

# Lasercutting

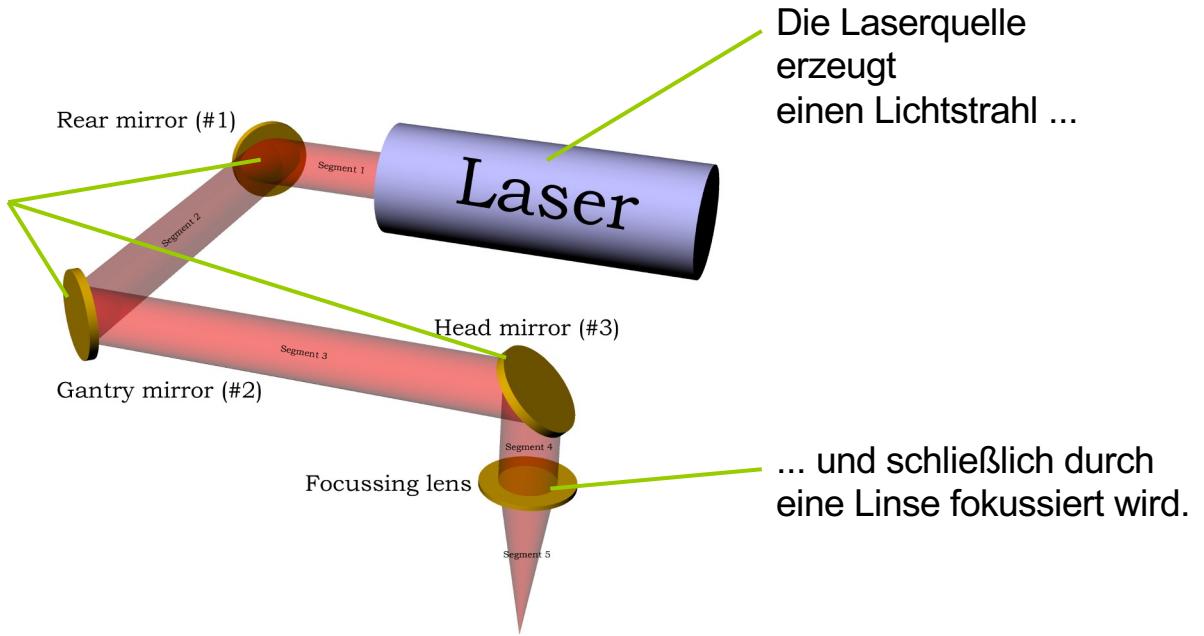


**Trotec R400**

CO2 Laser  
Laserklasse 2

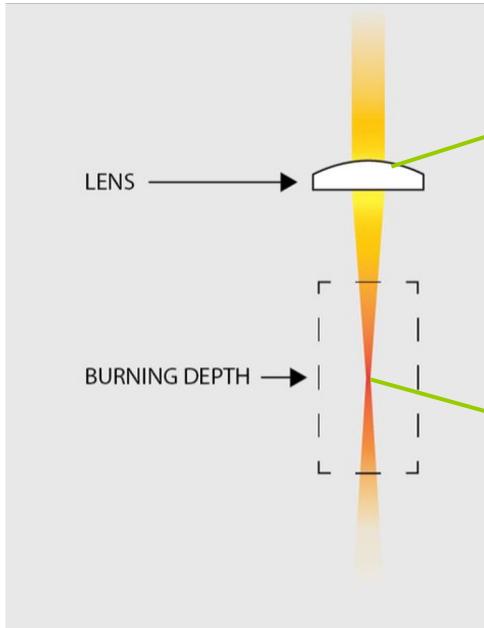
# How does it work?

..., der durch Spiegel auf den Schneidkopf geleitet ...



Die Laserquelle erzeugt einen Lichtstrahl ...

... und schließlich durch eine Linse fokussiert wird.



Fokus-Linse ...

... fokussiert den Laser nach unten ...

... zu einem dünnen und konzentrierten Strahl

schneiden



gravieren

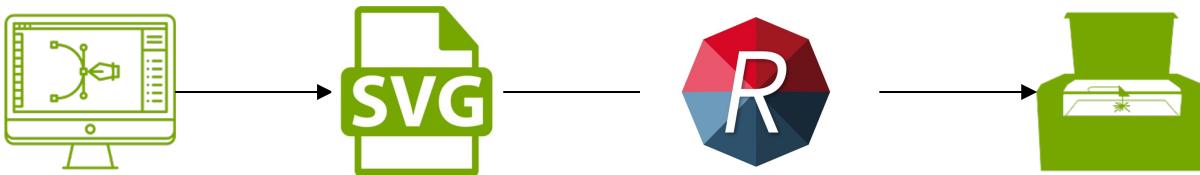


gravieren & markieren



markieren





Erstellen einer  
Vektordatei

Exportformat  
.svg  
+ .ai .pdf .dxf

Einrichten mit  
CNC-Software

Schnitt- und  
Gravur-Prozess

Luftunterstützung und Vacuair müssen immer eingeschaltet sein.

Bleibe während des Schnitt- und Gravurvorgangs bei der Maschine und überprüfe regelmäßig, ob alles in Ordnung ist.

STOPP bei konstanter Flammenbildung



Im Falle eines Vorfalls wende dich bitte an einen Werkstattleiter.



NI

Lasse den gesamten Rauch aus dem Schneideraum absaugen bevor du den Deckel öffnest.

Power: **0,1–100 %**



Geschwindigkeit: **0,1–100 %**



Frequenz **0-5000hz**

Laser folgt Vektoren mit **hoher Leistung** und  
mittlerer Geschwindigkeit

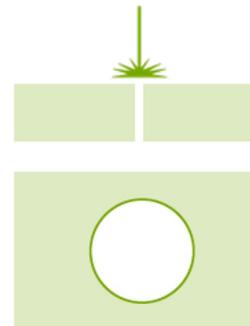
→ Durchtrennen des Materials



High Power



Medium Speed



Laser folgt Vektoren mit mittlerer Leistung  
und hoher Geschwindigkeit

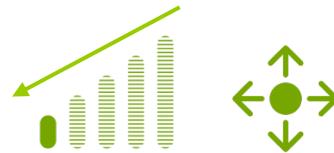
→ Anschnitt der Oberfläche



Medium Power      High Speed



Geschwindigkeit verringern und/oder  
die Leistung erhöhen.



Anzahl der Laserpulse pro Sekunde von 1 bis 5 000 Hz

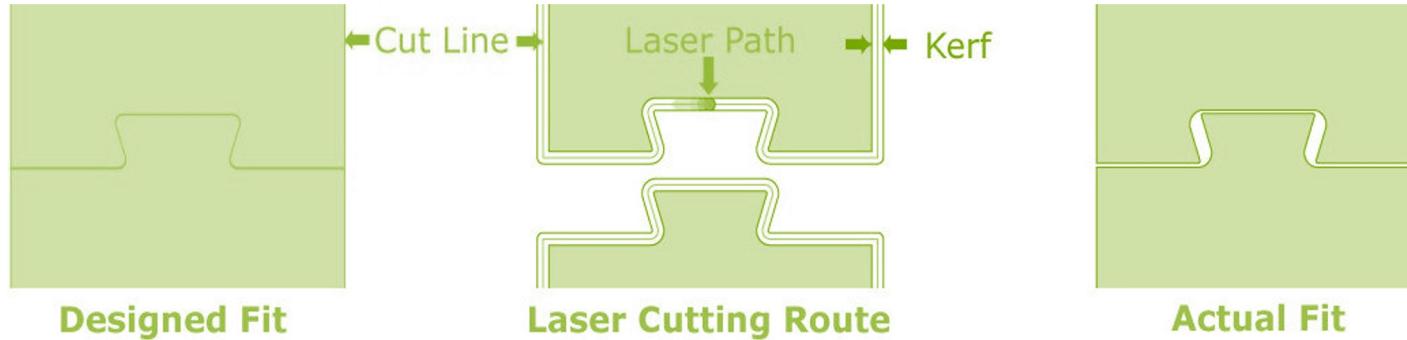
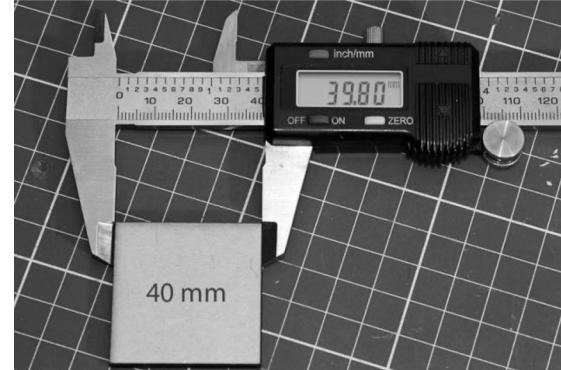


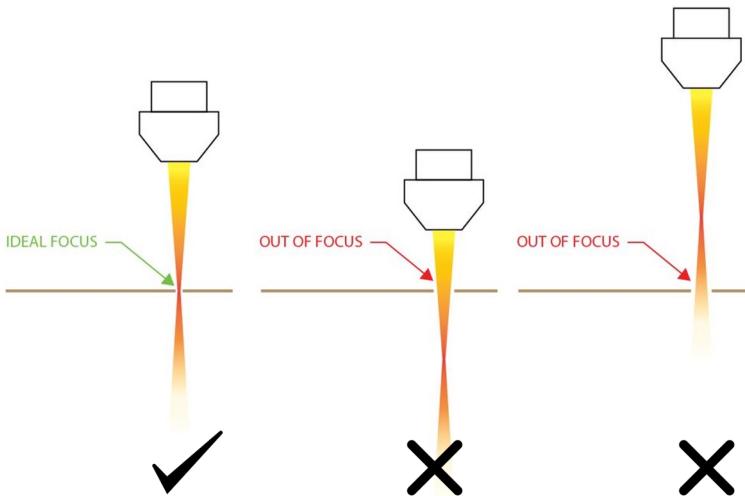
Verbrennende Materialien (Holz, Papier):  
**Niedrige Frequenz, 500 Hz**



Schmelzende Materialien (Kunststoffe):  
**Hohe Frequenz, 5000 Hz**

Abhängig von Materialeigenschaften  
ca. 0,10–0,30 mm





### Idealer Fokus

dünner Laserstrahlauschnitt  
auf der Oberfläche des Materials

### Defokussiert

Schneidet nicht durchs Material  
dicke Schnittlinien



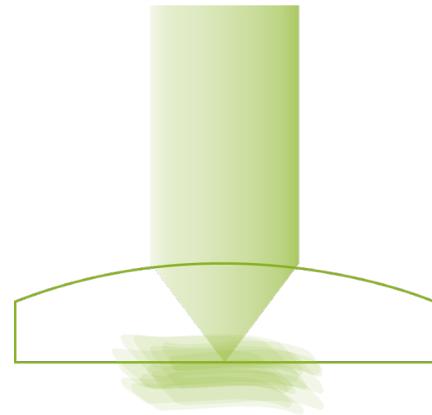
Guter Fokus



Schlechter Fokus

Beim Laserschneiden entstehen Rauch und Staub und die Linse wird **verschmutzt**.

Bei zu starker Verschmutzung fokussiert der Laserstrahl auf die Linse und verbrennt sie.



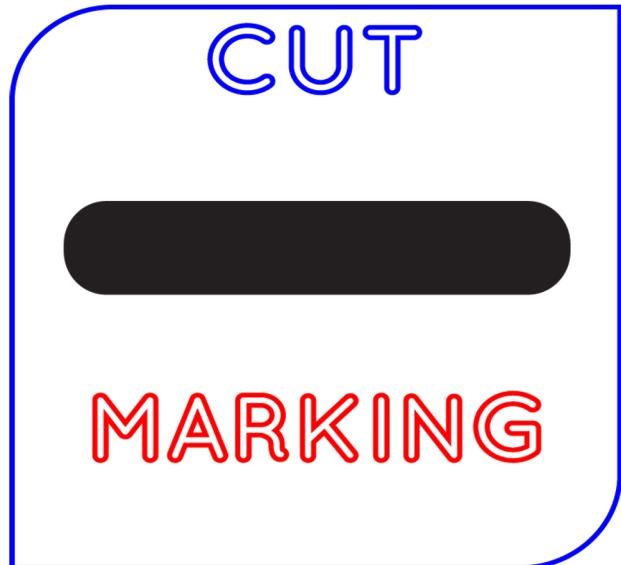
- Sieht schlecht fokussiert aus
- Flammen und Rauch
- Schneidet nicht durch
- Dicke und verschmutzte Schnittlinien

**Sofort anhalten**

Frage die Werkstattleitung nach  
einer Linsenreinigung.



Beginne immer mit einem Test in der Ecke deines Materials,  
um die richtigen Einstellungen zu finden.



**Zu dunkel oder verbrannt:**

Leistung verringern  
Geschwindigkeit erhöhen

**Schneidet Material nicht vollständig durch:**

Leistung erhöhen  
Geschwindigkeit verringern

Erzeugen toxische Gase



Beschädigen die Maschine



Entflammungsgefahr



# Verbotene Materialien

brennbare Stoffe,  
z.B. Schaumstoffe fangen leicht Feuer  
und sind i.d.R. verboten.

Metalle

Reflektierende Oberflächen

Materialien, deren Bestandsstoffe nicht zu ermitteln  
sind

Vinyl  
Polyvinyl Chloride (PVC)  
Polyvinyl Butyral (PVB)  
Polytetrafluorethylene PTFE (Teflon)  
Neoprene (CR)  
Kevlar, Nomex (PPTA, PMPI)  
Polystyrene/ Polystyrol (PS)  
Polycarbonate (PC)  
Polycarbonate (PC)  
Polyurethane (PUR)  
Polyethylene (PE)  
FPM / FKM (Viton®, Tecnoflon®, Fluorel®, Daiel®)  
Bakelite  
Synthetic leather  
Acrylonitrile butadiene styrene (ABS) Styrene

Caoutchouc  
Latex

Beryllium oxide  
Glass Fiber  
Carbon or Carbon Fiber  
Printed Circuit Board (PCB)

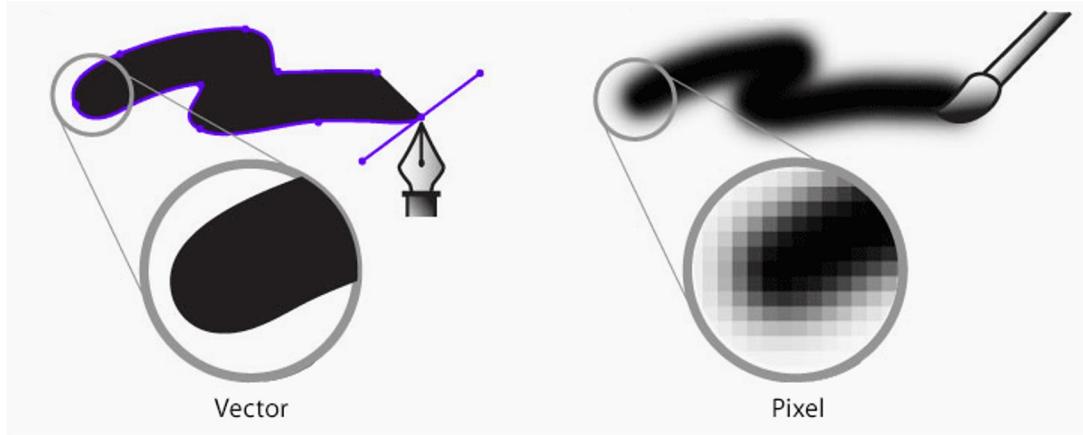
Farbmodus  
RGB



Abmessungen

Illustrator  
Corel Draw  
Autocad  
Inkscape (free)  
GravitDesigner (free)



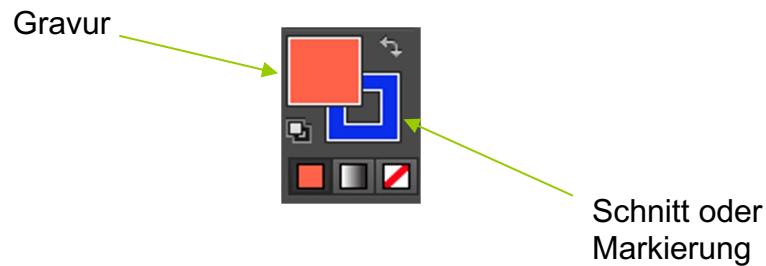


Schneiden, Markieren und  
Gravieren möglich

Nur Gravieren möglich

**Eine Farbe = eine Operation**

Nur im svg-Format möglich



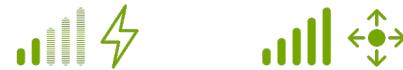
**Hinweis:** VisiCut kann alle RGB-Farben lesen, abgesehen von **Schwarz**, das Probleme verursacht.

Graviert **jeden einzelnen Punkt** einer Fläche

→ Flächiges Abtragen des Materials



Medium Power    High Speed





150 DPI



300 DPI



400 DPI



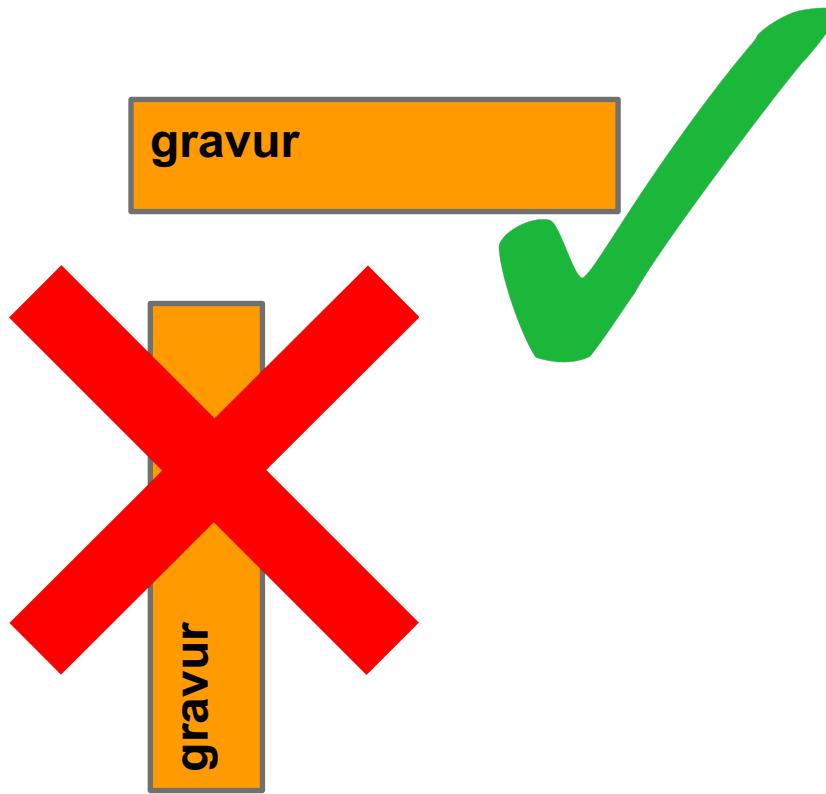
600 DPI

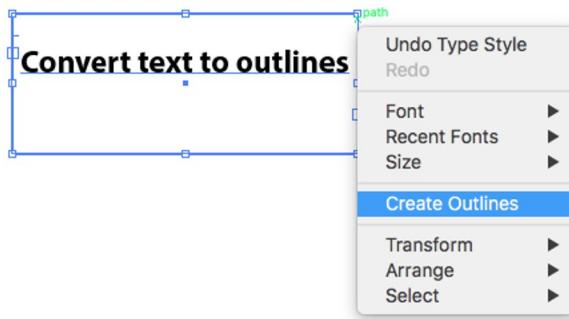
→ höhere Auflösung

längere Gravurzeit

höherer Detailgrad

- Gravuren entlang X-Achse anordnen





## Convert text to outlines

Convert text to outlines

R R

Bridges  
recommended for  
text cutting out

*metroplex laser*

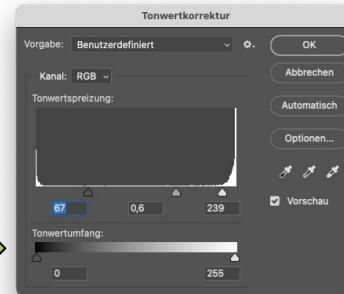
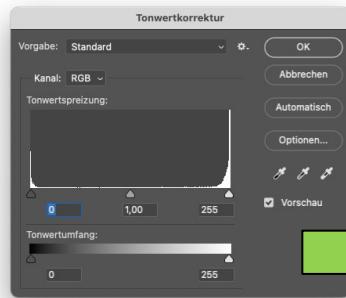
or use laser cutting  
fonts



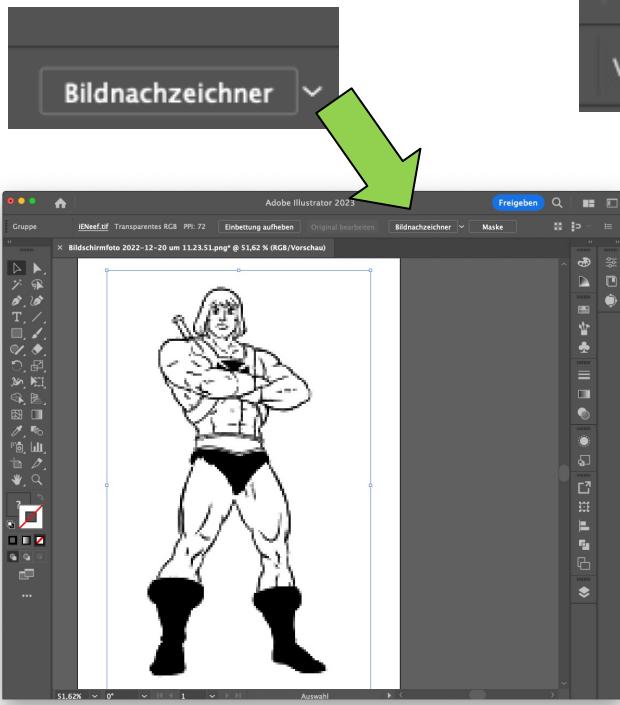
He-man is not only very low-res but also shows strong jpg artifacts.



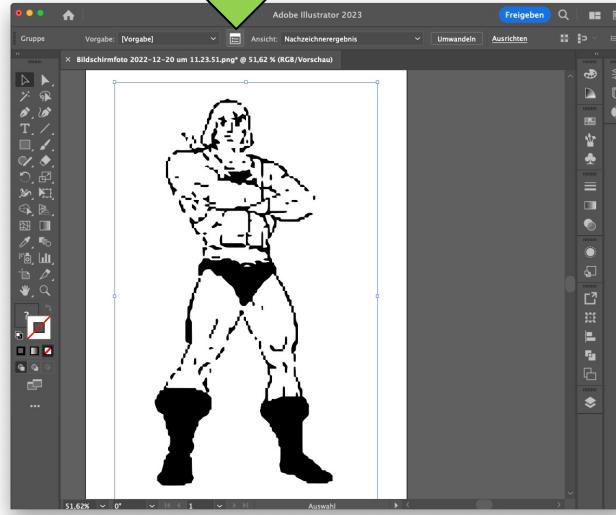
Use levels (Tonwertkorrektur) in Photoshop to remove grey artifacts

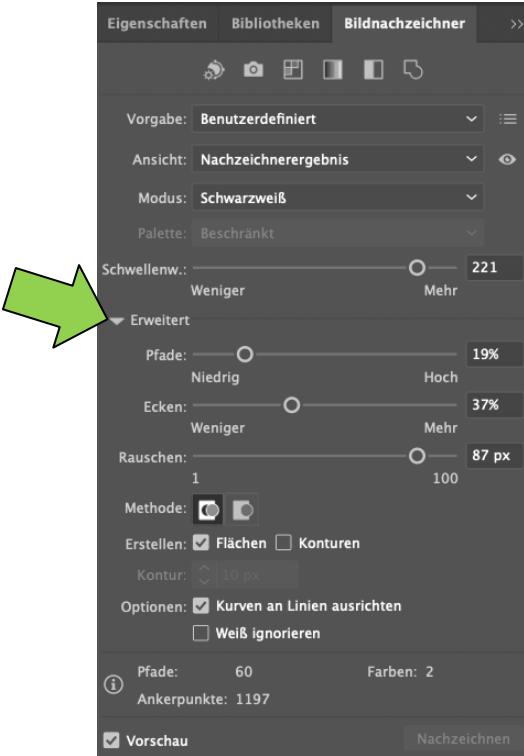
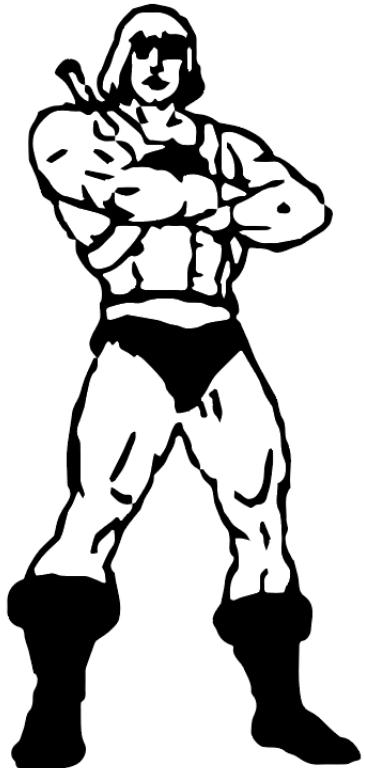


Select image,  
click „image trace / Bildnachzeichner“



Open the preset /  
Vorgaben panel

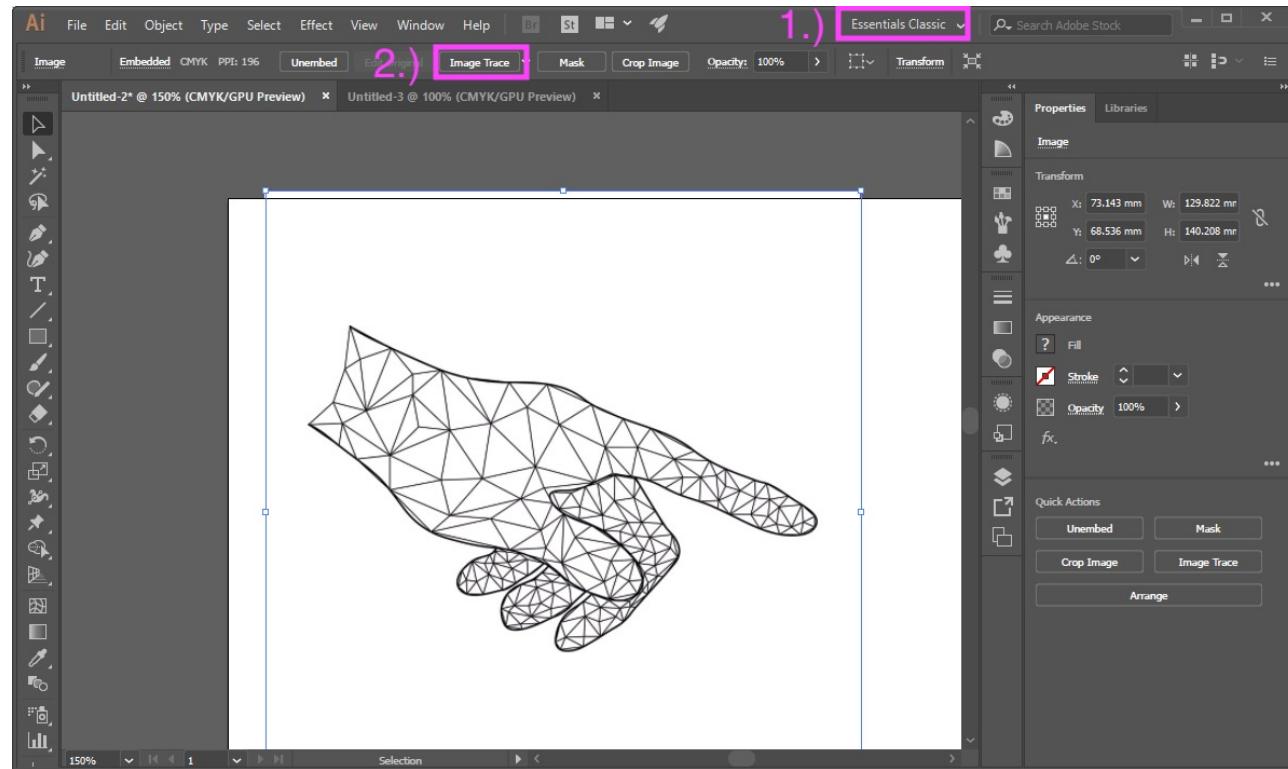


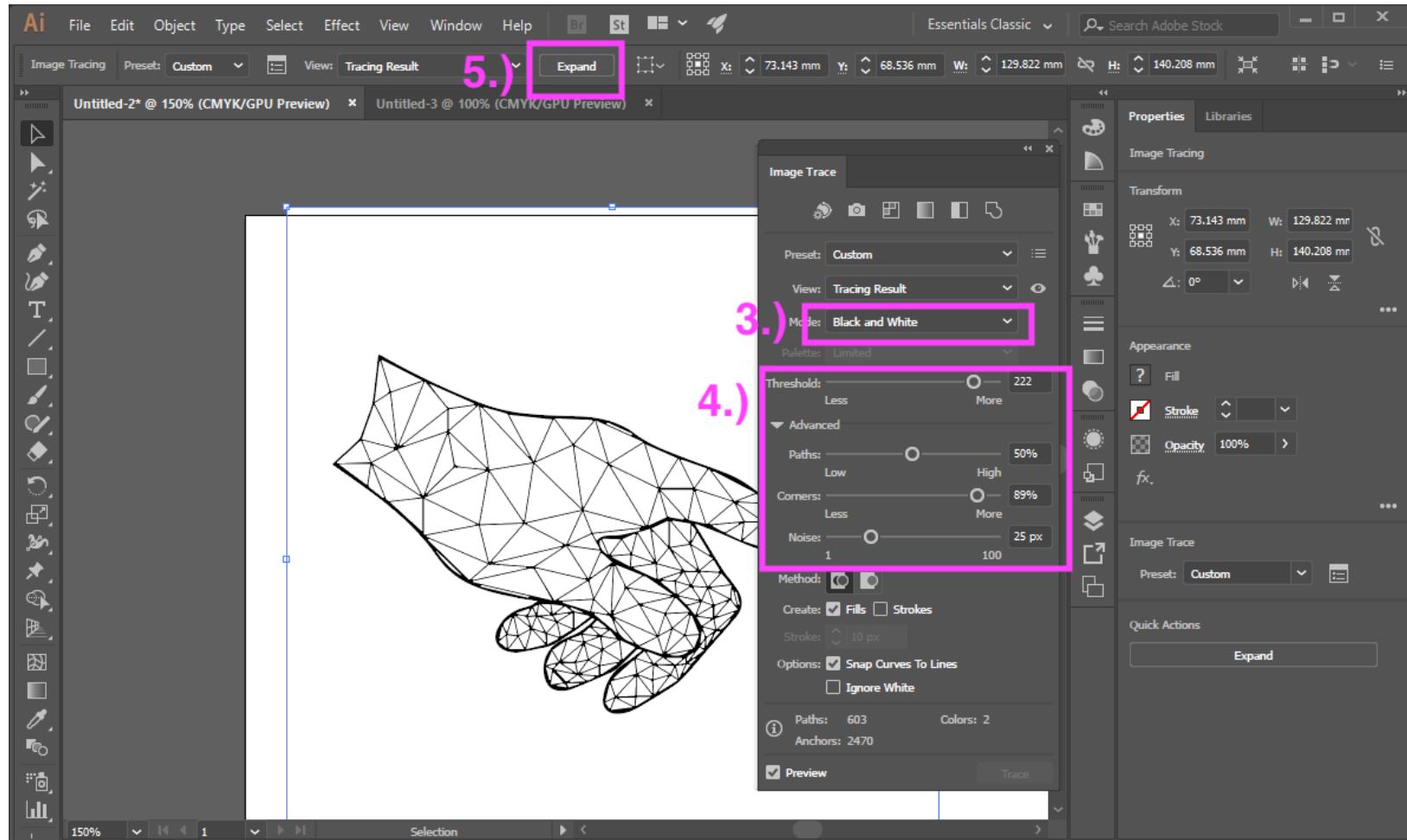


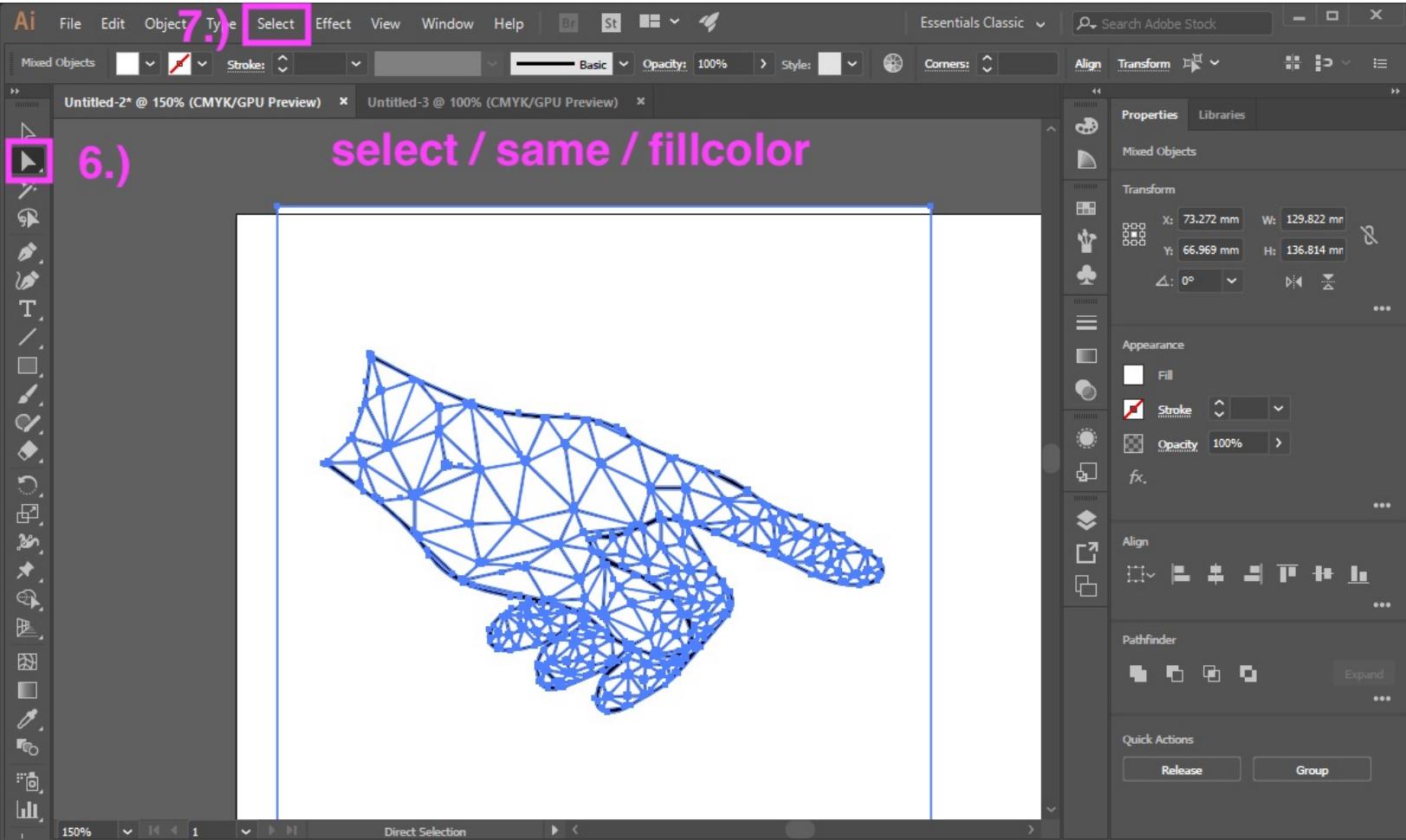
Expand panel  
(advanced / erweitert)

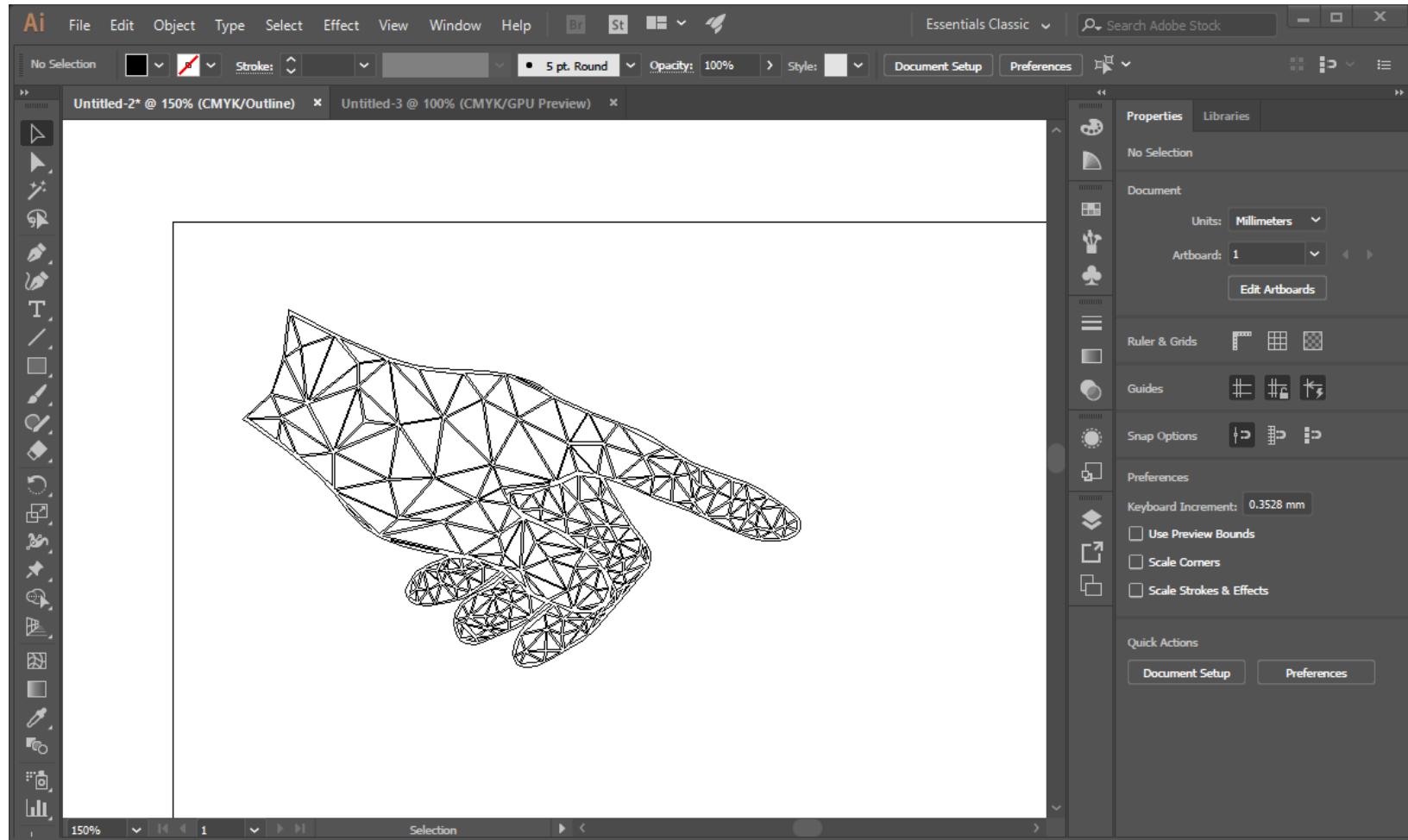
Adjust settings until happy.  
For more details check video  
On next slide

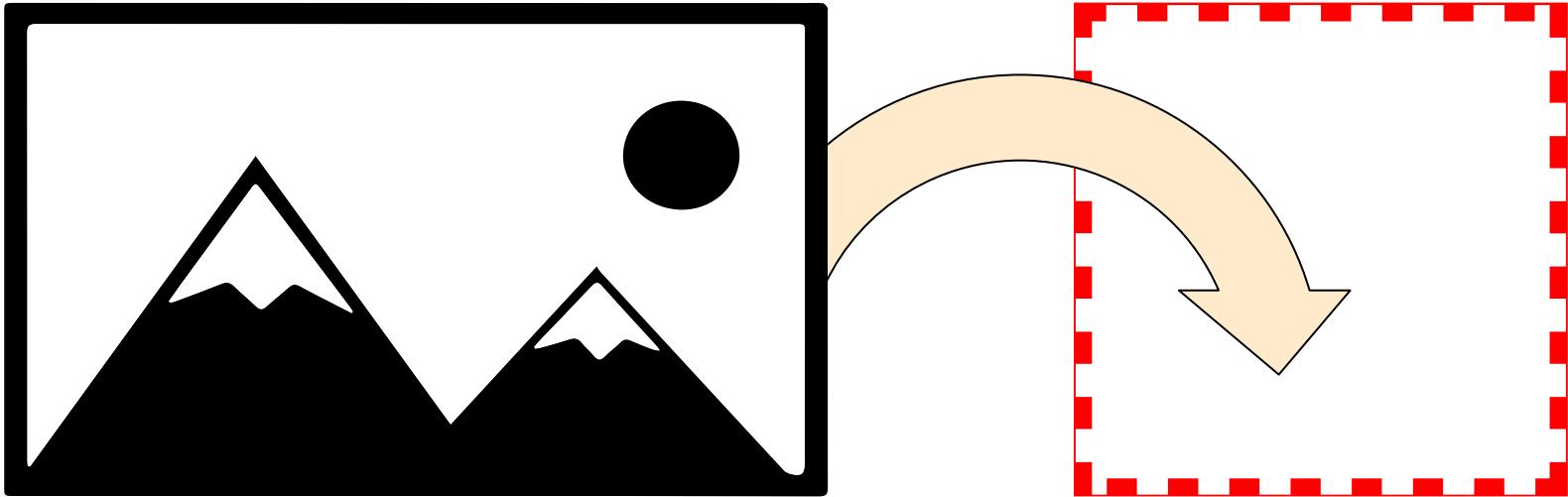
[https://www.youtube.com/watch?v=AUxtDCyaPFg&ab\\_channel=StickerMule](https://www.youtube.com/watch?v=AUxtDCyaPFg&ab_channel=StickerMule)









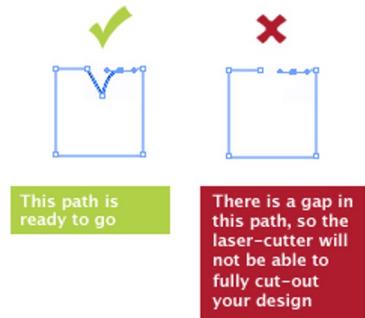


There are infinite options of how to place the image in our „frame“ some of them are better than others



**NEVER** scale images unproportionally!  
The few cases when it's OK are

- RGB Farbmodus?
- Korrekte Größe?
- Pfade geschlossen?
- Überlagernde Linien?



**ACHTUNG** Übereinanderliegende Linien werden mehrfach bearbeitet

preventing  
burning

## **Prevent burning:**

- Clean lens
- Focus correctly
- Make sure Air Assist is on
- Choose a setting that cuts through the material but is not overpowered.
- To prevent burnmarks from the metal grid, lifting the pieces is an option
- Potentially tape the material prior to cutting
- Apply water prior to cutting

## **Prevent burning (What AI says)**

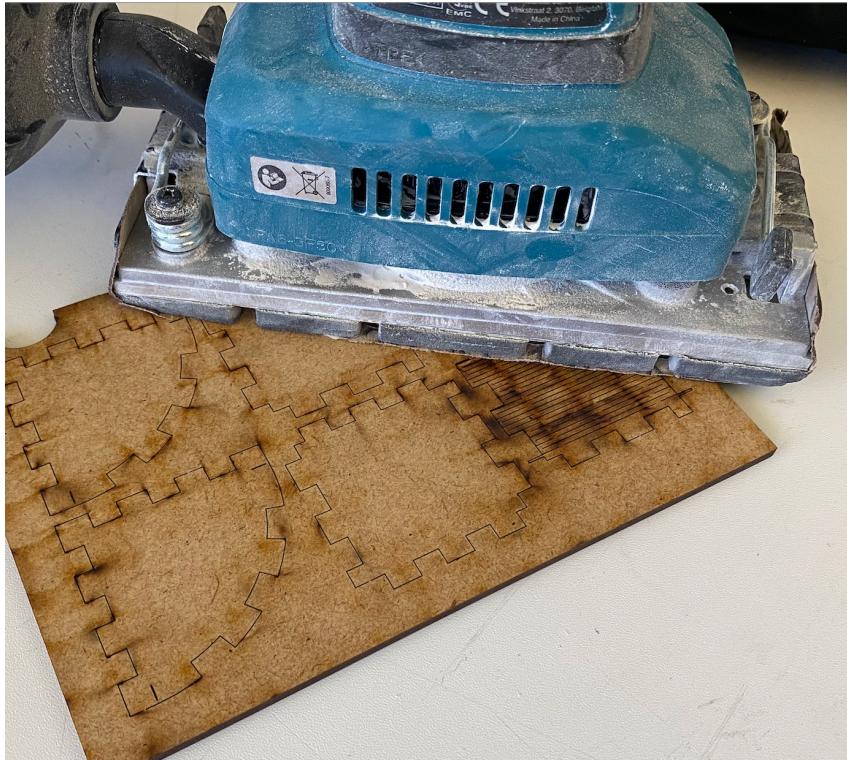
To prevent burning when using a laser cutter, there are several precautions you can take.

- First, make sure you are using the correct settings for the material you are cutting. Different materials require different laser power and speed settings to cut properly and avoid burning.
- You should also keep the focus of the laser beam as close to the surface of the material as possible to ensure a clean, precise cut.
- Additionally, it's a good idea to regularly clean the lens of the laser cutter to ensure that it is free of debris, which can cause burning.
- Finally, make sure to use adequate ventilation when using a laser cutter, as the fumes produced during cutting can be harmful.

## Prevent burning Birch (What AI says)

1. Use a low power setting. Birch plywood is a relatively soft wood, so you won't need as much power to cut it. Start with a low power setting and gradually increase it until you get a clean cut.
2. Adjust the speed. The speed at which the laser beam moves across the surface of the plywood can also affect the quality of the cut. A slower speed will produce a more precise cut, but it will take longer. Experiment with different speeds to find the right balance for your project.
3. Use a high-quality lens. The lens of the laser cutter focuses the laser beam and plays a key role in the precision of the cut. A high-quality lens will produce a more focused beam and produce cleaner cuts.
4. Use a pass-through technique. If you're cutting through the entire thickness of the plywood, try using a pass-through technique where you cut half of the thickness from one side and then flip the plywood over and cut the remaining half from the other side. This can help prevent burning by reducing the amount of time the laser beam is in contact with the material.
5. Use adequate ventilation. The fumes produced during laser cutting can be harmful, so it's important to use adequate ventilation to remove them from the workspace. A ventilation system or a fume extractor can help keep the air clean and prevent the buildup of harmful gases.

## Remove burn



Sand the whole plate while pieces are still in place.  
It's quick and allows to remove heavy burn.

Sanding burn at  
any later stage is harder.

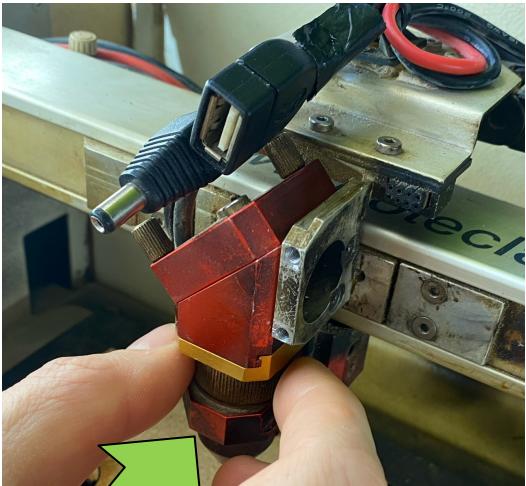
## Remove burn on engravings



Use a soft wire brush to carefully remove burn on engravings

Cutting  
with Trotec

## Before cutting: Check lens & clean if required



- 1) Unscrew below lens,
- 2) Remove lens and check



3) it's dirty



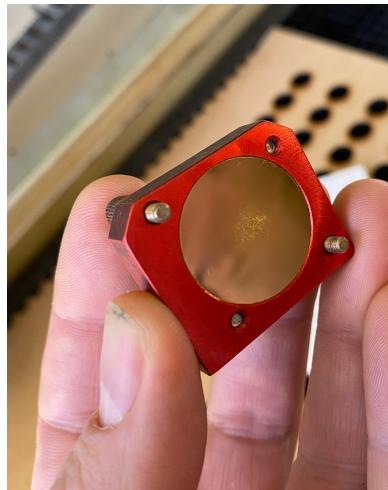
- 4) Apply 1 drop of cleaning fluid
- 5) Gently wipe with lens cleaning paper
- 6) insert lens and screw **tightly**



## Before cutting: Check mirror & clean if required



- 1) Unscrew mirror
- 2) Remove mirror and check



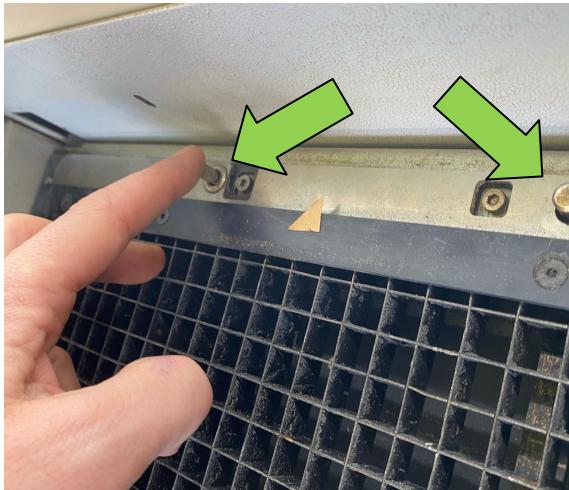
3) it's dirty



- 4) Apply 1 drop of cleaning fluid
- 5) Gently wipe with lens cleaning paper



## Clean work table / remove grid



- 1) Move x-carriage to top
- 2) Click locking bolts to open
- 3) Remove **carefully**,  
do **not** hit the lens unit



- 4) Clean table with handbrush or vacuum.  
It's important to do it regularly because leftovers can easily burn.

## Make sure compressor works



Check pressure scale.

If it's zero - probaly compressor is unplugged.

Plug it back in.

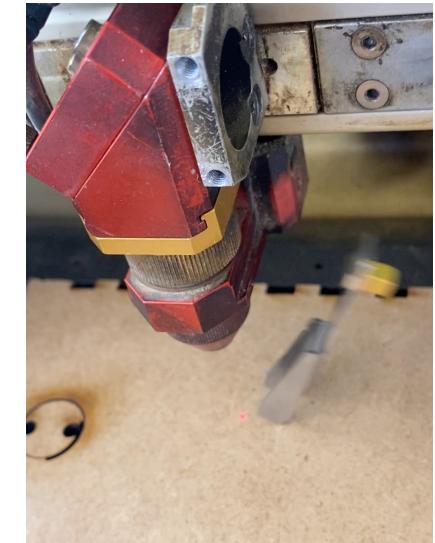
You always want to cut with air assist unless the material is so light it would be blown away (e.g. paper, thin stuff)

## Manual focus:

attach spacer at lens



Move table upwards until  
spacer falls off



# Working with Ruby

Import files on first tab

A screenshot of a web-based application interface for managing files. The top navigation bar includes a logo for 'trotec', a search bar with the URL 'localhost:2402/app/manage', and various icons. The main area is divided into 'Designs' and 'Jobs' tabs. Under 'Designs', there is a table with columns for Name, Created, and actions. Several entries are listed, including 'kerf strip.svg' and multiple entries for 'KYUB My New Project'. Under 'Jobs', a single entry 'X36-0356' is shown with the status 'New job 4291'. A large green arrow points from the top left towards the '+' button in the toolbar. Another green arrow points from the top right towards the 'Lasers' tab. A curved orange arrow points from the bottom left towards the 'New design' row.

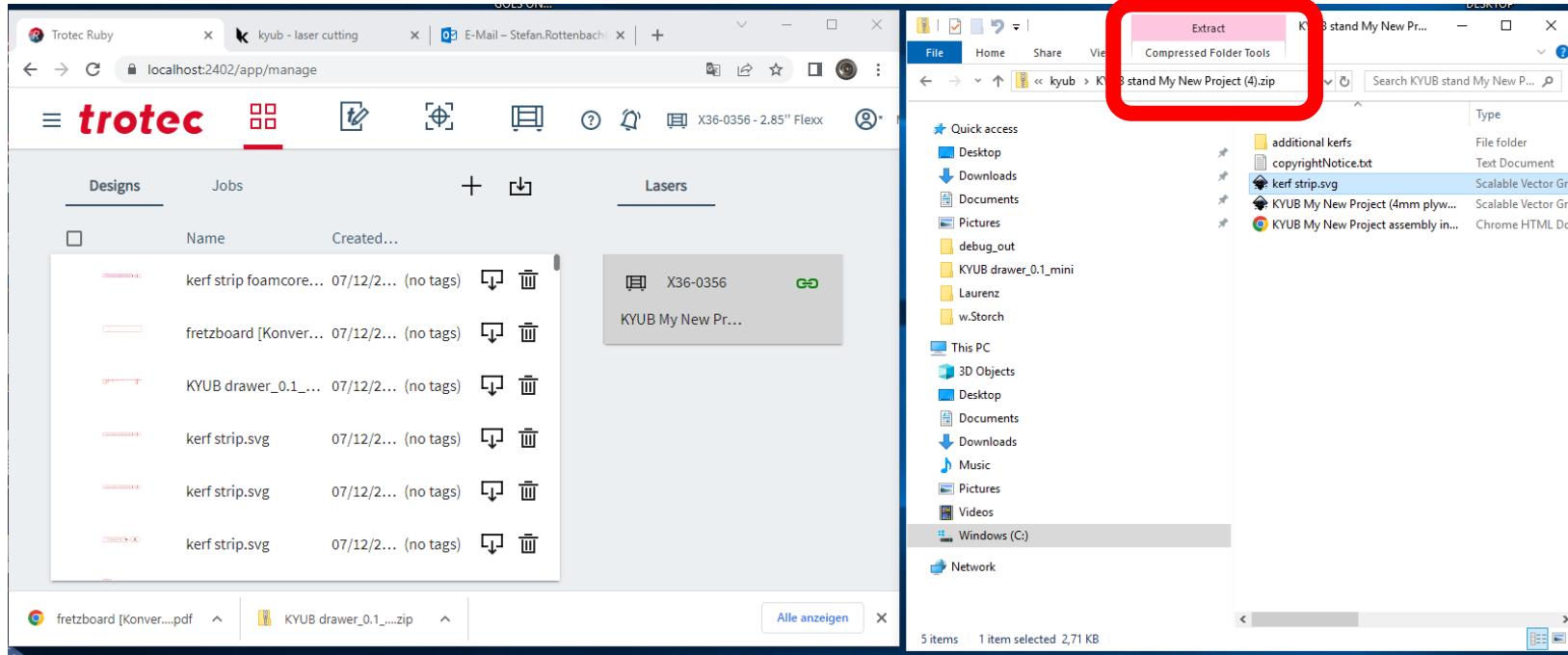
Name	Created	Actions
kerf strip.svg	07/12/20...	[Download] [Delete]
KYUB My New Project (...	07/12/20...	[Download] [Delete]
KYUB My New Project ...	07/12/20...	[Download] [Delete]
kerf strip.svg	07/12/20...	[Download] [Delete]
KYUB My New Project (...	07/12/20...	[Download] [Delete]
KYUB My New Project (...	07/12/20...	[Download] [Delete]
KYUB My New Project (...	07/12/20...	[Download] [Delete]
KYUB My New Project (...	07/12/20...	[Download] [Delete]
New design 4110	07/12/20...	[Download] [Delete]

By file dialog, or



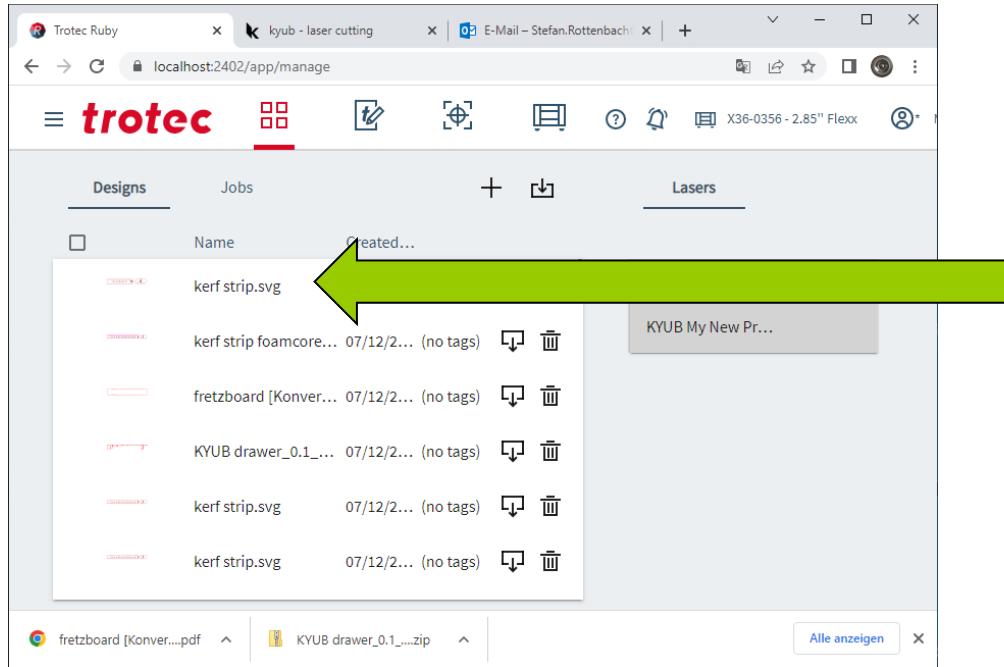
Drag and drop

# Working with Ruby



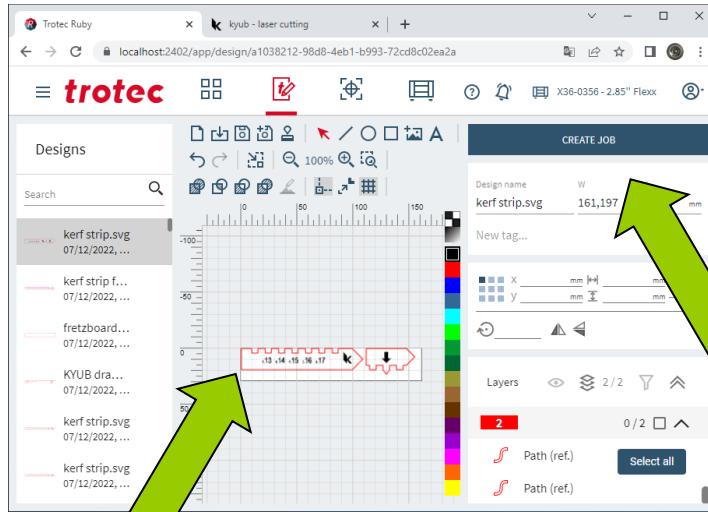
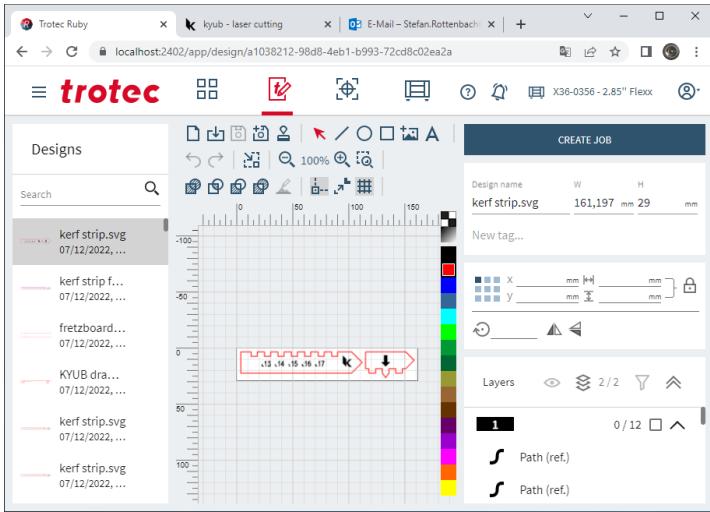
Dragging from a doubleclicked KYUB export zip file wont work.  
**Extract files first in order to drag them.**

# Working with Ruby



Doubleclick file to move  
to the next tab

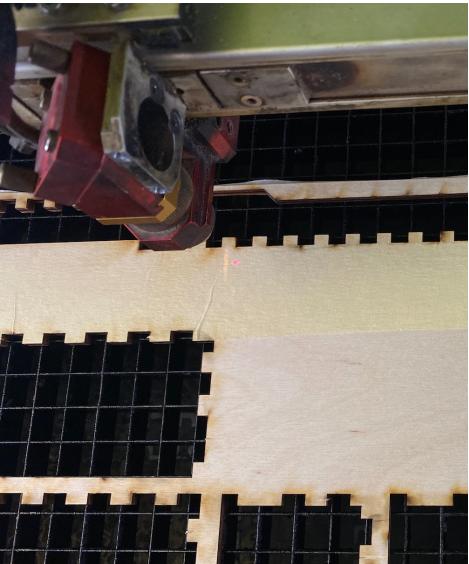
# Working with Ruby



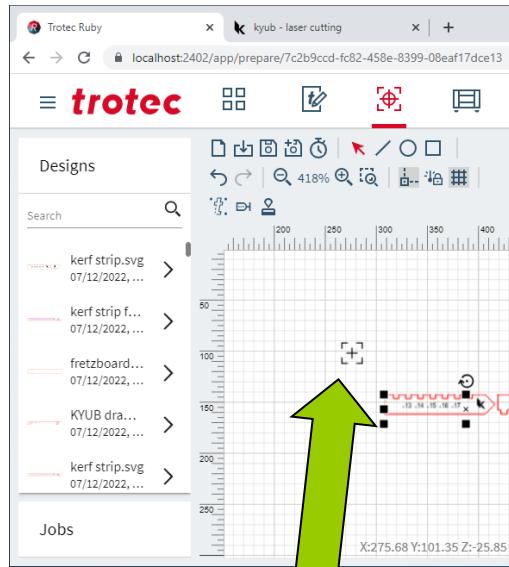
For precise alignment it's usefull  
to move the file to the artboard boundary

After arranging press  
„create job“

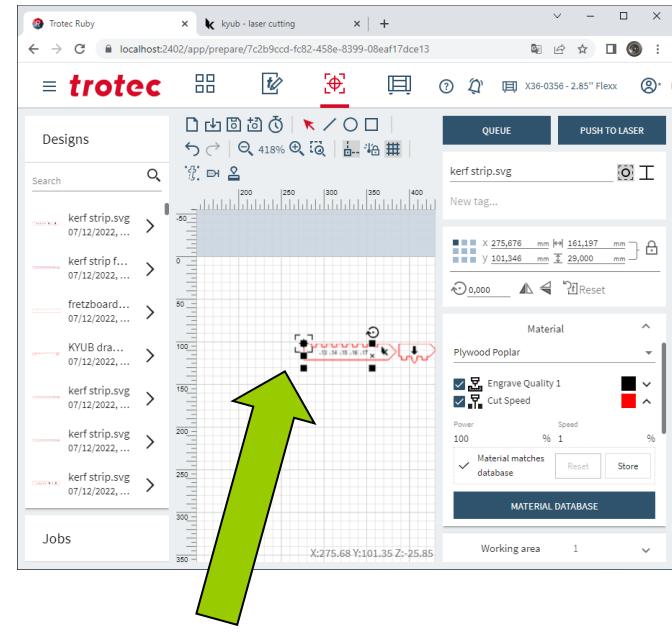
# Working with Ruby



Move laser (red dot) to desired cutting area

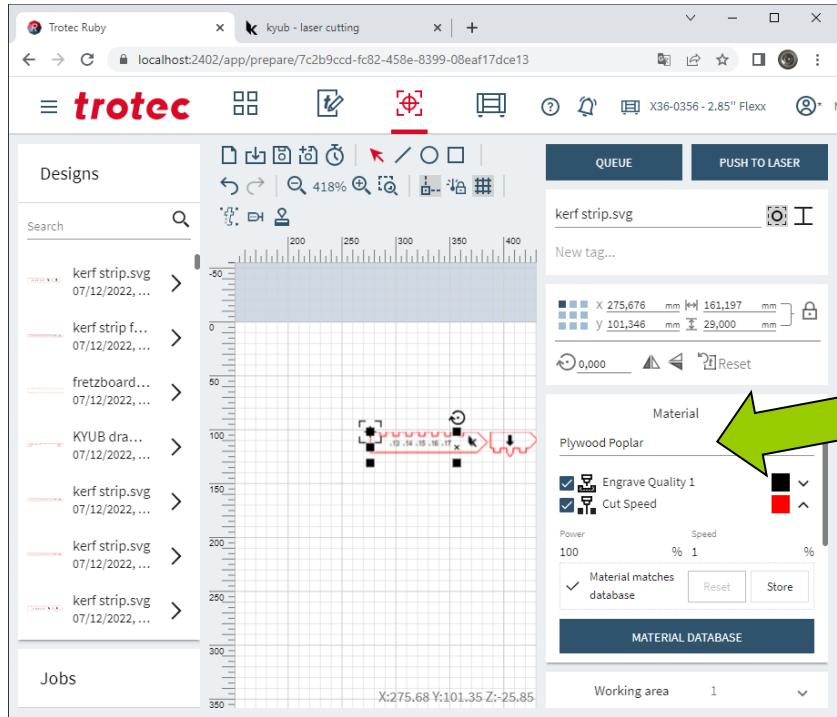


Crosshair represents  
position of laser



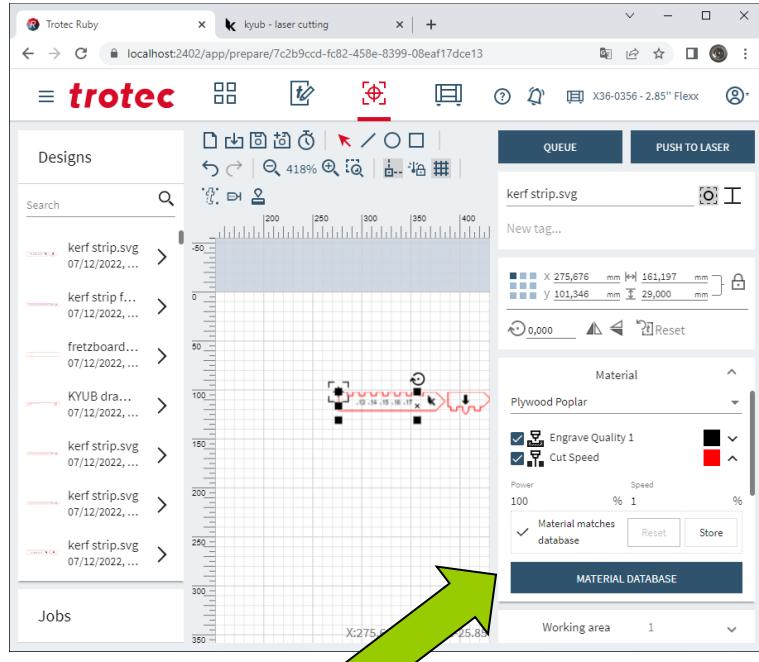
Align file with crosshair  
(magnetic snap)

# Working with Ruby

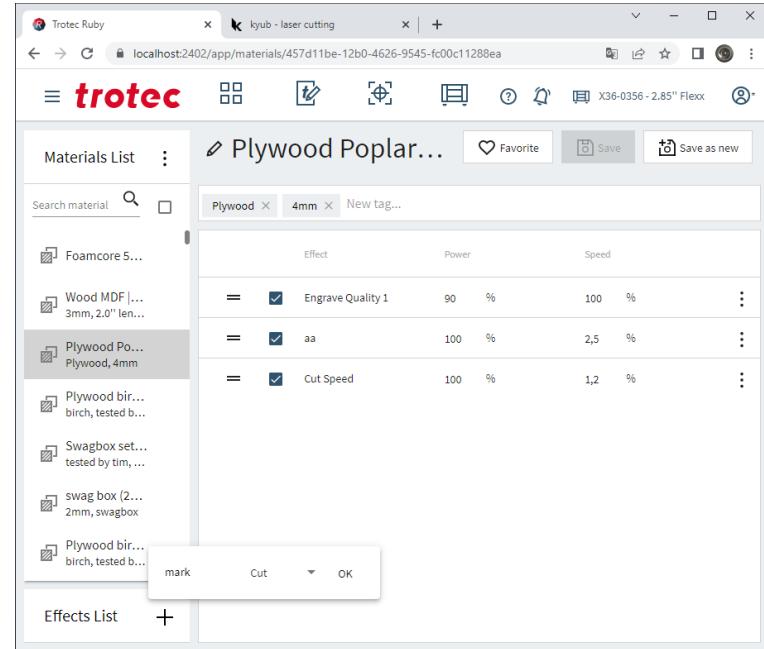


Select material here,  
edit settings if needed

# Working with Ruby

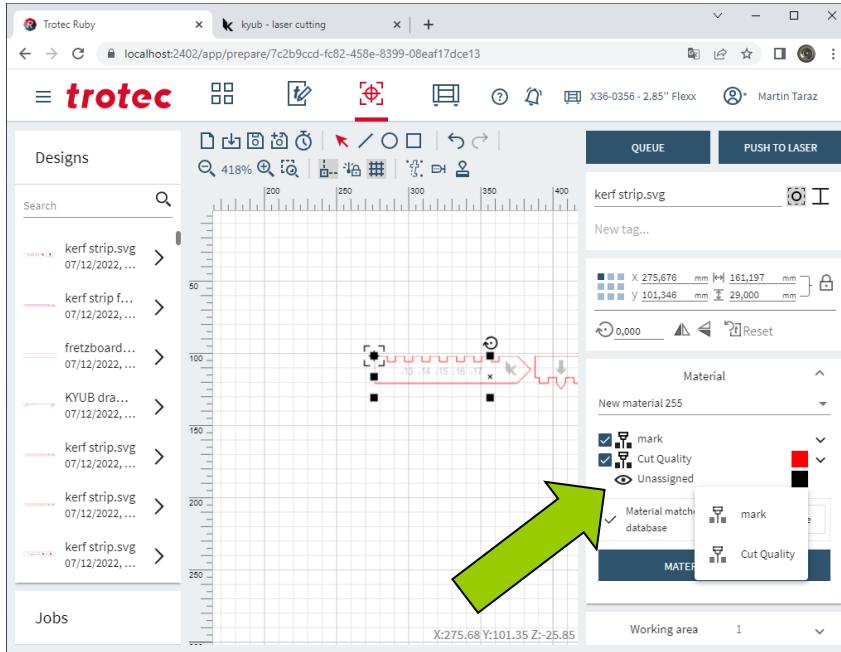


For all editing options jump to „material database“

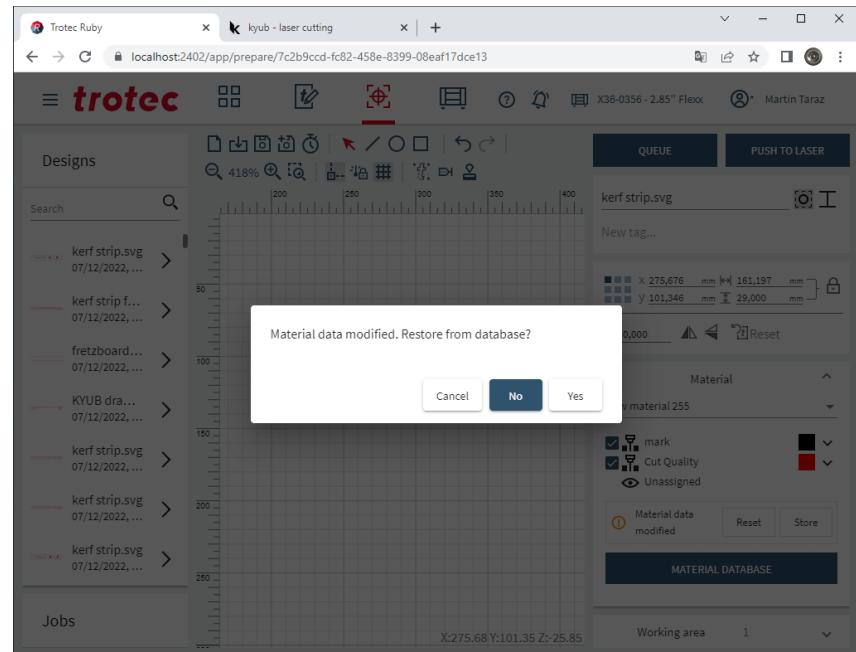


Here you can save new materials and rename them

# Working with Ruby

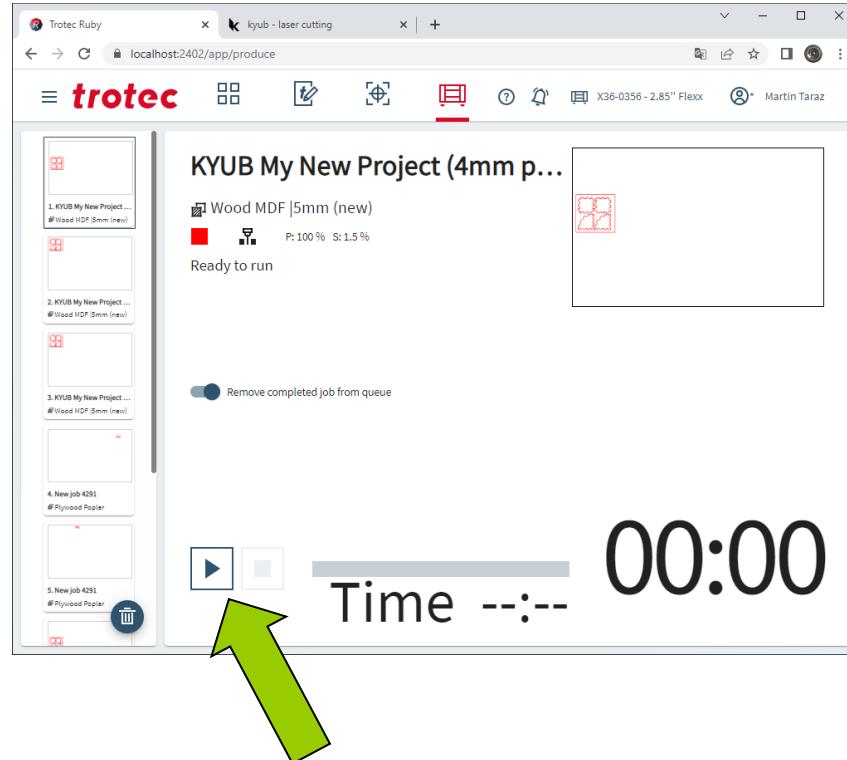


Assign colors to the predefined process here (right click on color)



If you made changes do not restore the defaults from database

# Working with Ruby



You reached the final tab,  
Hit play to cut!