

Laser Ablation Master Toolpath Generator

SOP Author: JPR

SW Author: JDV

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Master Toolpath Generator



Introduction

Master Toolpath Generator is short script that will compose a master toolpath for whole convex preform laser ablation having different types of cavities (main lenses, reference lenses, overflow lenses).

It needs an input in a form of individual cavity toolpath, i.e. **.bia* file generated by standard means.

The input syntax is defined by type of lenses, e.g. “type-a”, “type-l” etc. The Master Toolpath Generator then look for removal (“remov” syntax for cavity preform ablation) and cleaning (“clean” syntax for cavity cleaning).

The main orientation of the mold inside laser ablation machine is mold arrow pointing towards right hand side (positive X direction of laser ablation machine coordinates).

It corrects the layout position based on CMM symmetry measurement.

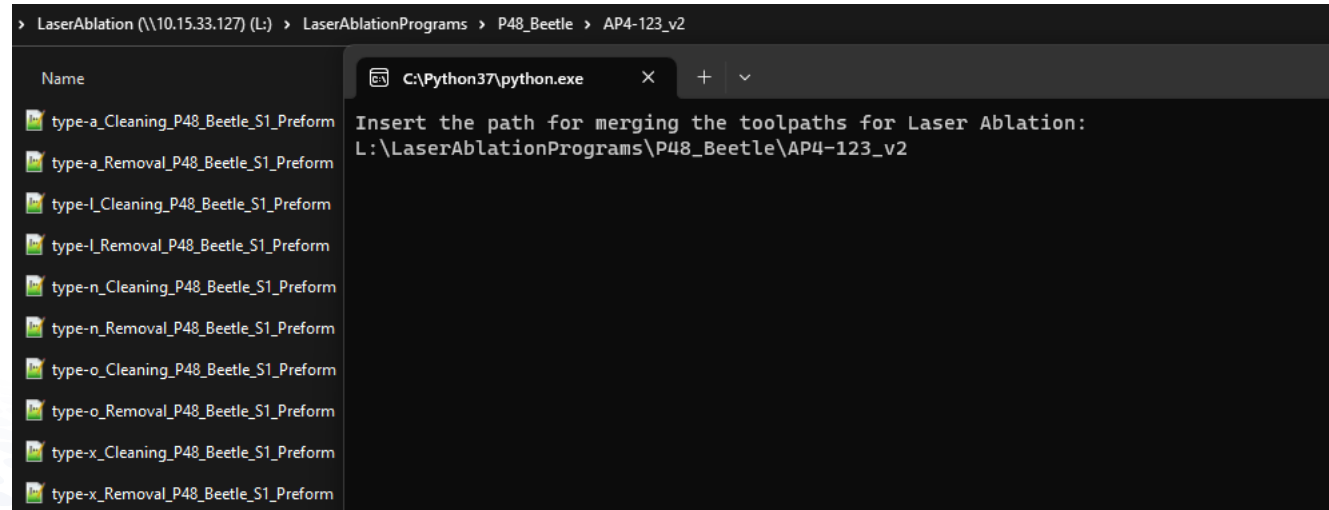
The generated master toolpath have sorted cavities for their laser ablation in an order that starts to ablate cavities with lowest Y coordinate, removal and cleaning (if specified) at each cavity position. Once lowest Y coordinate cavities are finished, the second lowest Y coordinate cavities are being processed etc.

Master Toolpath Generator

Open “Master Toolpath Generator_v1.0.2.py” in Python

Once you open the Master Toolpath Generator in Python, you will be requested to enter the full path of the prepared *.bia files for individual types of lenses and removal/cleaning parameters.

Insert the full path (including drive letter) where *.bia files for the mold are present.

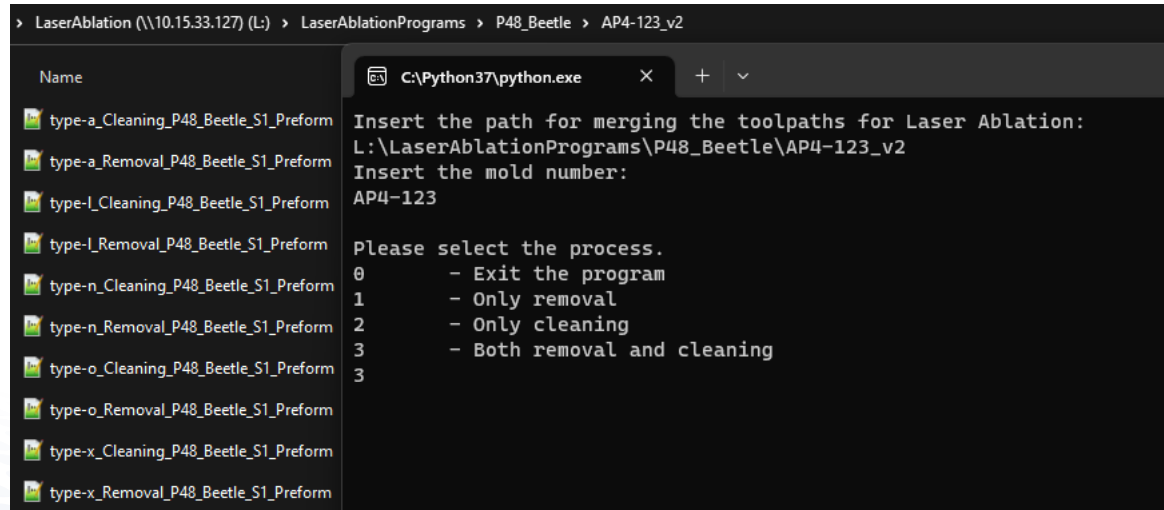


Master Toolpath Generator

Mold number and process

Insert correct mold number and press “Enter”.

New line with process selection appears, you can choose whether only removal, only cleaning or both. Write a number corresponding to your choice and press “Enter”.



```
> LaserAblation (\10.15.33.127) (L:) > LaserAblationPrograms > P48_Beetle > AP4-123_v2

Name
type-a_Cleaning_P48_Beetle_S1_Preform
type-a_Removal_P48_Beetle_S1_Preform
type-l_Cleaning_P48_Beetle_S1_Preform
type-l_Removal_P48_Beetle_S1_Preform
type-n_Cleaning_P48_Beetle_S1_Preform
type-n_Removal_P48_Beetle_S1_Preform
type-o_Cleaning_P48_Beetle_S1_Preform
type-o_Removal_P48_Beetle_S1_Preform
type-x_Cleaning_P48_Beetle_S1_Preform
type-x_Removal_P48_Beetle_S1_Preform

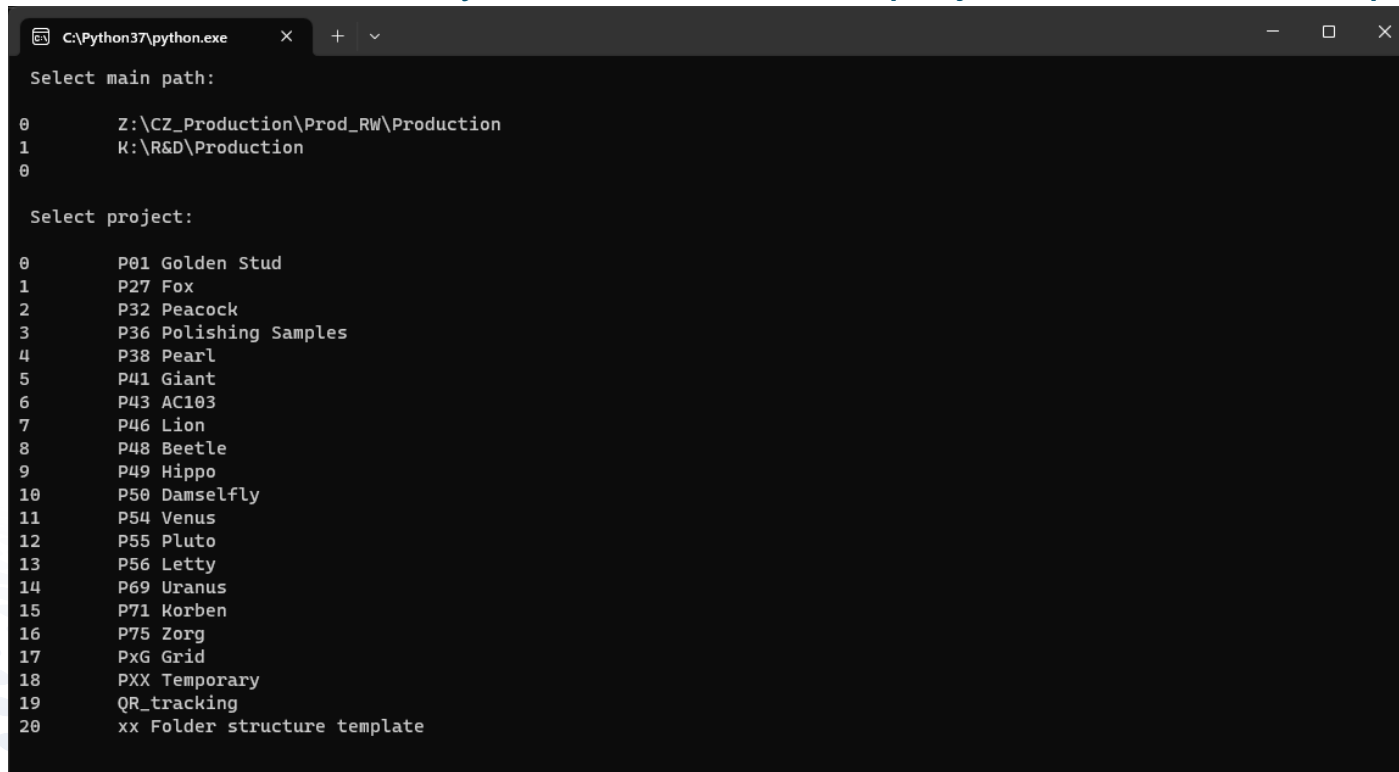
C:\Python37\python.exe
Insert the path for merging the toolpaths for Laser Ablation:
L:\LaserAblationPrograms\P48_Beetle\AP4-123_v2
Insert the mold number:
AP4-123

Please select the process.
0      - Exit the program
1      - Only removal
2      - Only cleaning
3      - Both removal and cleaning
3
```

Master Toolpath Generator

Select the main path of your production folder

To distinguish from new R&D projects run at Kaleido and standard/mass production run in Czech please select the path. This selection will redirect you to the choice of project in the selected path.



```
C:\Python37\python.exe
Select main path:
0      Z:\CZ_Production\Prod_RW\Production
1      K:\R&D\Production
0

Select project:
0      P01 Golden Stud
1      P27 Fox
2      P32 Peacock
3      P36 Polishing Samples
4      P38 Pearl
5      P41 Giant
6      P43 AC103
7      P46 Lion
8      P48 Beetle
9      P49 Hippo
10     P50 Damselfly
11     P54 Venus
12     P55 Pluto
13     P56 Letty
14     P69 Uranus
15     P71 Korben
16     P75 Zorg
17     PxG Grid
18     PXX Temporary
19     QR_tracking
20     xx Folder structure template
```

Master Toolpath Generator



Project, layout and mold side selection

Write a number specifying your desired project to be laser ablated, e.g. for “P48 Beetle” write corresponding number “8” from previous slide.

Then write a number corresponding to the layout you want to laser ablate, e.g. write number “8” for “Layout 11”.

Then select which side of the mold you want to laser ablate, e.g. write “0” for “S1”.

```
19      QR_tracking
20      xx Folder structure template
8

      Select layout:

0      Layout 01
1      Layout 02
2      Layout 03
3      Layout 05
4      Layout 07
5      Layout 08
6      Layout 09
7      Layout 10
8      Layout 11
9      Layout 12
10     Layout 15
11     Layout 16
12     Layout 18
13     Layout xx (template)
8

      Select side of layout:

0      S1
1      S2
0|
```

Skip missing toolpaths

Based on the layout you will be prompted to skip missing toolpaths.

Typically “m” and “k” types which do not have preform and are grinded at grid grinding process.

This serves as a check that you have all toolpaths in place to start the laser ablation process.

```
Select side of layout:
0      S1
1      S2
0

There are some Removal toolpaths missing. Namely      ['m', 'k']

Should they be skipped?
0      - the program will quit
1      - Skip the toolpaths
1
```

Master Toolpath Generator

Define layout center position and mold orientation **MK3**

Enter the half size of the mold (or mold center from the top mirror surface). Typically it is „-37.452“ mm for MK4 mold.

Then enter symmetry values from CMM measurement to shift the layout center accordingly.

Enter how you put the mold (orientation in laser ablation machine), mold top part is defined by an arrow.




- Arrow pointing in negative Y axis direction of machine coordinate system, i.e. select “No rotation”.
- Arrow pointing in positive X axis direction of machine coordinate system, i.e. select “90 deg CW rotation”.

```
What is the half size of the mold (distance from vision markers' mirror surface to the center of the mold) in [mm]?
78.5

What is the z-correction from CMM in [mm]?
-0.0016

What is the y-correction from CMM in [mm]?
0.02455

Should the orientation be flipped?
0      - No rotation
1      - 90 deg CW rotation
1
```

| | | |
|---|-------------------|---------|
|  | Y Value_Symmetry1 | 0.0254 |
|  | Y Value_Symmetry2 | 0.0237 |
|  | Z Value_Symmetry3 | -0.0016 |

mean of
the two

Master Toolpath Generator

Define layout center position and mold orientation **MK4 S1 concave**

Enter the half size of the mold (or mold center from the top mirror surface). Typically it is „-78.5“ mm for MK4 mold.

Then enter symmetry values from CMM measurement to shift the layout center accordingly.

- For MK4 mold you have to also move typically 13 mm to the center of „ear“ when object reference on datums used (verify on drawing). Add „-13“ mm to „y-correction from CMM“.

Enter how you put the mold (orientation in laser ablation machine), mold top part is defined by an arrow.

- Arrow pointing in negative Y axis direction of machine coordinate system, i.e. select “No rotation”.
- Arrow pointing in positive X axis direction of machine coordinate system, i.e. select “90 deg CW rotation”.

```
What is the half size of the mold (distance from vision markers' mirror surface to the center of the mold) in [mm]?
78.5

What is the z-correction from CMM in [mm]?
-0.0016

What is the y-correction from CMM in [mm]?
0.02455

Should the orientation be flipped?
0      - No rotation
1      - 90 deg CW rotation
1
```

| | | |
|---|-------------------|---------|
| Y | Y Value_Symmetry1 | 0.0254 |
| Y | Y Value_Symmetry2 | 0.0237 |
| Z | Z Value_Symmetry3 | -0.0016 |

mean of
the two

Master Toolpath Generator

Define layout center position and mold orientation **MK4 S2 concave**

Enter the half size of the mold (or mold center from the top mirror surface). Typically it is „-78.5“ mm for MK4 mold.

Then enter symmetry values from CMM measurement to shift the layout center accordingly.

- **For MK4 mold you have to also move typically 13 mm to the center of „ear“ when object reference on datums used (verify on drawing). Add „+13“ mm to „y-correction from CMM“.**

Enter how you put the mold (orientation in laser ablation machine), mold top part is defined by an arrow.

- Arrow pointing in negative Y axis direction of machine coordinate system, i.e. select “No rotation”.
- Arrow pointing in positive X axis direction of machine coordinate system, i.e. select “90 deg CW rotation”.

```
What is the half size of the mold (distance from vision markers' mirror surface to the center of the mold) in [mm]?
78.5

What is the z-correction from CMM in [mm]?
-0.0016

What is the y-correction from CMM in [mm]?
0.02455

Should the orientation be flipped?
0      - No rotation
1      - 90 deg CW rotation
1
```

| | | |
|---|-------------------|---------|
| Y | Y Value_Symmetry1 | 0.0254 |
| Y | Y Value_Symmetry2 | 0.0237 |
| Z | Z Value_Symmetry3 | -0.0016 |

mean of
the two

Master Toolpath Generator

Define layout center position and mold orientation **MK5**

Enter the half size of the mold (or mold center from the top mirror surface). Typically it is „**+68.5**“ mm for MK5 mold.

Then enter symmetry values from CMM measurement to shift the layout center accordingly.

- **For MK5 mold you have to also move 74 mm when object reference on MK5 holder is used. Add „+74“ mm to „y-correction from CMM“.**

Enter how you put the mold (orientation in laser ablation machine), mold top part is defined by an arrow.




- Arrow pointing in negative Y axis direction of machine coordinate system, i.e. select “No rotation”.
- Arrow pointing in positive X axis direction of machine coordinate system, i.e. select “90 deg CW rotation”.

```
What is the half size of the mold (distance from vision markers' mirror surface to the center of the mold) in [mm]?
78.5

What is the z-correction from CMM in [mm]?
-0.0016

What is the y-correction from CMM in [mm]?
0.02455

Should the orientation be flipped?
0      - No rotation
1      - 90 deg CW rotation
1
```

| | | |
|---|-------------------|---------|
|  | Y Value_Symmetry1 | 0.0254 |
|  | Y Value_Symmetry2 | 0.0237 |
|  | Z Value_Symmetry3 | -0.0016 |

mean of
the two