CNC-STEP GmbH & Co. KG

Laser-engraving unit 455nm
Operation description

https://www.cnc-step.com/

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Pictures and graphics

Laser-engraving unit

Operation description

Short description

The case contains the complete electronics to place the laser module in service, as well as the complete laser engraving device, which are necessary to use our laser engraving device. A High-Z portal machine with computer and appropriate CAM/CNC-control-software (KinetiC-NC, ConstruCam-3D, etc.) is necessary to put the machine into service. This manual describes the installation, start-up and service of our laser engraving device.

Content

1 General

The engraving device was designed on the basis of the strict observance of standard regulations and guidelines and has been tested insensitively and carefully. However, we provide no guarantee of fault-free operation. The manufacturer ensures that the engraving device in connection with the most suitable mechanical components, used within the meaning of the description and user manual are suitable for their designated use. The possibility is excluded of any liability whatsoever being assumed for damages, claims or costs, indirect and direct
Consequential damage or other damage, from lost profit, operational disruptions and stoppages, loss of business information and so on. The engraving device is an application, which only works in conjunction with a portal unit and appropriate software. It is no self-contained machine or handheld device.
In view of the fact that, despite intensive endeavours, errors can never be completely avoided, we are thankful at all times for tips and suggestions for improvement.

1.1 Description of symbols

HINT: Special instructions relating to the effective use of the equipment

ATTENTION!: General and additional information or instructions and prohibitions for avoiding damage.

Instructions or restrictions designed for the protection of personnel and safety of the device

Not to be used by persons with pacemakers
This sign stands for activities involving a high risk for persons with pacemakers.

Warning of hazardous electrical voltage
This sign stands for activities involving system components carrying live voltage.

Warning of hot surface
This sign stands for activities where hot items need to be handled.

Laser Radiation Warning - Avoid irradiation of eyes and skin by beam- or scattered radiation.
This sign stands for activities where special protection measures are required.

2 Required version and contents of ConstruCAM -3D

- **Version ConstruCAM-3D Ver. 7.041.3**

In above mentioned version these buttons should be available (if this is not the case, please contact us!).

Hint: The current version of ConstruCam is found on our homepage *https://www.cnc-step.com* under service / downloads.
You will receive an activation code via email.

3 Opportunities for quality improvement in advance

Selected picture can be optimized in an image-processing program in advance.

The picture should be edited in a Photostyler (for example Corel PHOTO-PAINT) and saved as greyscale image (8Bit/Pixel – not in color, exception: JPG).
Pictures in .JPG – format can be saved as color pictures (24Bit). While importing, these are converted into greyscale images.

Advice: over-sharpen the black/white picture (greyscale image).
The final result of the laser processing is much softer than the original template. By over-sharpening the template (picture/image) fuzziness resulting from this processing technology (laser) is largely neutralized.

Note: The picture-quality significantly affects the quality of the final result. (laser engraving)

4 Generation of a laser- processing file with pictures

ConstruCAM-3D can import Bitmap-files (256 greyscales = 8Bit greyscales = 1 Byte/Pixel) into following formats:

BMP - Windows Bitmap
GIF - CompuServ Bitmap
JPG - JPEG Bitmap (auch24 Bit Farbformate)
PCX - Paintbrush Bitmap

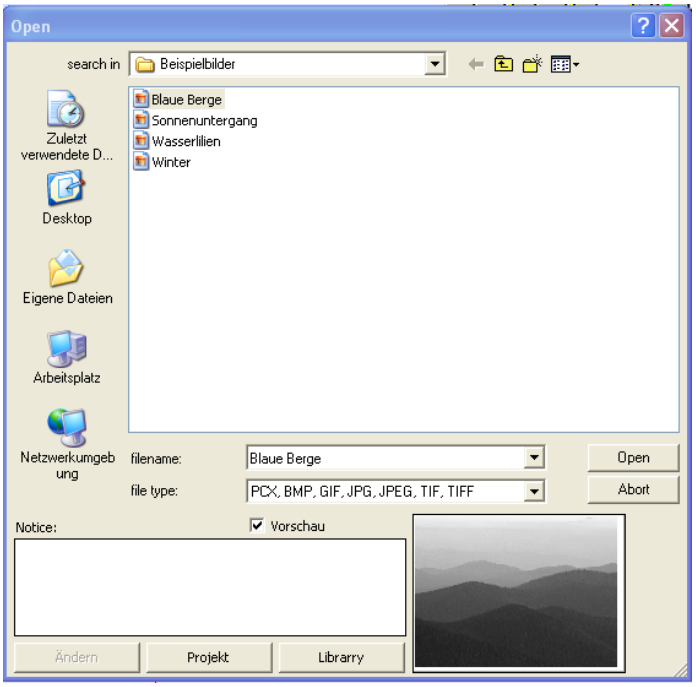
Importing a greyscale-image and adapt size (dimensions).

Open ConstruCAM-3D

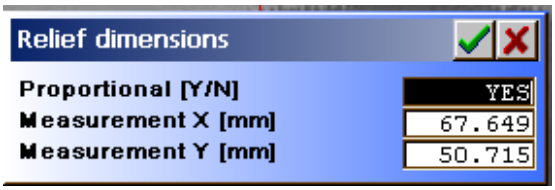
In ConstruCAM-3D

1. Press icon „KinetiC-Laser“ with mouse
(small yellow triangle on the right-hand side just below File>Extras)

2. Select desired file from opened window.



3. By pressing the button „open“ this file is imported into ConstruCAM-3D.
This process may take several minutes.
4. After successful import the relief-dimensions window will open.



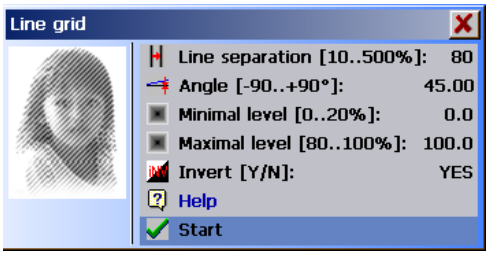
Determine the desired picture size.
The box is chosen via mouse, input is made via keypad.

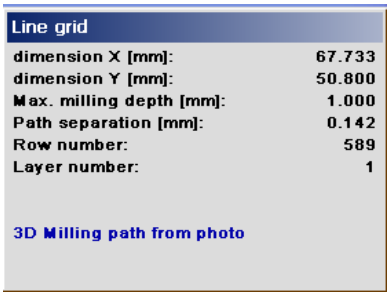
The query in the first line:
Proportional: YES = X and Y proportions are kept.
Proportional: NO = X and Y both values can be set separate from each other.

With the „green tick“ all setting values are confirmed.
After confirmation the file is adapted accordingly.

The „red X“ serves to stop the action.

5. Processing parameters in window line grid





The parameters of the laser-processing can be adjusted here.

Line spacing [10..500%]
With the line spacing, the path distances to each other are defined. A larger line spacing means a larger path distance and consequential a brighter/darker (regarding Invers [J/N]) picture.
Reference value for the laser about 80%.

Angle [-90..+90°]
Setting of Angle of the milling lines, „0“ results in horizontal lines. The „angle” is only used for in-line processes.
Reference value laser about 45°

Minimum level [0..20%] and maximum level [80..100%]
Limit of the lower and upper grey values. Herewith barely perceptible grey values can be avoided. The lower level can be limited from 0..20% and the upper level from 80..100% . 0% or 100% result in no limit.

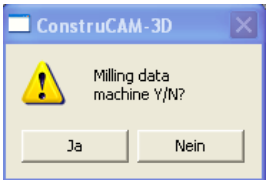
Inverse [Y/N]:
Yes: The brightness levels are inverted.
Bright areas are interpreted dark, dark areas bright.

After pressing „start“ the generation of the processing file is started.

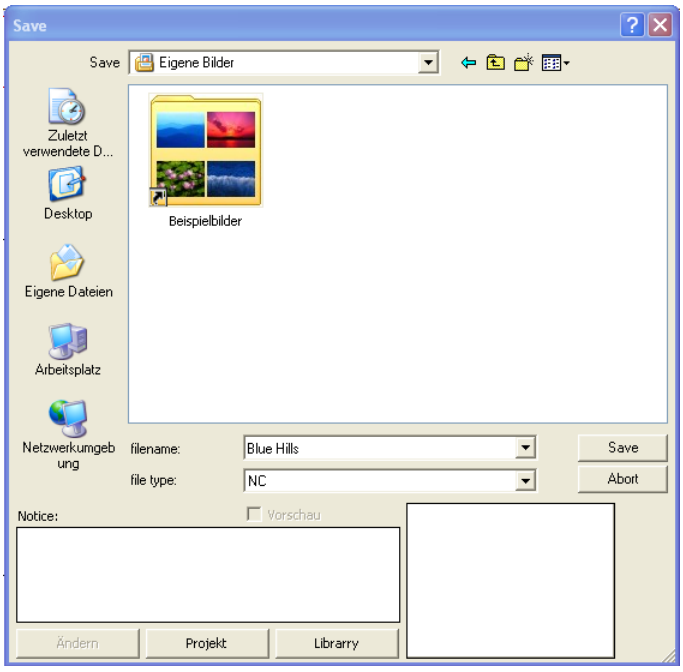
This may take a few minutes.

Please, no operations during waiting period**!**

6. After successfully generating the laser processing-file, please save the created milling files.



Confirm with „Yes“ (Ja).



7. Save with desired name and in desired folder.

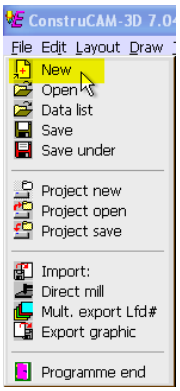
A picture-file is transformed into a laser processing-file.
After saving, the laser processing-file, it can be loaded and edited at any time in KinetiC-NC.

5 Generating a laser processing-file with graphic

Open ConstruCAM-3D

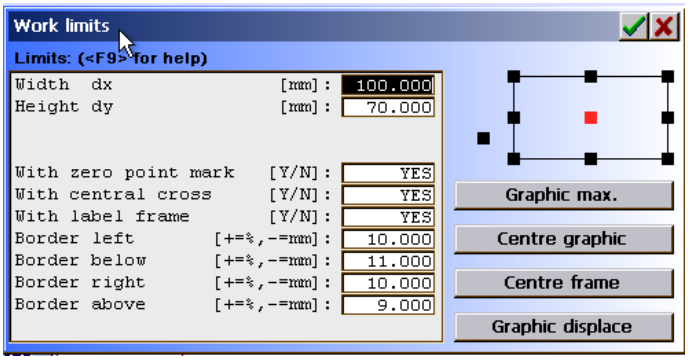
In ConstruCAM-3D

1. Press button „new“ to create an new file.



2. Select width, height and zero point position in following window.

Example: dx=100 dy=70, zero point position is selected in the center.

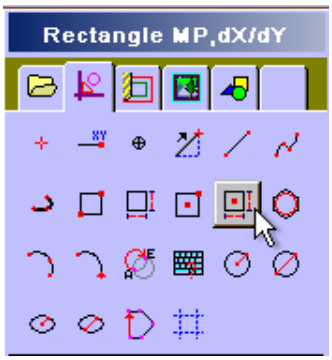


With the „green tick“ all adjustment-values are confirmed.

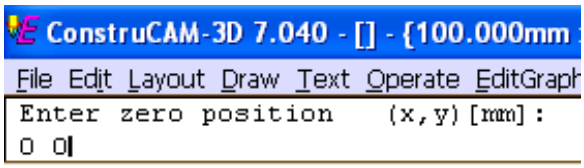
The „red X“ cancels the action.

3. Creation of a contour

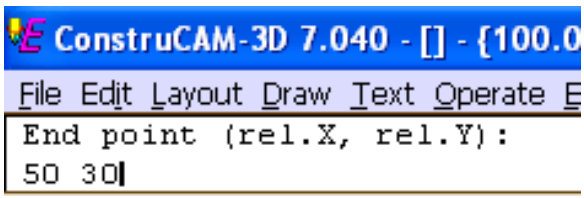
Example: rectangle (x=50, y=30) dimensioned via center (x=0, y=0).



Enter zero point with „0“tab-key„0“and press “enter”.

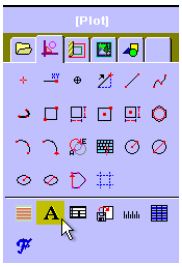


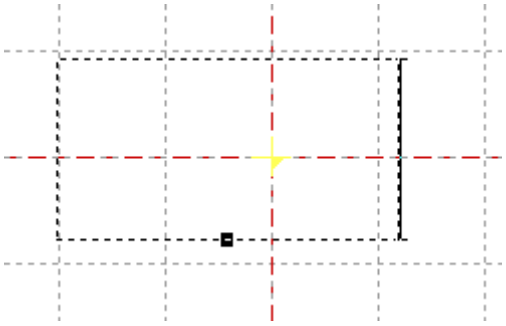
Enter „50“tab-key„30“and press “enter”.



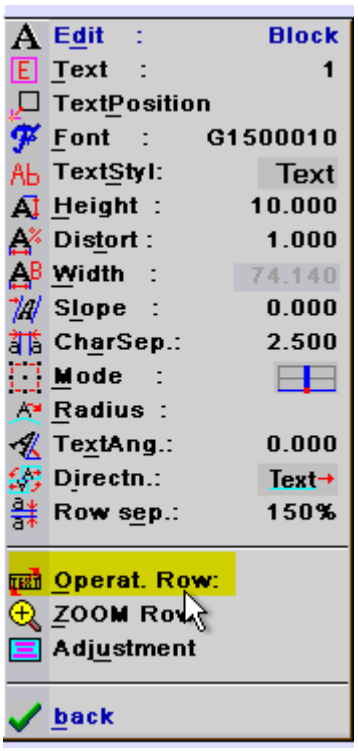
The rectangle lays centred on the drawing surface.

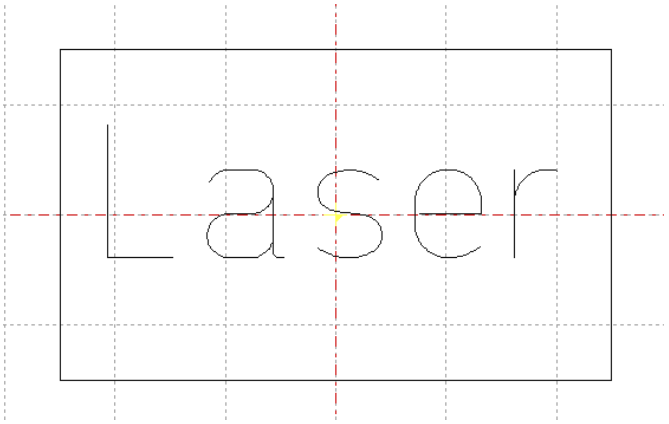
4. **A**ctivating „text box“ with button (see picture)



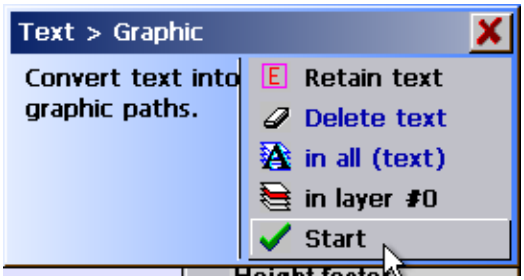


Insert text box into drawing surface and position.
Example: Drop lettering „Laser“ with following text formatting centered into the rectangle.

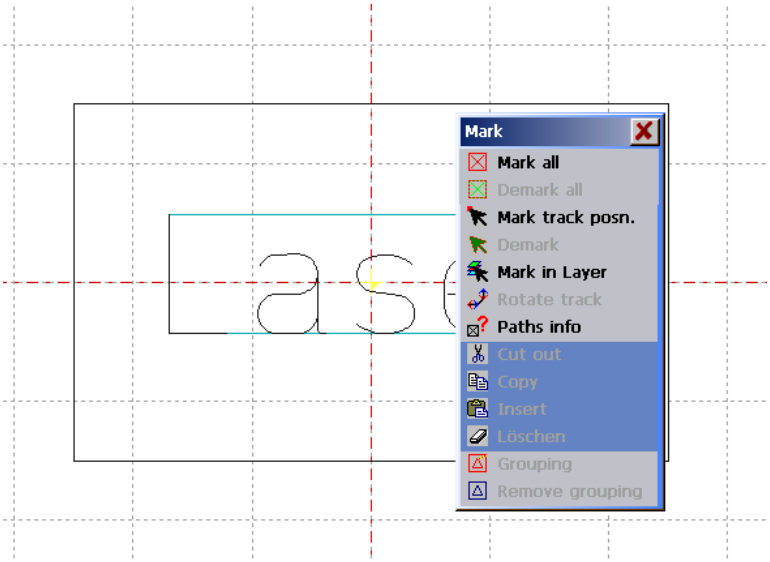




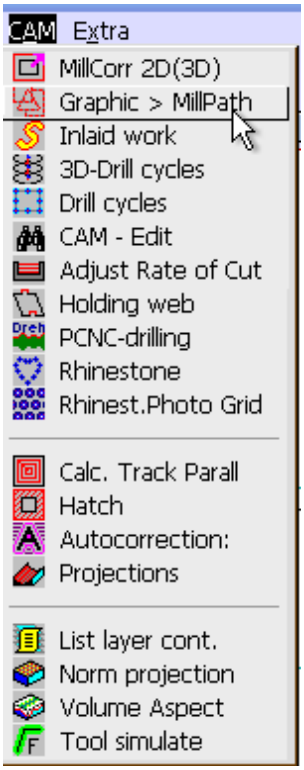
5. Transform lettering into a graphic under „Operat. Row:“. Press button „Start“ in following window to confirm transformation.



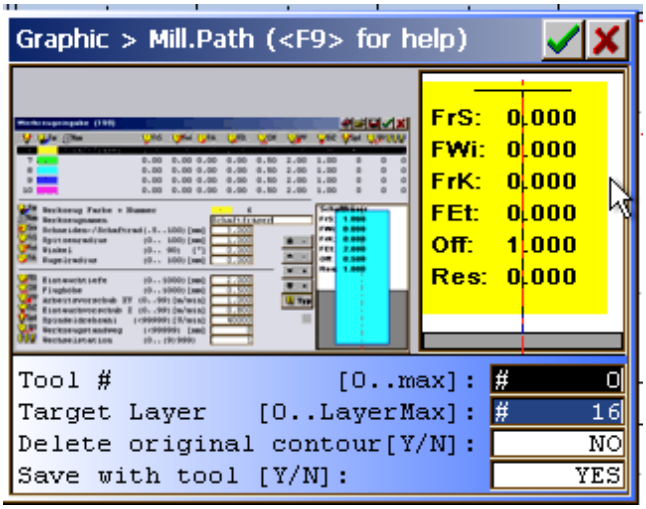
6. By clicking right (mouse) call up the menu and choose „select all“.



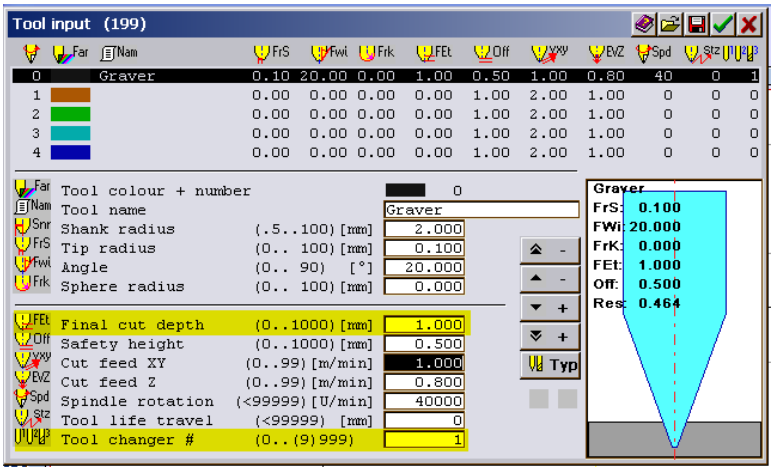
7. Select the line„Graphic > milling path“ in the file tab „CAM“



Click with the mouse onto the right-hand sided yellow box in following window.



Select an engraver in the tool-window under „Type“ (for example 0,1mm)



For processing by using the laser-engraving unit, only two settings are important!

1. Immersion depth

   The final cut depth is to set the max. power of the laser diode

   Value 0,10 for 10%, 0,20 for 20% up to 1,00for 100%!

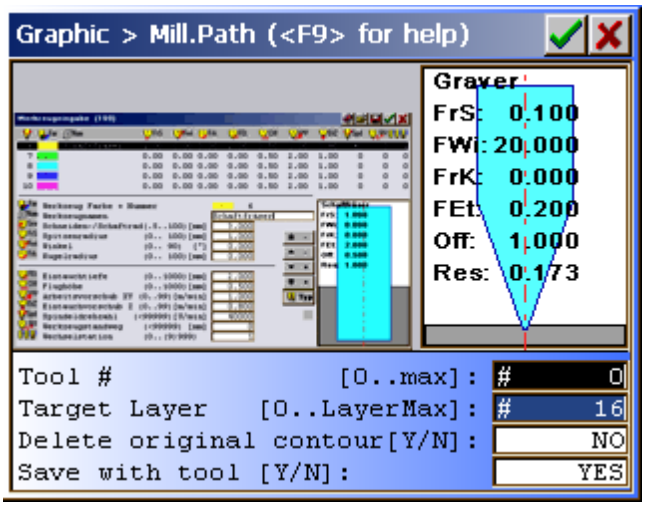
   This results in the G-code:

   100% Power = speed S=15.000

With the „green tick“ all setting values are confirmed.

The “red X” cancels the action.

Determine „destination layer“in the previous window.
For example destination layer „16“.



With the „green tick“ all adjustment values are confirmed.
The “red X” cancels the action.

8. Press icon „KinetiC-Vektor“.
(Right-hand side next to the laser Symbol under File>Extras on the right-hand side)

- **Attention this symbol is assigned twice in ConstruCam 3D! For processing by laser only the downright button is applicable (Extras>KinetiC-Vektor) !!!**

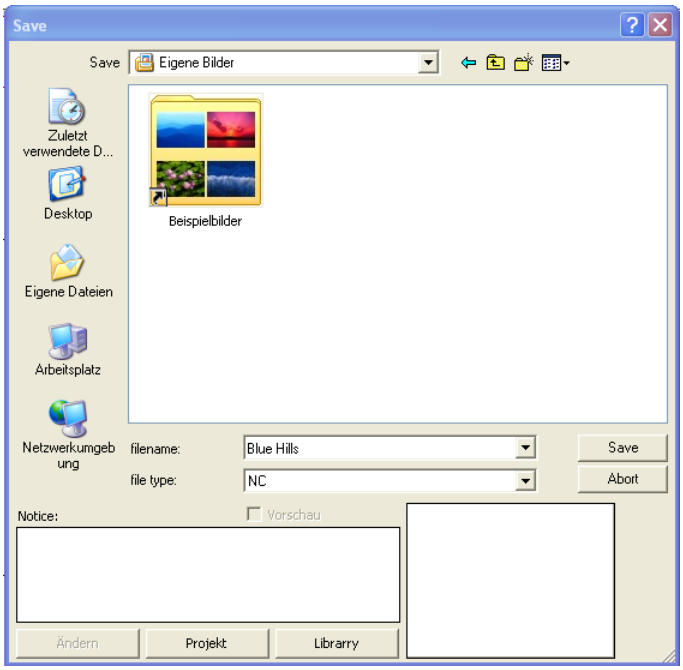
Select files/layers for export in following window.

! Colored layers are preset!!

! Please whiten the layers, which shouldn't be transferred, by using the mouse!

Export the laser-processing file via button „Export".

9. Insert desired name and folder in window „Save".
Then press „Save" .



Your graphic-file has been transformed into a laser-processing file.

After saving, the laser- processing file can be loaded and used in KinetiC-NC at any time.

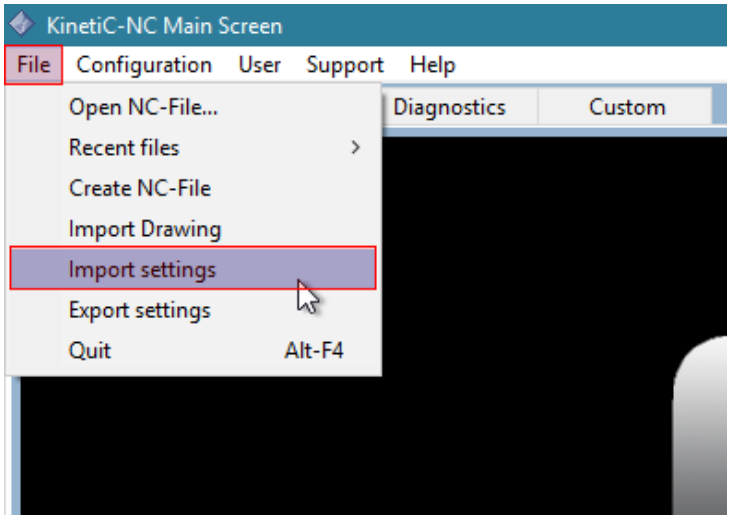
6 Set-Up KinetiC-NC Software

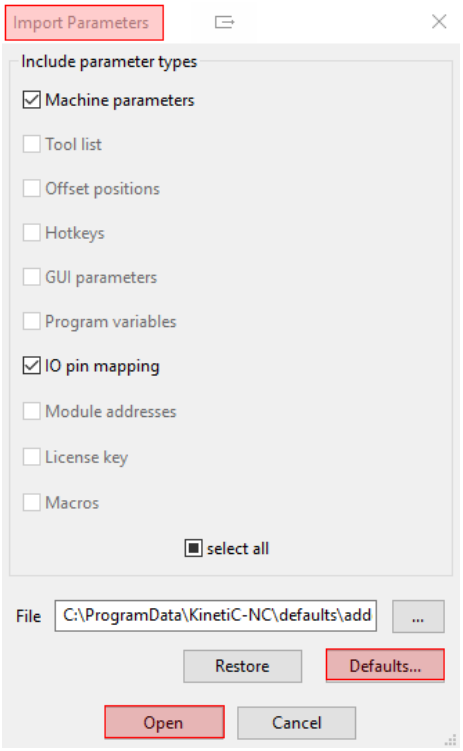
After the laser unit has been mounted on the machine and connected to the Zero-3 controller, the software still must be configured.

For this, the existing parameter file for this laser unit must be loaded.

6.1 Load default setup for the laser unit

The default parameters for the laser unit can be loaded as follows.



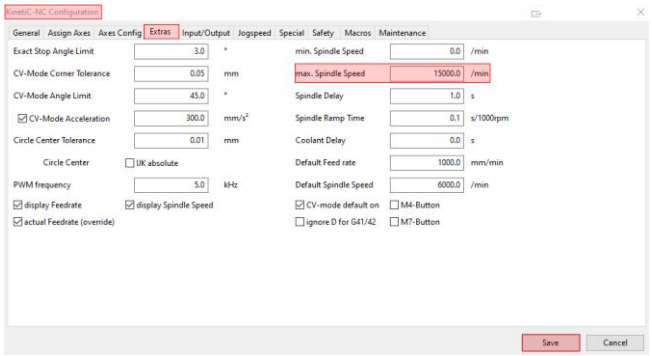


Under "File" you can import the default settings.
Under Defaults / Addons you find the file „***Laser-Engraving-Unit.ini***“.

The parameters are activated by pressing the
Button "Open".

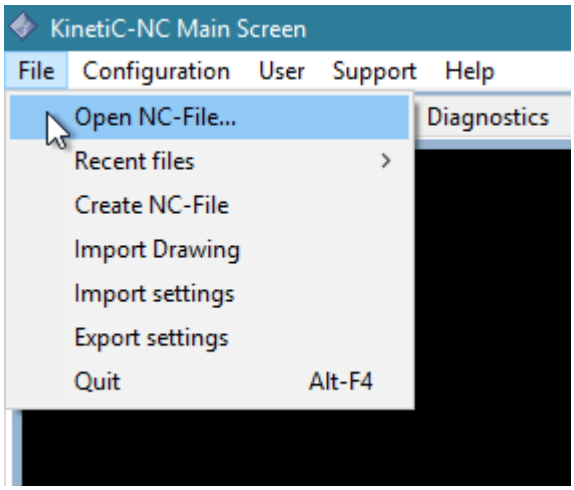
6.2 spindle speed (= max. power of the laser)

Please check the max. Spindle speed in KinetiC-NC.
The laser works in a speed range between 0 and 15,000 (0-100% power).
To do this, set the max. Spindle speed to 15,000!



6.3 File open in KinetiC-NC

1. **Open NC-File**



At the top of the title bar you will find the menu bar.

Select "File -> Open NC File ..." to open the file dialog. Select the desired file. If you have opened a file before, you can open it again from the list of recently used files.

The laser processing file is now loaded and ready to be used in KinetiC-NC.

Do not carry out further actions during waiting period!

See user manual KinetiC-NC under section „Open file”

7 Focusing

The laser has a fixed focal length of 30mm and therefore does not have to be focused, but only moved 30mm over the material.

7.1 Machine reference run

Carry out reference run

7.2 Set workpiece zero points

Lower the Z-axis so far that between the surface of the workpiece and the lens of the laser

there is a distance of approx. 30 mm.

Move the laser head over the material in X and Y to the starting position.

Tip:

In order to better approach the workpiece zero point, the laser can be switched on manually with low power.

7.3 Switch on the laser manually

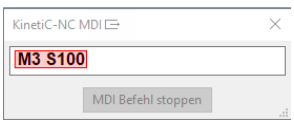
- **Laser radiation warning – Avoid irradiation of eyes and skin by direct and scattered radiation. Wear a protection glasses to protect your eyes from the scattered radiation caused by laser beams.**

- **Attention: laser-protection glasses do not protect your eyes from the direct effect of laser beams!**

HINT: Please pay attention to safety regulations mentioned in the user manual!

1. Please wear a laser protection glasses.
2. Remove any Persons and animals not wearing laser protection glasses.
3. Close the hood or other safety device (maybe a door) to activate the Interlock (Loop must be closed)
4. Make sure the INTERLOCK LED on the Laser is activated

The laser should be switched on in the MDI window using the “M3 S100” command (the S command stands for the power (0-15,000)



Confirm the entry of the command via "Return"!

The MDI window can then be closed using the X.

The laser can be switched off again using the spindle button. 

Caution: Do not switch on the laser using the spindle button before executing the MDI command!

Then the last used speed / power is used. This could be too high and the workpiece could be damaged.