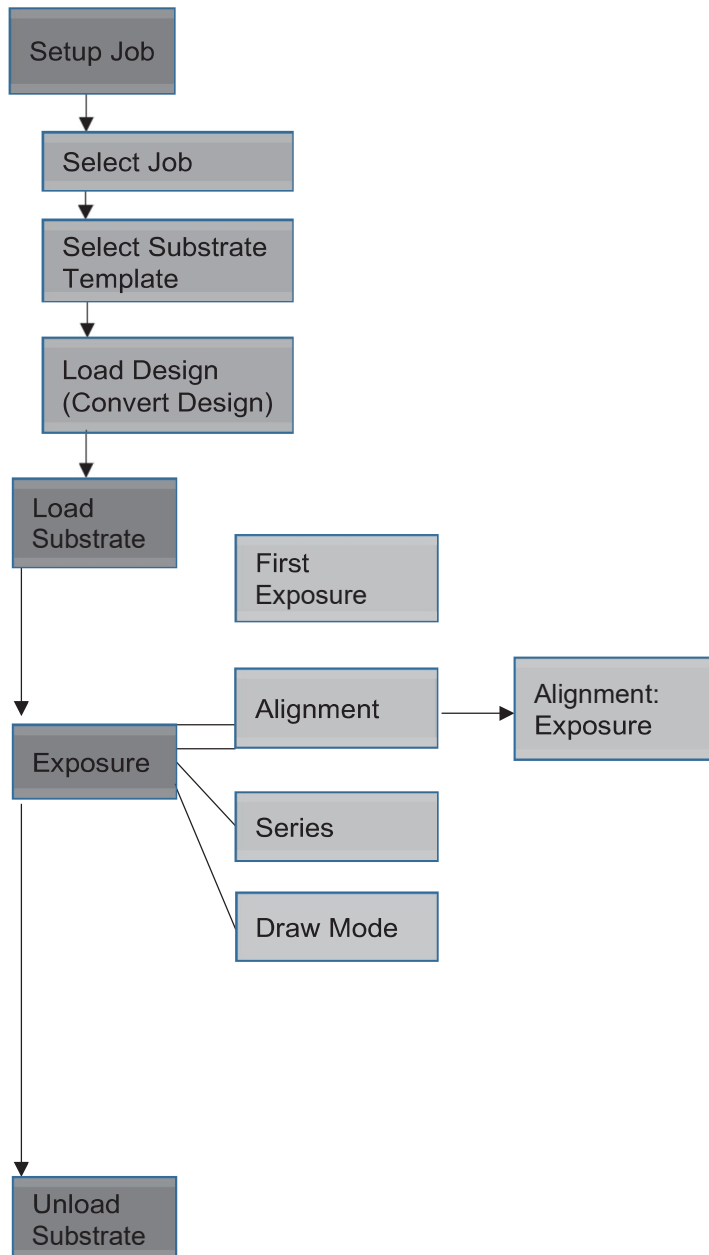
Contents

1 Introduction

This guide gives quick instructions on how to setup and execute an exposure job with the MLA Maskless Aligners. Follow the instructions carefully. If you require more detailed information, refer to the related document *User Guide*.

(i) To load a design from an external storage media into the corresponding HIMT folder, copy the external design file to the directory:
HIMT\Designs\<design type>.

2 Setting up the Exposure Job

After you have clicked the shortcut icon, the wizard opens and leads you to the *Setup Job* panel, where a new job has been created automatically. This job has a **Name** and a **Number**. The name can be changed by clicking into the **Name** field. The number is fixed and auto-incrementing.
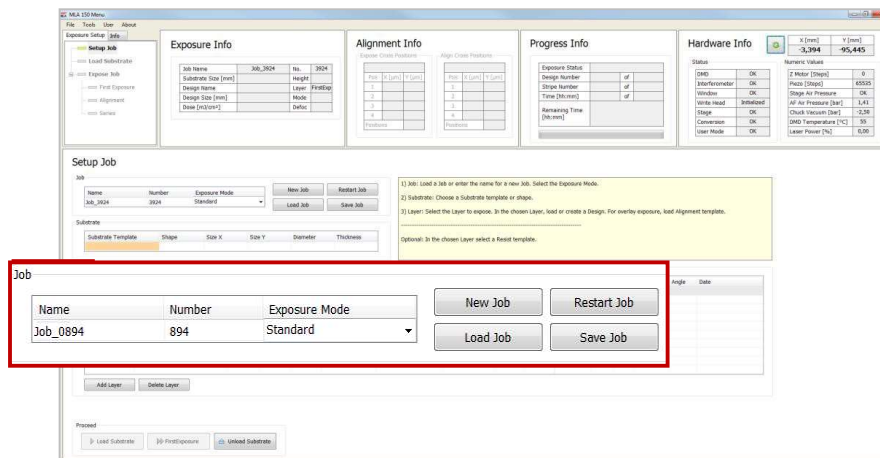
From the drop-down list, select one of the available exposure modes:

Standard: To expose a single design for each layer. Overlay exposures are possible in this mode (sections *3 Standard Exposure (without Overlay), 4 Standard Exposure with Overlay*)

Series: To expose a small test design (e.g. dosetest) several times with varying dose and/ or defocus values (section *5 Series Exposure*)

Draw Mode: To create boxes, circles or ellipses of arbitrary size limited only by the camera field. Used for creating connections between structures or for repairing imperfections in structures of an exposed layer. To expose crosses/shapes on the layer without selecting a design (*6 Draw Mode*)

If you do not intend to use the new job, you can also choose from the following options in the *Job* frame:

- To **continue or repeat** a job, click **Load Job**. A list appears from where you select the required job.

- To **repeat an exposed layer** of that job you need to copy the job with **Restart Job**. The system deletes the process data of the selected job and sets up the job with the same settings but with a new job name/number.

- To **start another new job after you have finished an exposure job,** click **New Job**. The new job has a new number and a new, but editable, name. Continue with the instructions for a new job.

3 Standard Exposure (without Overlay)
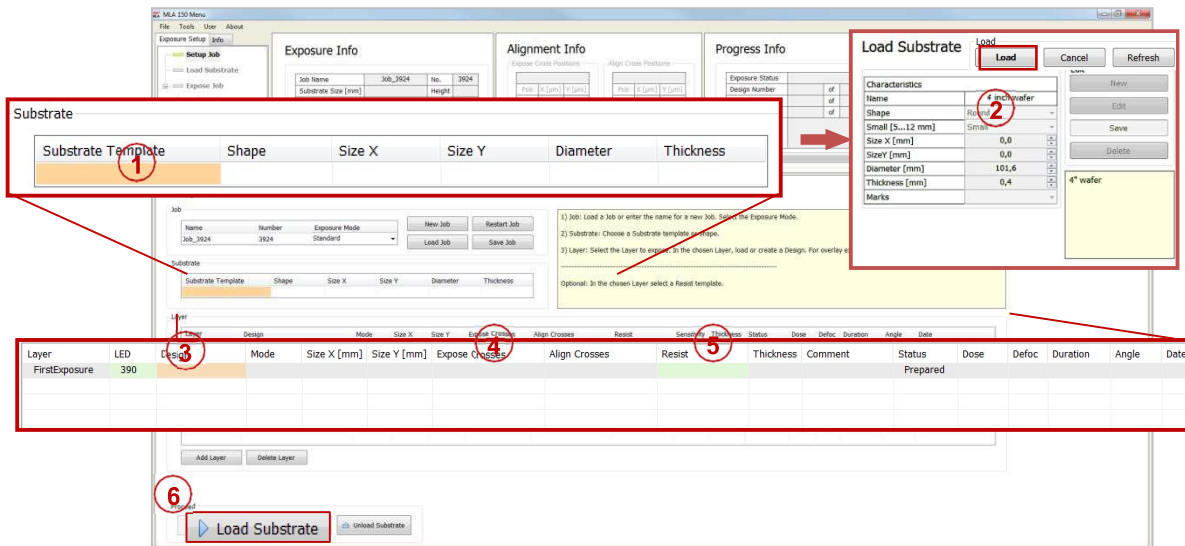
ⓘ For overlay exposures go to section *4 Standard Exposure with Overlay* in this guide.

In the **Substrate** frame**:**

1. Double-click **Substrate Template**.

2. Select your substrate size or at least the shape (automatic_round or automatic_rectangular) and click **Load**.

In the **Layer** frame:

3. Double-click Design and load the design file.

    ⓘ For instruction on how to convert a new design, refer to *7 Design Conversion* in this guide.

4. It is possible to load a template for alignment crosses which are exposed on the layer. To load this template, double-click into the value field titled **Expose Crosses** and select a bitmap template file from the list

5. Optionally, double-click **Resist** and select the resist type.

6. Click **Load Substrate** and load the substrate according to the on-screen instructions displayed in the *Load Substrate* panel.

    Note*:* Check for correct loading and write head position.

The system measures the surface and searches for the center of the substrate.

In the *First Exposure* panel:

7. Double-check the design name.

8. Set the **Dose** value by entering the value into the text field.

9. Set the **Defoc** by selecting the value with the spin buttons (range -10 to 10).

10. Activate the **Expose with substrate angle** checkbox if you wish to expose with the rotation angle of the substrate on the chuck.

11. It is possible to expose crosses on the layer. If not selected in the Setup panel a bitmap file can be selected for every cross position. Activate the **Expose Crosses** checkbox. Click **Edit** and select a template for every cross position. For selecting the same file in every position, activate the checkbox **Use first bitmap for all**. Enter the positions into the table. Click **Apply**, to leave the editing mode. Use this option also for changing the cross position information

12. If desired, activate **Auto-Unload**. The system executes the unloading procedure automatically.

13. Click **Start Exposure.**

4 Standard Exposure with Overlay

In the *Substrate* frame**:**
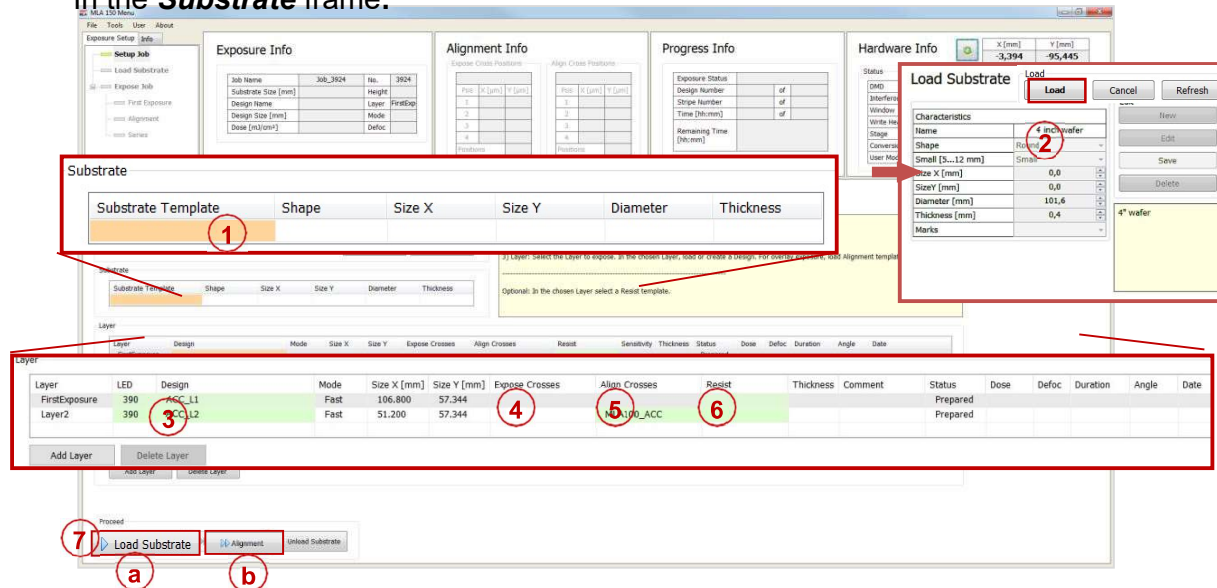
> ℹ️ For alignment, at least the second layer must be chosen. The first row in the list is always reserved for the first expose without overlay. To leave out the first exposure row, leave it blank and click **Add Layer**.

1. Double-click **Substrate Template**.

2. Select your substrate size or at least the shape (automatic_round or automatic_rectangular) and click **Load**.

In the *Layer* frame:

3. Double-click **Design** and select the design for your overlay exposure.

   > ℹ️ For instruction on how to convert a new design, refer to *7 Design Conversion* in this guide.

4. It is possible to load a template for alignment crosses which are exposed on the layer. To load this template, double-click into the value field titled **Expose Crosses** and select a bitmap template file from the list

5. For selecting a template that contains the alignment crosses, double-click **Align Crosses** and choose from the list. To set the alignment marks manually, select the template *_Manual* for manual setup.

6. Optionally, double-click **Resist** and select the resist type.

7. *Option a*: Click **Load Substrate**, load the substrate according to the on-screen instructions. You are led automatically to the next step.

   Option b: If you have already loaded the substrate, click **Alignment**.

In the *Alignment* panel:
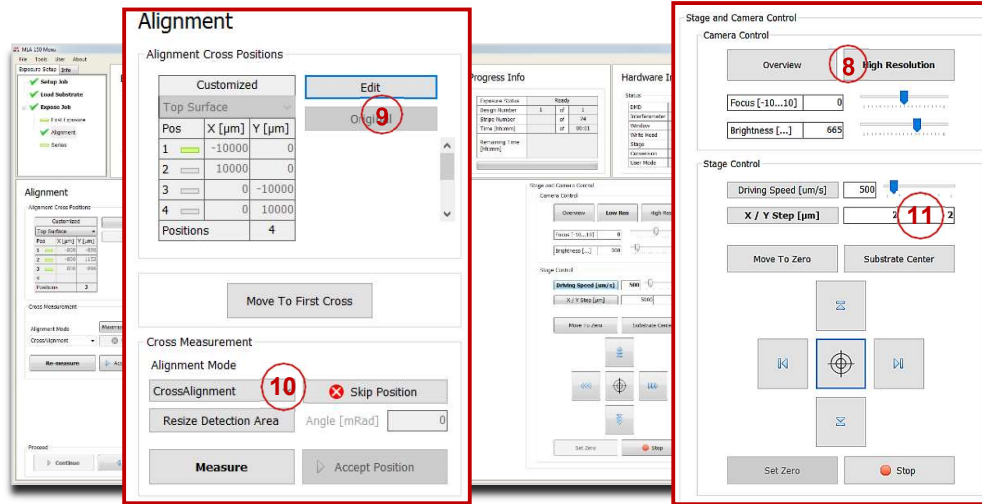
8. Choose a camera from the Stage and Camera Control panel:
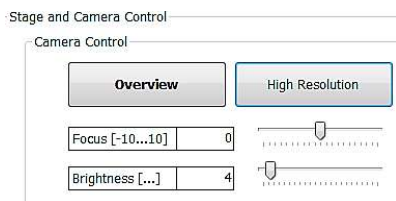
	Field of view
High Resolution:	380 µm x 285 µm
Overview*:	13 mm x 10 mm

*Overview cannot access the entire surface of the substrate due to mechanical limits.

> *Note:* Using the **High Resolution** camera for alignment is recommended whereas the **Overview** camera might only be useful for alignment procedures with coarse structures.

9. Double-check the positions of the alignment crosses taken from the template file.

- To change the cross positions, click **Edit**. Enter new values and click **Save**. The positions are stored in a temporary file and turned into a permanent template after exposure start.
- To restore the original positions from the file, click **Original**.
- If the template _Manual.xml_ was selected, set the alignment marks manually by using the **Edit** function. For every alignment cross enter the coordinates and click **Apply**.

10. From the **Alignment Mode** dropdown list choose between **Cross Alignment** and **Manual Alignment** This selection can be made for every single position

11. Use the **Stage Control** section of the **Control Panel** to move the cross into the camera center.

> **Note:** You can switch between continuous movement and stepwise movement. In step mode enter the **step size** [µm] for X and Y direction into the corresponding fields. In the continuous mode, change the **driving speed** [µm/s] either by using the slider or by clicking into the field and entering the speed manually into the corresponding field. Alternatively, click into the slider field to use the arrow keys for setting the speed

12. Determine the alignment marks in:

A. Cross Alignment Mode:

→ Click **Measure**. The system measures the position of the cross and moves it to the center of the camera window. Examine the positions and click **Accept Position** to confirm it. The procedure moves on to the next alignment cross. In the **Pos** field, the rectangle turns into a check.

> **Note:** Unsatisfying measurements can be improved by changing the brightness settings before clicking **Re-Measure**. For the finding cross function to work properly it is important that the alignment cross fills the entire camera window. If this was not the case, click **ResizeDetectionArea**. Inside the camera window, a rectangle appears showing the new detection area. To enlarge the detection area, click the right bottom corner of the rectangle without releasing it and drag it to the desired size while holding down the mouse button. To maximize the detection area again, click **MaximizeDetectionArea**.

B. Manual Alignment Mode:

→ Click **Measure**. In the camera window, a crosshair appears. Move the crosshair to the position in which the alignment marks should be set, and click. The crosshair turns from green to orange.
> **Note:** For fine positioning use the arrow buttons.

→ To center the position of the alignment mark inside the camera window, click **Center Cross**.

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13. Repeat the procedure for all alignment cross positions. Restarting the alignment procedure is possible by clicking **Cancel**. Alternatively, with **Setup Job** the alignment procedure gets cancelled and the Exposure Wizard moves back to the **Setup Job** panel.

14. Click **Continue**.

In the *Alignment: Exposure* panel:
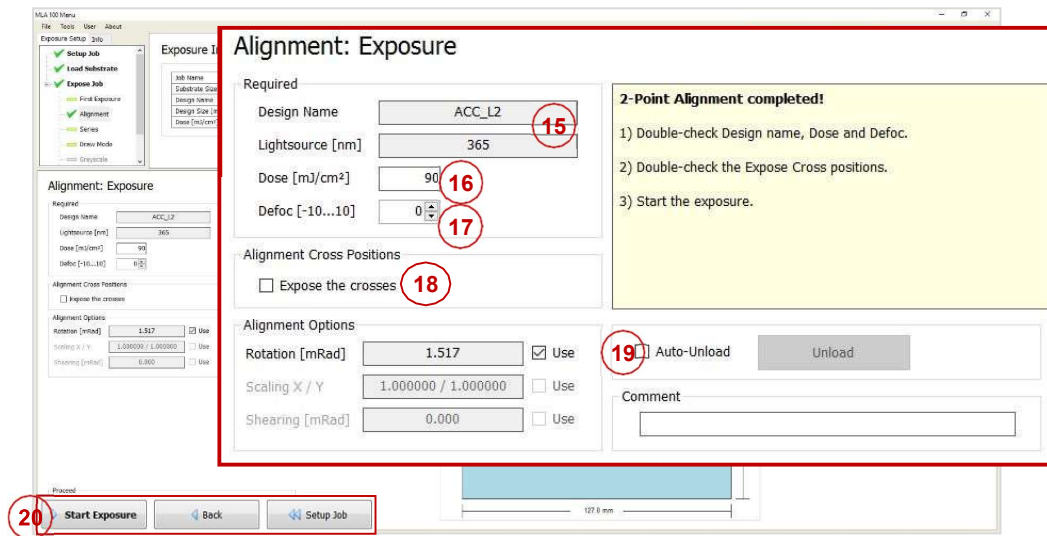
15. Double-check the design name and the light source.

16. Double-check and, if required, edit the **Dose** value by entering it into the text field.

17. Set the **Defoc** by selecting a value with the spin buttons (range -10 to 10).

18. It is possible to expose crosses on the layer. If not selected in the Setup panel a bitmap file can be selected for every cross position. Activate **Expose Crosses** checkbox. Click Edit and select a template for every cross position. For selecting the same file in every position, activate the checkbox **Use first bitmap for all**. Enter the positions into the table. Click Apply, to leave the editing mode. Use this option also for changing the cross position information.

19. If desired, activate **Auto-Unload**. The system executes the unloading procedure automatically.

20. Click **Start Exposure**. .

5 Series Exposure

By selecting **Series** from the Exposure Mode dropdown list (see *2 Setting up the Exposure Job*), a template and standard test design for series exposures is loaded

automatically.

In the *Substrate* frame:

1. Double-click **Substrate Template**.
2. Select your substrate size or at least the shape (automatic_round or
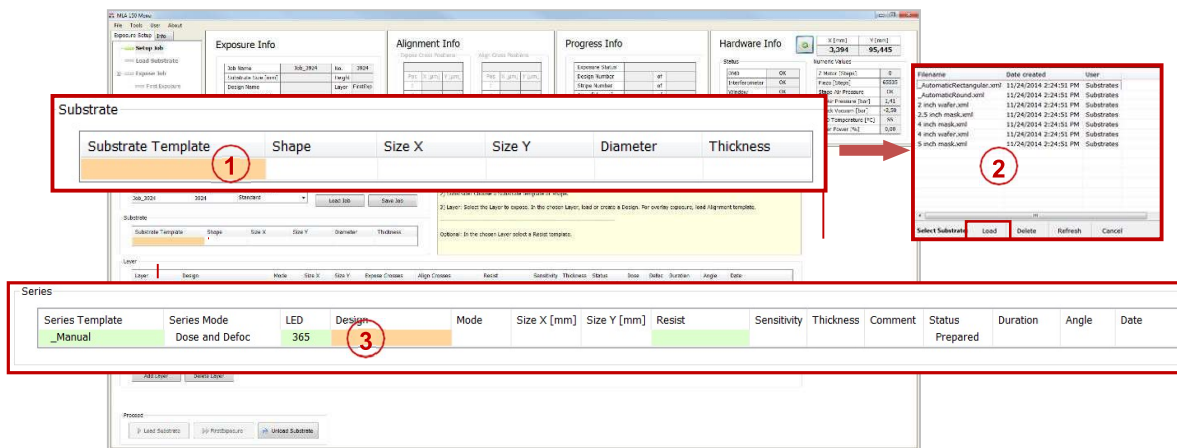
automatic_rectangular) and click **Load**.

In the *Layer* frame:

3. It is possible to select a different template by double-clicking **Series Template** and select one from the list. The design file can also be changed by double-clicking **Design** and selecting the design file.

The wizard moves on to the next panel.

In the *Parameters* frame:

4. Select from the options in the **Mode** dropdown list: **Dose**, **Defoc** or **Dose and Defoc**.

5. Set the values required for the selected mode.

6. If desired, activate **Auto-Unload**. The system executes the unloading procedure automatically.

7. Click **Start Exposure**.

6 Draw Mode

After having selected the Exposure Mode, you select the substrate size.

In the *Setup Job* panel:
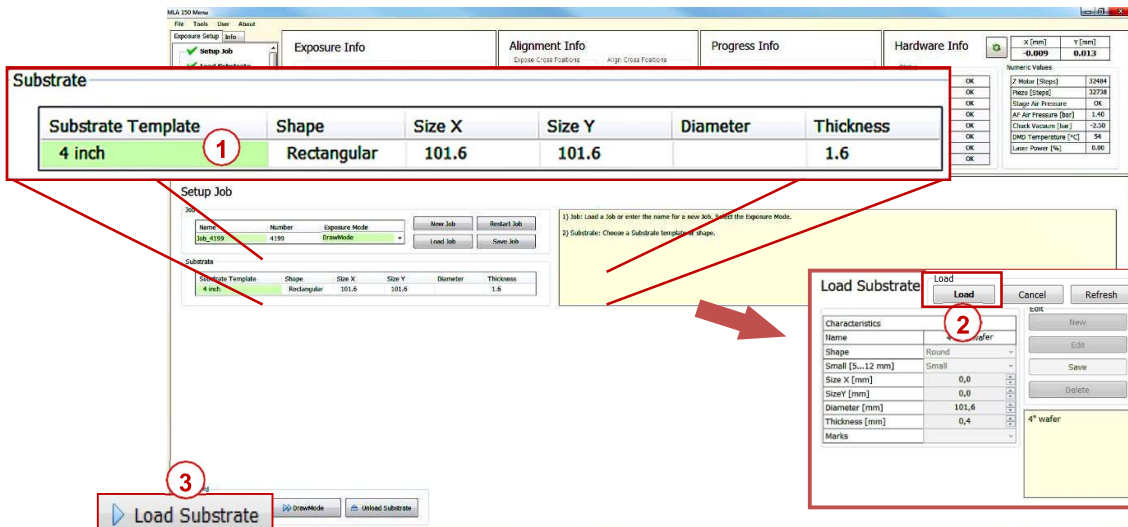
1. Double-click **Substrate Template**.
2. Select your substrate size or at least the shape (automatic_round or automatic_rectangular) and click **Load**.
3. Click **Load Substrate** and load the substrate according to the on-screen instructions displayed in the *Load Substrate* panel.
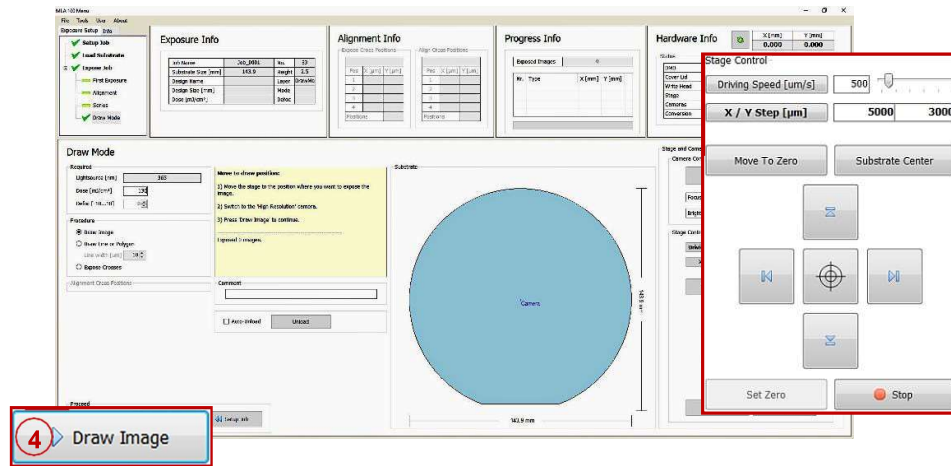
Note: Check for correct loading and head position. For small substrates the system issues a dialog box if the substrate type has not been completely defined in the step of substrate template selection.

The system searches for the center of the substrate.

In the *Draw Mode* panel

4. Click **Draw Image** and select the area for the structure on the substrate inside the camera window (use the Stage Control section for moving on the substrate).

5. In the camera window select the shapes of the structures that should be drawn onto the substrate by clicking on the corresponding icon.

   ⓘ You can load an existing file by clicking Load and selecting the file. To load a bitmap file, click **BMP** below the structure icons.

6. You can drag the structure to the desired position by clicking and moving the cursor with the mouse button held down. To rotate the structure click into the dot inside the structure and move the cursor without releasing the mouse button until the desired position has been found.
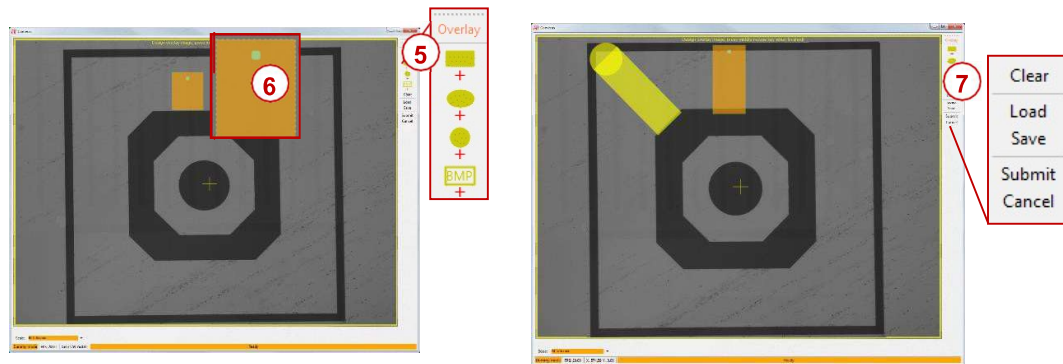
7. To confirm the drawn image, click **Submit** in the menu bar of the camera window. To clear the image, click **Clear** and start again.

   ⓘ To save the image, click **Save**, insert a name for the file and save it. To cancel the entire procedure, click **Cancel**.

Back in the **Draw Mode** panel
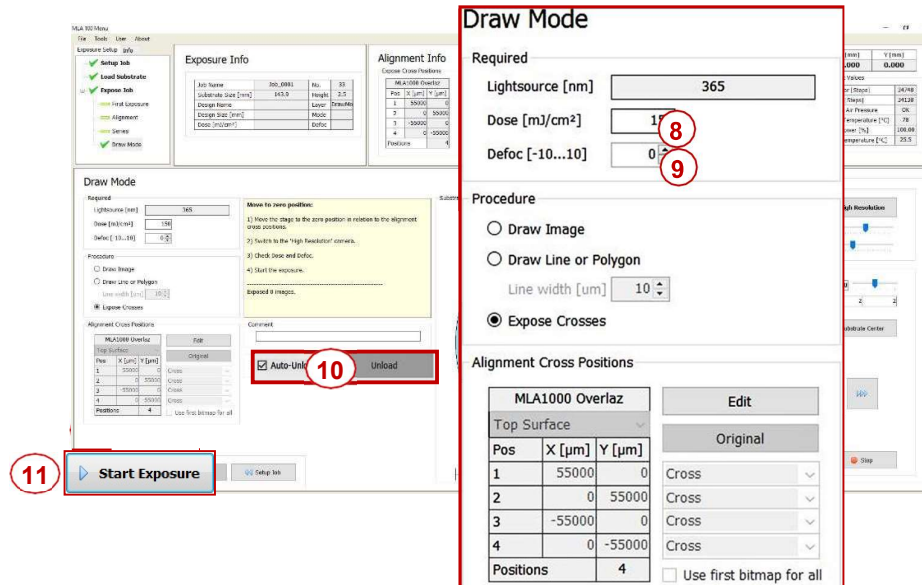
8. Set the **Dose** value by entering the value into the text field.

9. Set the **Defoc** by selecting the value with the spin buttons (range -10 to 10).

10. If desired, activate **Auto-Unload**. The system executes the unloading procedure automatically.

11. Click **Start Exposure.**

7 Design Conversion

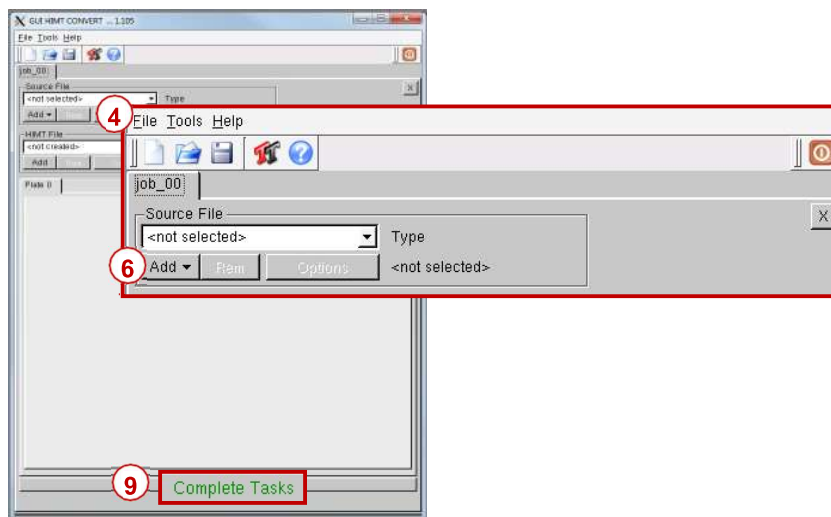To use a new and yet unconverted design, follow these instructions:

In the *Layer* frame:

1. Double-click **Design**. The **Load Design** panel containing a list of designs opens, where you normally select one of them for your exposure.
2. To upload a new design, click **Convert Design**.

3. The conversion software opens.

In the *Conversion* window:

4. From the menu bar, select **File→New Job**.

5. Enter a name for the job.

6. Click **Add** and select a design format. A directory opens containing the source files for the selected design format.

ⓘ To load a design from an external storage media into the corresponding HIMT folder, copy the external design file to the directory *HIMT\Designs\<design type>*.

7. From the directory, select the file to be converted.

8. If necessary, change settings and / or use the viewer application (for details see related document *Conversion Job Manager)*.

9. Click **Complete Task**. A message pops up. Wait until the message box informs about the completion of the process.

10. In the message box, click **Finish**.

11. Click into the wizard window to refresh the design list, or click **Refresh**. The new file is now listed and ready to be selected for the exposure job.