

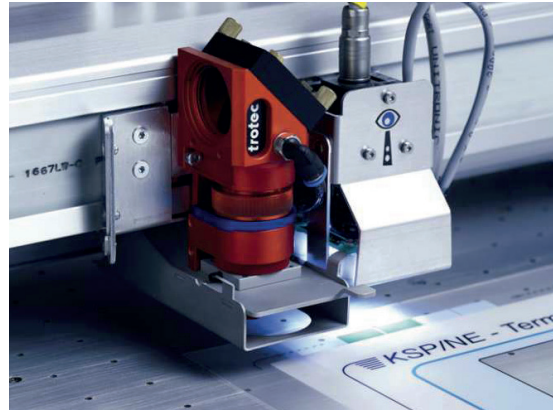
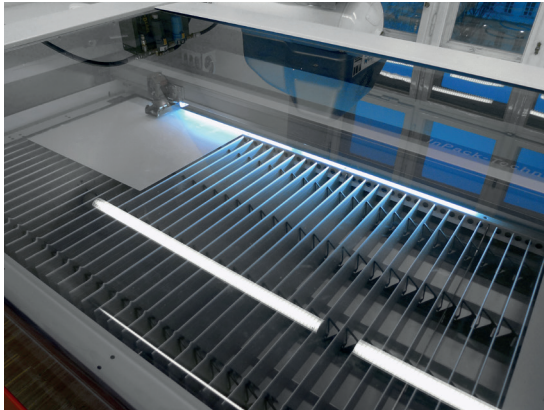
# Laser User Manual

Part 1 |

Basics and Preparation

Laser Cutter Trotec Speedy 300

# 1. Basics



In 1960, Theodore Maiman built the first apparatus that used the principle of „Light Amplification by Stimulated Emission of Radiation.“ This principle allows for the generation of light with power densities billions of times higher than the maximum power or energy densities conventionally achievable.

With the laser, various materials with low thicknesses can be cut, or drawings can be etched or engraved into the surface.

## Materials

Maximum thickness, see material list:

Plastics, e.g.:

- Acrylic glass GS
- Polystyrene
- Polyester sheets (Vivak)

Wood and wood-based materials, e.g.:

- Poplar plywood
- Aircraft plywood
- Linden wood

Cardboard, e.g.:

- Greyboard
- Finnboard
- Bristol board

The following materials CANNOT be used:

PVC films (release toxic chlorine gas)  
MDF (clogs the laser), stone, metal

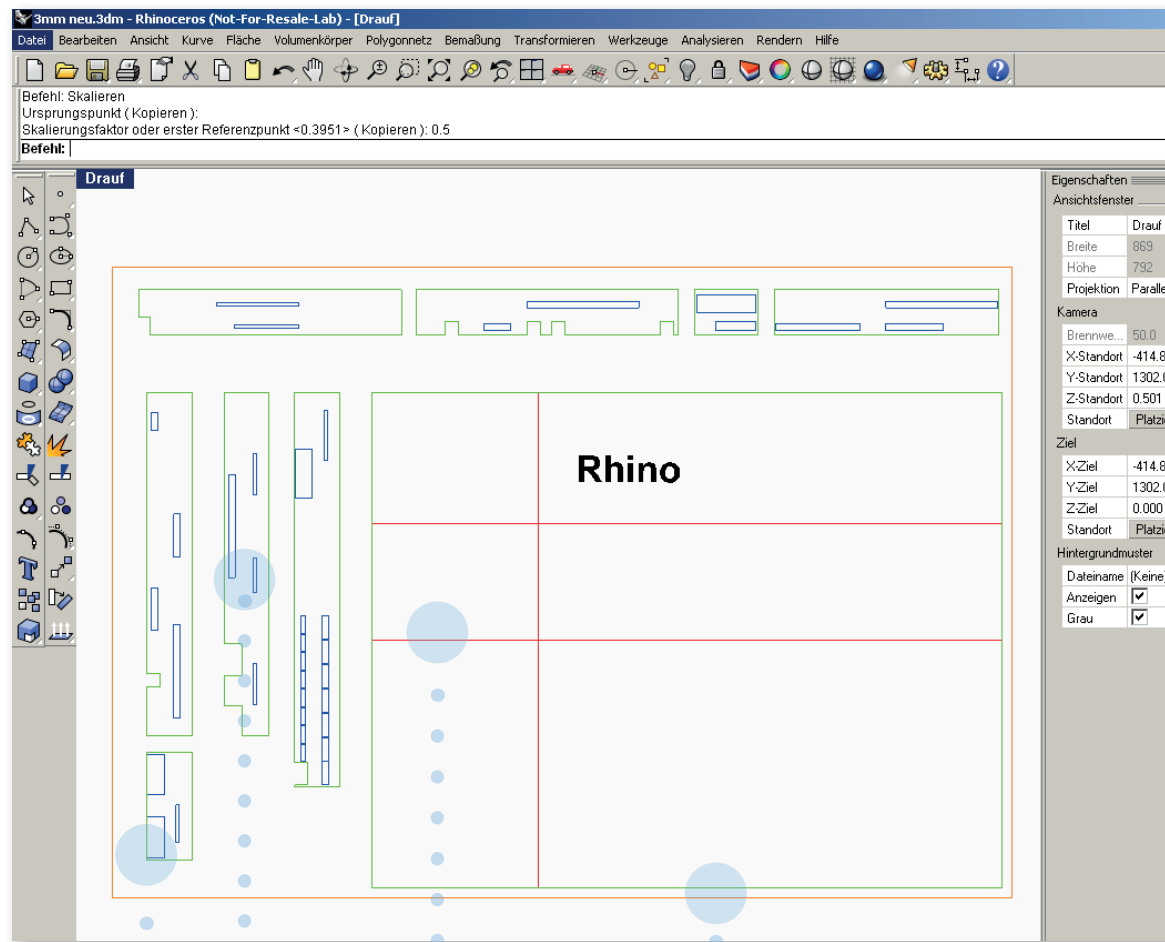
## Work Area of the Laser Table

710 x 430 mm  
(= maximum working area)

## File Format

- CAD drawings (Rhino/AutoCAD/...)

## 2. Drawing preparation



- 1. Etching (Red)
- 2. Cutting Inside (Blue)
- 3. Cutting Outside (Green)
- Frame (Color of Your Choice)

### Prepare the drawing (e.g., RHINO)

- Draw the design in mm (to the correct scale)
- Draw a frame (the size of the material used) and place the parts to be cut within the frame.
- No duplicate lines (clean drawing)
- Connect lines (max. 3000 lines)
- Clean up the drawing (only include parts to be lasered)
- Save the drawing in formats that can be opened by Rhino (dwg, dxf, etc.)
- Do not use line width (only hairline)
- Display lines in the layer color (print color)

**Work Area of the Laser Table:**  
**W=710mm H=430mm**

### Layers and Colors

The laser receives its information through the print job, so specific colors must be used. Each color is assigned a specific cutting power (according to the material cutting list) for either etching or cutting, and the tasks are processed in the following order.

### Order (Etching and Cutting)

	R	G	B
1. Red	255	0	0
2. Blue	0	0	255
3. Cyan	0	255	255
4. Green	0	255	0
5. Magenta	255	0	255
6. Yellow	255	255	0

# Laser User Manual

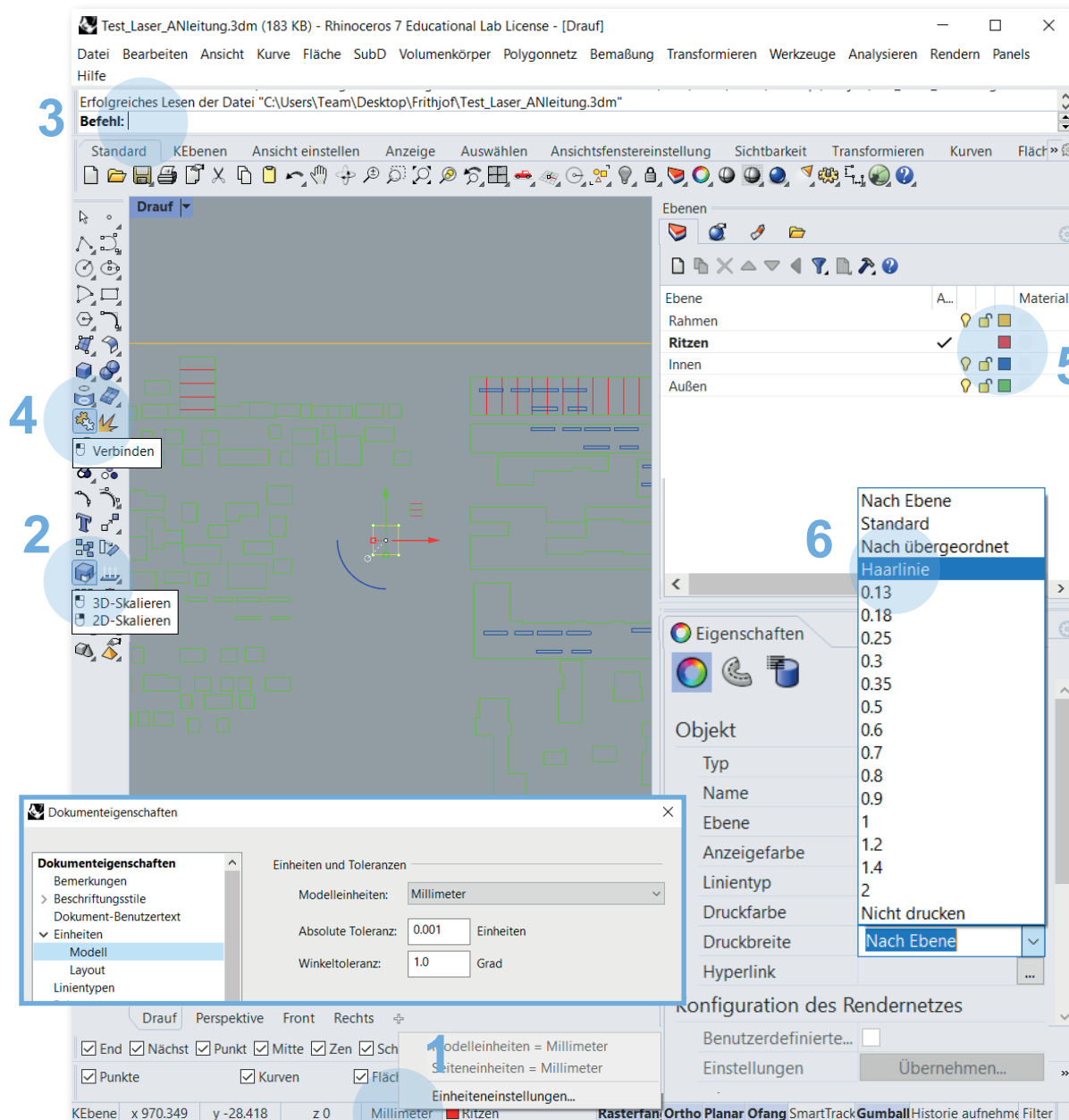
Part 2 |

Operation of the Laser Cutter

Trotec Speedy 300



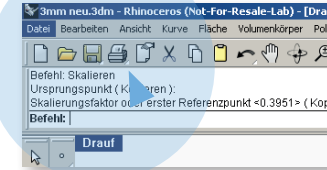
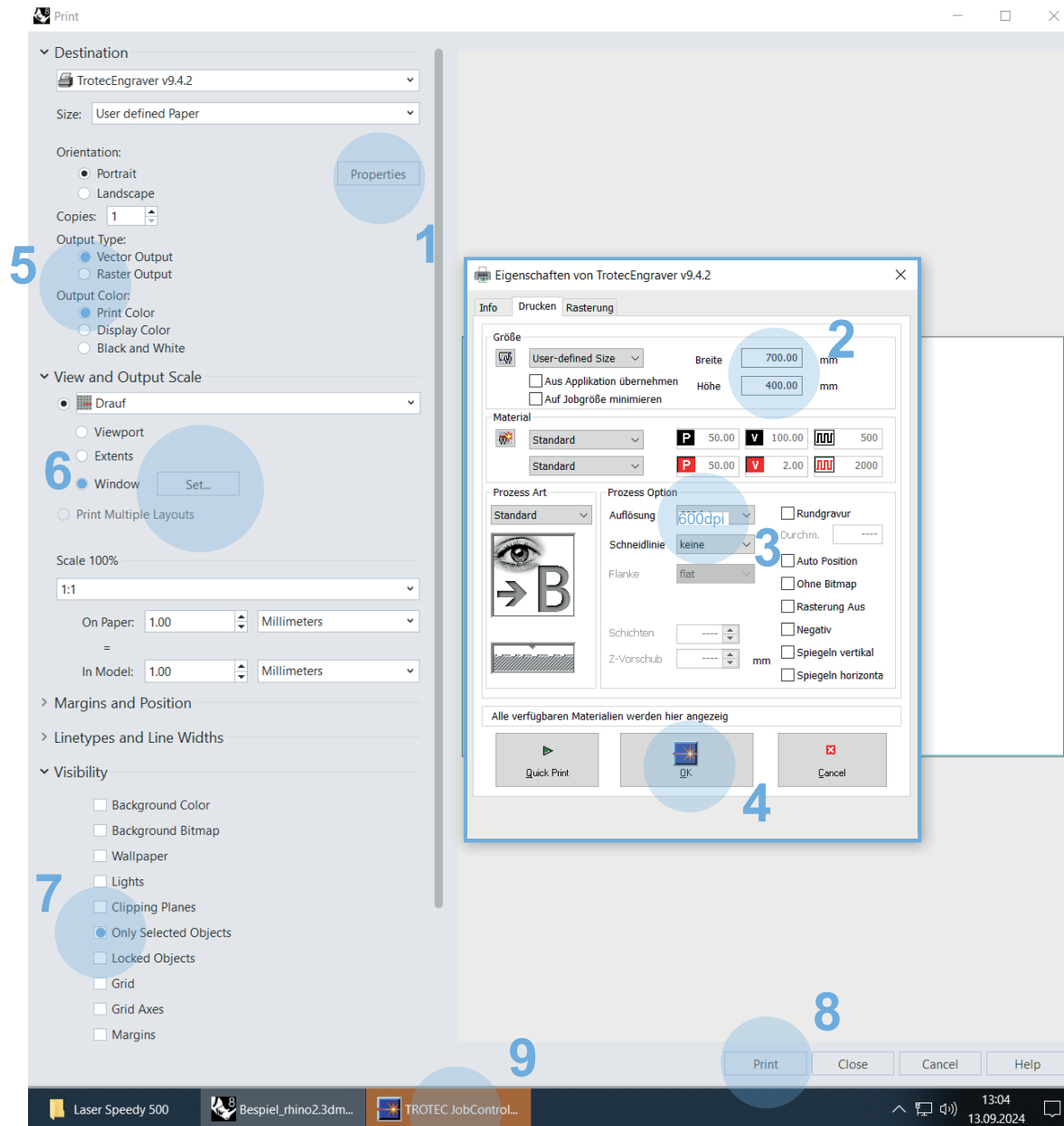
# 1. Check units and scale



The drawing must be properly structured and configured

1. Set to Millimeters: Right-click on Millimeters > Unit Settings... > switch to Millimeters  
If a scaling prompt window appears, confirm with No
2. To Scale: Scale > then follow the instructions in the command line
3. Delete All Duplicate Lines: In the command line:  
German: "DuplikatAuswählen"  
English: "seldup"
4. Join Lines Together: Select all and then choose: Join
5. Double-click on the Colors > switch to RGB values
6. Laser Without Line Width (always preset). If there is a line width, select the object > Properties (Line Width) > Hairline

## 2. Printer settings

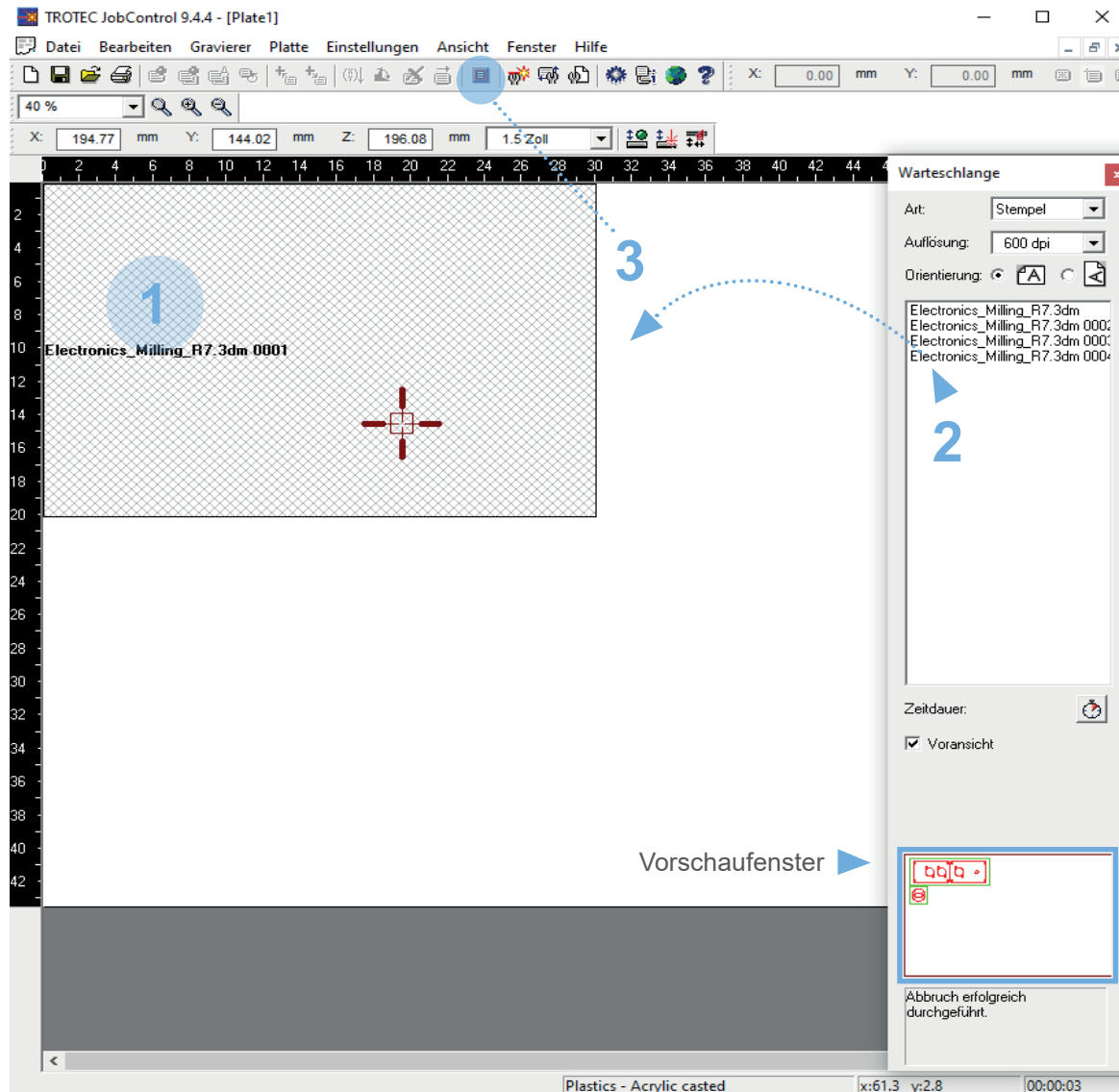


Once the drawing is fully prepared, the printer settings can be accessed.

### Printer settings - Follow the order:

1. Access Properties
2. Enter the width and height of the material to be cut, e.g., 700 x 400 mm  
(710 x 430 mm = maximum working area)
3. Set resolution to 600 dpi (standard)
4. Click OK
5. Select vector output and print color
6. Activate the Window and press "SET...". Then, first click on "Move" in the Rhino command line and then drag the print area over the drawing (if you don't click "Move" first, you will change the previously set dimensions of the working area)  
When scaling, use "Scale 100%" to ensure it is printed at a 1:1 scale (as long as the drawing is in mm and correctly scaled)
7. Select visibility and uncheck "Only Selected Objects."
8. PRINT
9. After clicking Print, switch to the TROTEC Jobcontrol window

# 3. TROTEC job control



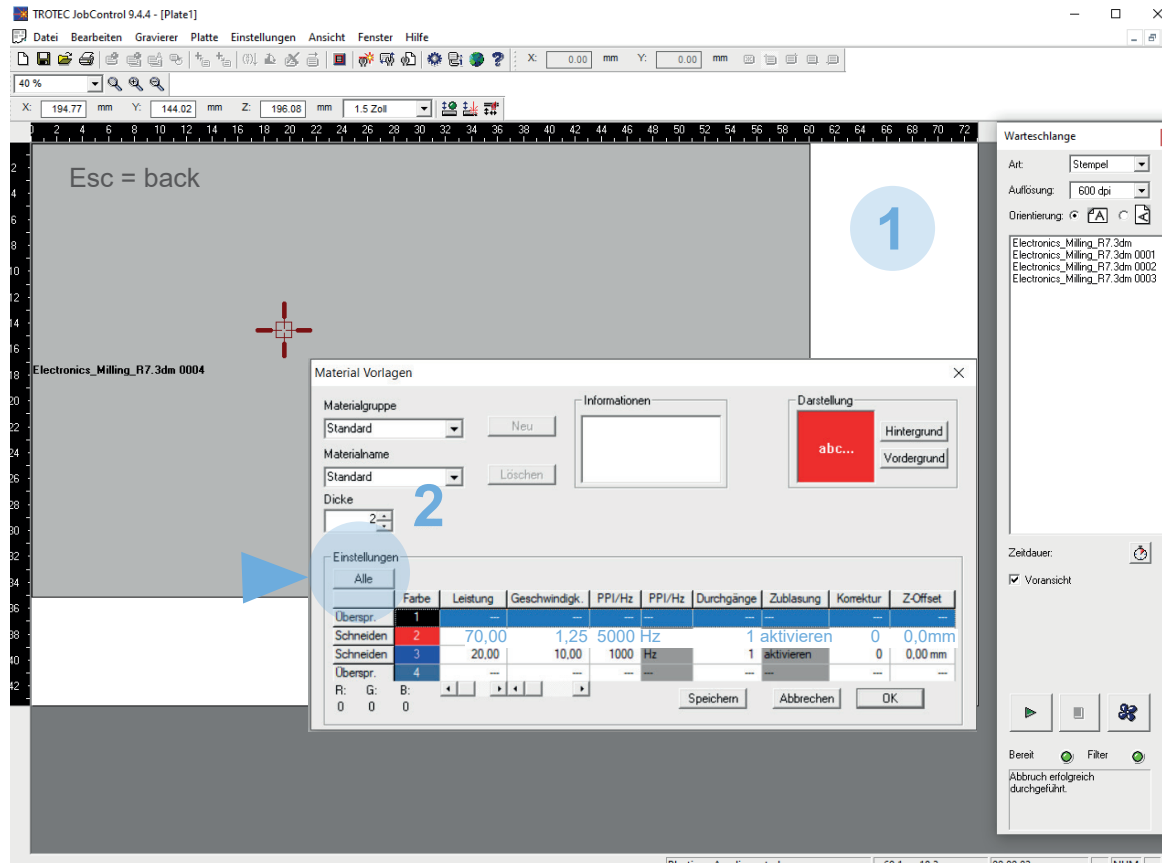
## Program to start the job

The print job is sent to the program for the laser (TROTEC Engraver).

1. Click once on the old job (this changes the color), right-click, and select "Delete Job" to remove the old job.
2. Double-click on the desired laser file (you can identify the correct file in the small preview window). Double-clicking will automatically position the job in the upper left corner, provided the print area size was correctly set in Rhino.
3. Display the view for the positioned job.
4. If a job needs to be repeated with potentially different parameters, first change the parameters. Right-click in the gray window to open a list of various commands -> Job Reset -> Play.

The white area corresponds to the working area of the laser.

## 4. Set laser parameters



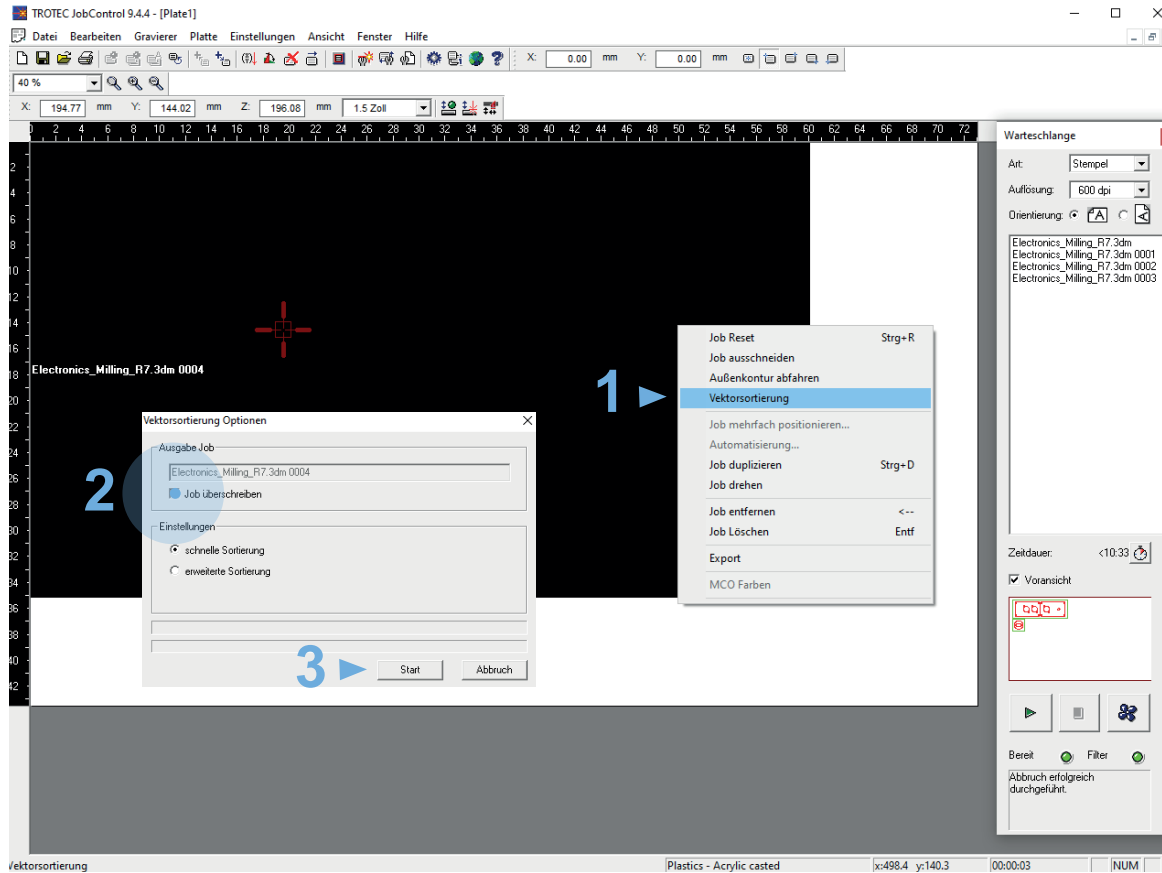
1. Double-clicking in the white area opens the window for the laser parameters.  
In this table, the respective values must be entered based on the material and material thickness (see material list).
2. When accessing the menu for “All,” all 16 colors that can be set will be displayed. The laser processes the colors in the order from 1 to 16.

The values for cutting and etching must be taken from the list provided at the computers. Only the materials listed may be lasered.

**Important:** In the “Assist Gas” column, “Gas1” must be entered. The strength of the assist gas can be adjusted at the control panel (see chapter: “7. Positioning the material and adjusting the table height”).



# 5. Vector sorting

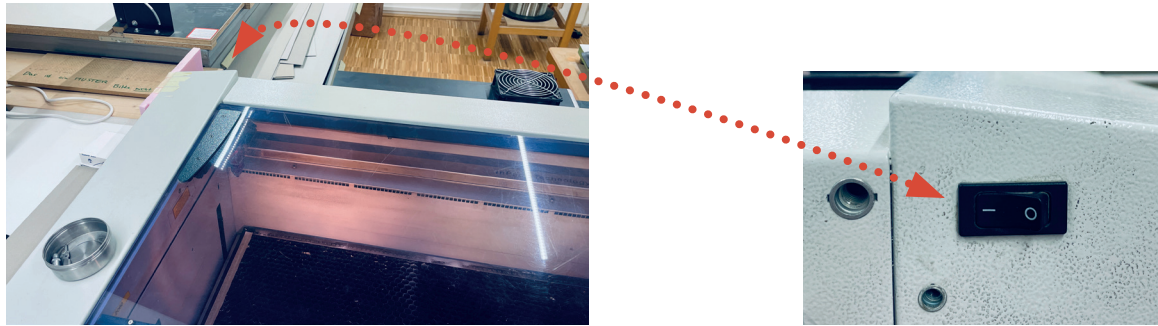


For complex drawings (many lines and individual parts), vector sorting should be performed, meaning the lines will be processed in order rather than randomly.

1. Right-click in the job window  
Vector Sorting > click
2. Click on „Overwrite Job“
3. Press start

Once the vector sorting is complete, click Close.

## 6. Turn on the Laser



**CLOSE THE LID +  
TURN ON POWER**

↳ Then the Laser will perform its reference run

Reference run (=Homing)      The laser is moving to its reference points. Once the laser is connected, the software takes a snapshot of the laser head's location

Order:      Z > The table goes down  
Y > The head moves backwards  
X > The head moves to the left

## Payment

The following data needs to be filled out in the excel table on the desktop:

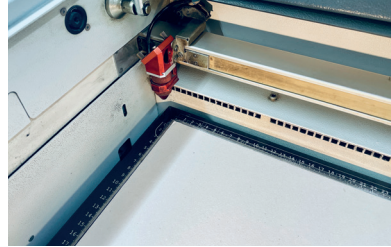
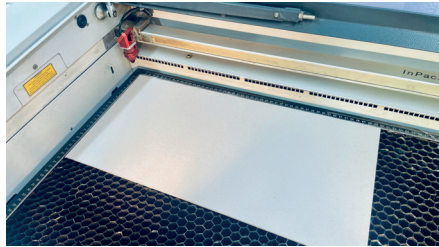
- date
- name
- matriculation number
- telephone number
- time begin
- time end
- total minutes
- to pay

costs for using the machine: until 15 min = 2€ /  
until 30 min =4€ / until 45min = 6€ / until 60min = 8€

The amount needs to be paid afterwards in cash in the workshop office.

Datum	Name	Mat. Nr.	Tel. Nr.	Zeit von	Zeit bis	Gesamt Min.	zu zahlen	gezahlt
03.06.2014	Max Mustermann	58801	015880126429	09:34	11:34	120 min.	16,00 €	
03.06.2014	Sarah Musterfrau	58802	015880126428	11:39	12:35	56 min.	8,00 €	

# 7. Positioning the material and adjusting the table height



1. The material should preferably be placed in the upper left corner of the table.

## Control Panel

To ensure the focal point of the laser beam is correct, the distance from the lens to the material must be adjusted (using a focusing foot). If the material thickness changes, this distance must be re-adjusted.



2. If the material is warped, the sides must be secured to the table with masking tape.

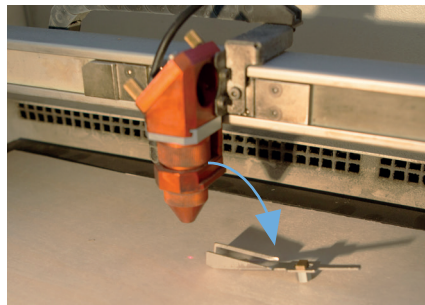
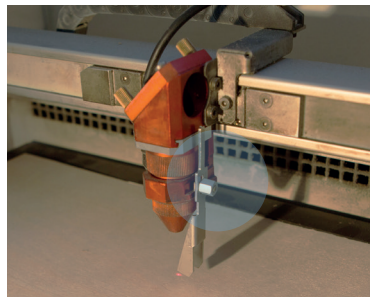
3. Using the control panel, position the laser head over the material (move it slightly forward into the center)



- 3** forwards  
left - right  
back

- 1** standby

- 2** table height:  
up  
down

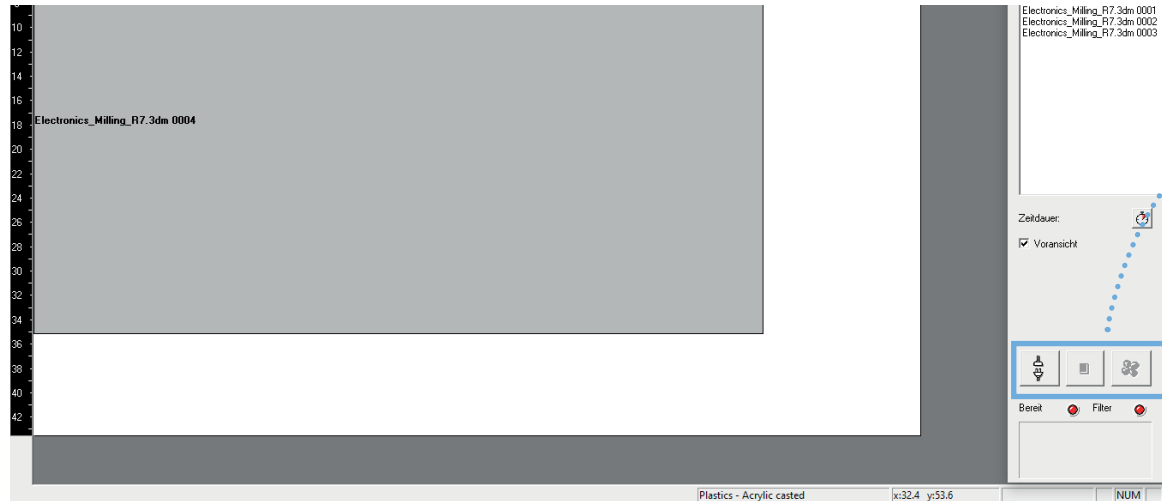


4. The „focusing foot“ must be hung on the projection of the carriage as shown in the image. Then, the table should be carefully moved upward in small increments until the focusing foot drops.

## WARNING!

Raising the table too high will cause the machine to alarm and require a restart. Turn the machine off and on again and wait for it to finish the homing.

# 8. To turn on a laser



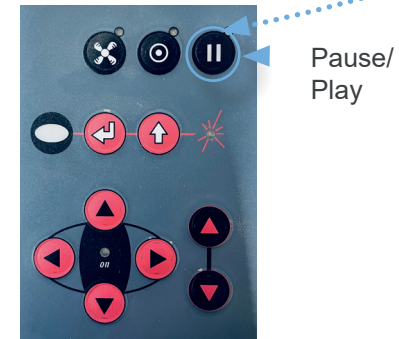
After adjusting all settings, the laser can be turned on.



Control Panel

**WARNING:** Suction turns on automatically. Dust extraction: turns on automatically.

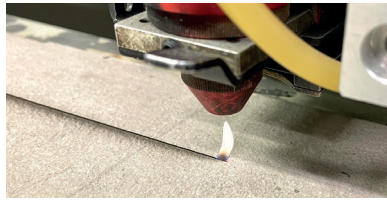
**DO NOT ADJUST ANYTHING!!**



If you need to remove any parts, you can pause the process. Press the pause button, wait for the laser to stop, open the lid, remove the fallen parts, close the lid, and restart the laser with the pause button again.

The laser must be supervised at all times. Pause the process before leaving the room.

# 9. Behavior in case of smoke, fire, and accidents



## A candle flame

1. Pause the laser
2. Open the lid
3. Blow out the flame

## Smoke incident

1. Pause the laser
2. Do not open the lid
3. Wait for the smoke to clear
4. Check the settings and adjust if necessary
5. Call the workshop



## Fire (The material is on fire)

1. Emergency stop the laser operation
2. Manually push the entire axis with the laser head backwards
3. Drop the material onto the floor
4. Throw the fire blanket over the material
5. Call the workshop



## Severe fire (Machine is on fire)

1. Emergency stop the process immediately
2. Activate the fire alarm and call the fire department at 122
3. Use the fire extinguisher to put out the fire
4. Exit the workshop
5. Call the workshop



## First Aid

1. A first-aid kit and bandages can be found next to the front door
2. For serious injuries, call the emergency services at 144 and also dial the internal emergency number at the university