

LASER GUI HELP AND DOCUMENTATION

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HOW TO START

1. Double click **laserGUI.bat** in “**Laser**” file. A command prompt will appear, followed by the Laser Control GUI shortly after.
2. **DONE!** You’ve successfully opened the GUI. It should look like Figure 1 below, but without the entries.

The screenshot shows the 'Laser Control' application window. It is divided into two main sections: 'Step 1) Tilt alignment' and 'Step 2) Rasterfahrt'.

Step 1) Tilt alignment

- Left alignment (camera) point [mm]**
x1: 39.101
y1: -60.939
- Right alignment (camera) point [mm]**
x2: 113.007
y2: -64.62
- Button: **Create alignment script**

Step 2) Rasterfahrt

- Origin in design [mm]**
x0D: -36800E-3
y0D: -2800E-3
- First shooting point in design [mm]**
xD: 46.639
yD: -167.595
- Origin in LASER SITE coordinates [mm]**
Go to site for these coordinates.
x0: 46.595
y0: -152.341
- Other parameters**
Direction: ☒ Inwards ☐ Outwards
Script name: rasterTest
pitch [mm]: 0.2
startZ [mm]: 3.05
Square size [mm]: 5
More Settings...: ☐ yes ☒ no
Button: **Create Rasterfahrt script**
- Button: **Get help**

Figure 1: Laser GUI with example values. Add “E-3” behind your value, if you want to write down micrometers and convert them directly into millimeters, as shown in the entries x0D and y0D!

3. As you can see, there are two steps: 1) Tilt alignment and 2) Rasterfahrt. Both sections are executed separately and are described in the following.

NOTES

1. All distance or coordinate values are in **millimeters with decimal point!**
2. It is possible to do conversions by adding “E-3”, which is the same as 10^{-3} (see Figure 1)
3. This guide assumes you know how to use the laser already.

STEP 1: TILT ALIGNMENT

Sections [Left (camera) alignment point] and [Right (camera) alignment point]:

1. **Choose 2 alignment marks on your design.** Those 2 points will be leveled along the x-axis.
2. Move to the corresponding alignment marks using the jog sheet.
3. Enter the x and y coordinates in **mm with a decimal point.** (e.g. 0.2 for 0.2 mm).
[No need to move to laser site. Stay at the camera position!](#)
4. **Press the button** [Create alignment script]. If successful, an info pop-up will appear (Figure 2)
5. **"alignment.vbs"** will be saved into "Skripte" folder. It will be overwritten with a new script every time you press the button.
6. Load this script into your 3Dmicromac application and execute.
7. Check if successful. Correct manually if needed.

TIPS:

- The further away the alignment points (x1,y1) and (x2, y2) are from each other, the better the alignment.
- First use the camera with lower magnification to move to the alignment marks. Then use the largest magnification and z-axis to focus on them. The alignment vastly depends on the accuracy of the coordinates!

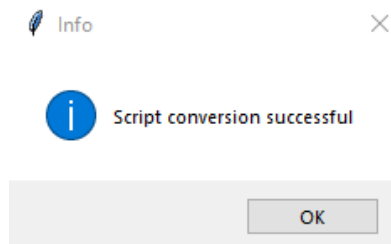


Figure 2: Pop-up appearing after a successful script conversion. The script is saved into the "Skripte" folder

STEP 2: RASTERFAHRT

Section [Origin in design]:

1. For x0D and y0D, look for a point in your **design** you can easily find on your wafer through the laser camera. This could be one of the alignment marks you chose for the tilt alignment.
2. Enter the coordinates from your design in mm.

Section [First shooting point in design]:

1. For xD and yD, choose the first shooting point in your **design**. The coordinates will be the **center** of the first shot.
2. Enter the coordinates from your design in mm.

Section [Origin in LASER SITE coordinates]:

1. For x0 and y0, look for the point you chose as your origin in section [Origin in design] on the **laser**.
2. First move to the laser **shooting site** before entering the laser coordinates in mm.

Section [Other parameters]:

1. **Direction:** Selects the direction of the Rasterfahrt (snail). Both snails go in clockwise direction.
 - a. **Inward:** Starts at the upper left corner and moves to the right first (Figure 3, left)
 - b. **Outward:** Starts at the center and moves to the right first (Figure 3, right)

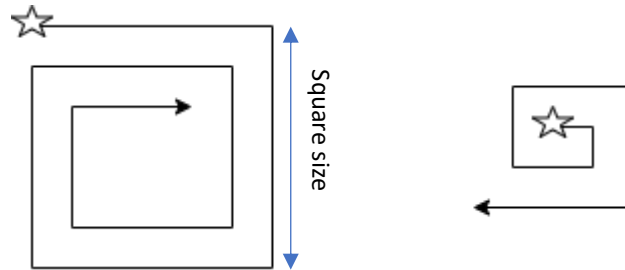


Figure 3: Inward Rasterfahrt (Left) and Outward rasterfahrt (Right). The star indicates the first shooting point.

2. **Script name:** The name under which the script will be saved as.
 - a. If you enter “test_XYZ”, you will get a script named “test_XYZ.vbs” (saved into the Skripte folder).
 - b. If the same script name is chosen as an already existing script, the older script with the same name **will be overwritten**.
3. **Pitch:** Distance between the centers of two shots. To be entered in mm. (e.g. 0.2 for a 200 μm pitch)
4. **startZ:** The z value (height/focus) previously determined from “Fokussuche” in mm. (usually around 0.31 mm)
5. **Square size:** The Raster/Snail the laser follows has to be a **square**. So the square size indicates the length of one side of the square along which the laser shoots in mm (Figure 3, right). **The Square size must be a multiple of the pitch.** Please note that the **square size differs from the area that is actually being shot**. This depends on the currently used laser mask. E.g. if the laser shoots fields of 2x2 mm, the actual square size after shooting increases by 1mm on each side.
6. **More settings:** The following settings are **optional**. Only enter **numerical values**. If nothing is entered, the following default values will be applied:
 - a. **StartLeistung:** -26 (Attenuator position in degrees)
 - b. **PulseEnergy:** 220 (Laser pulse energy value in kV)
 - c. **EnergyMode:** 0 (Not known yet. Our predecessors had it that way. Keep it zero)
 - d. **TriggerMode:** 0 (Same. Keep it zero)
 - e. **waitMs:** 100 (Milliseconds waited between shot and movement in case the .vbs function waituntilinpos does not work. Currently not applied.)
 - f. **Pulse:** 1 (Number of pulses shot by laser)
 - g. **repRate:** 20 (Laser Pulsewidth in μs)
 - h. **Overlap:** 0 (Overlap between shots in mm. If overlap is non-zero, the correct functionality is only given if the mask size (actual shot size) = pitch.)
7. Press the button **[Create Rasterfahrt script]**. If successful, an info-prompt will appear again. The script with your chosen name will be saved into the “Skripte” folder.
8. Upload script into your 3Dmicromac application and execute.

TROUBLESHOOTING

Error	Possible reasons
ValueError: could not convert string to float.	<ul style="list-style-type: none">- You forgot to fill some entries (which are not under [More Settings...])- You used a decimal comma (e.g. 1,3) instead of a decimal point (1.3)
The laser does not shoot the position I want it to.	<ul style="list-style-type: none">- Used camera coordinates instead of laser site coordinates for x0 and y0 (origin in LASER SITE)- You have a typo (happens to the best)