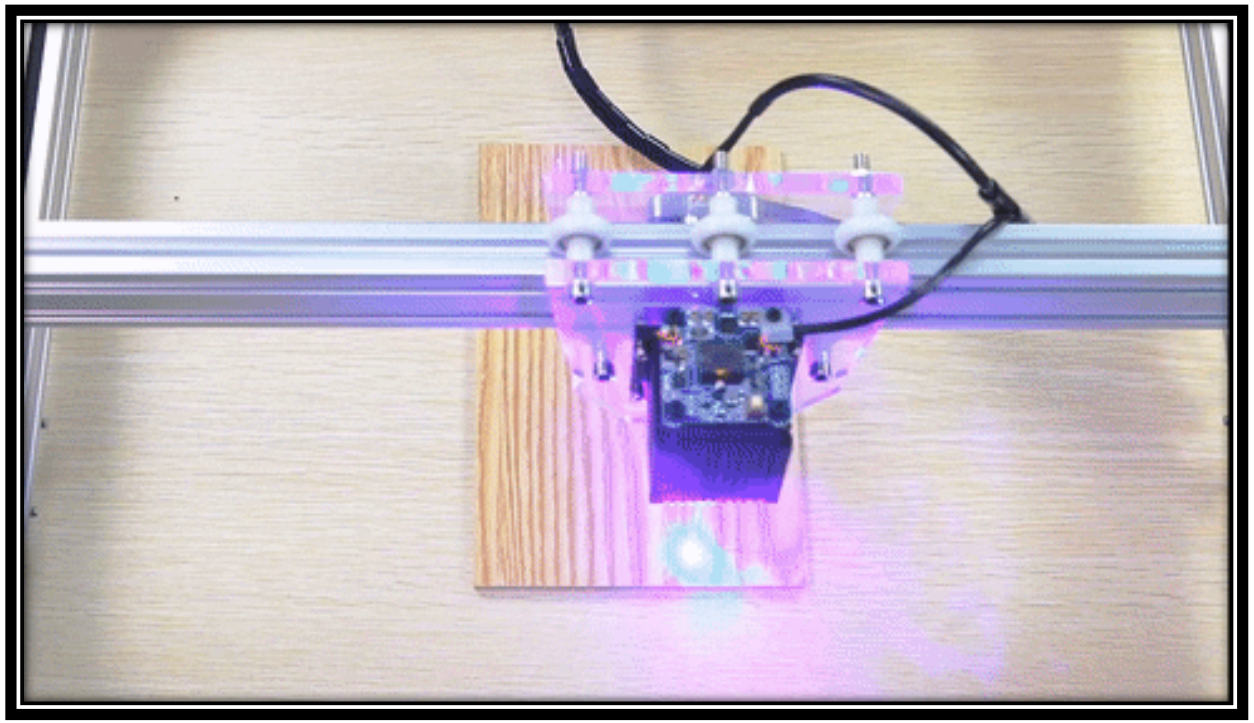
Introduction to Laser Engraving & Cutting

What is Laser Engraving?

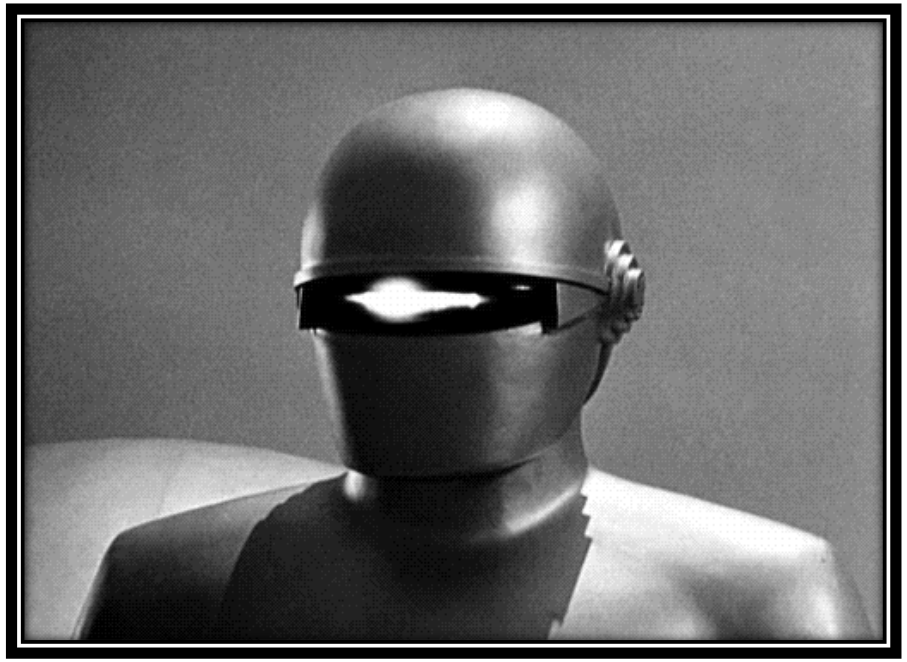
Exactly what it sounds like!

The practice of using a laser to engrave objects.



A Little History

1960: First laser constructed using a synthetic ruby crystal to amplify light.
1960: First continuous laser beam generated, now used in laser welding and cutting.
1962: Invention of Q-switching for pulsed laser beams, essential for laser etching and engraving.
1964: Invention of Nd:YAG laser, used today for etching, cutting, and welding in manufacturing.
1964: Invention of CO2 laser, applied in laser marking and cutting.
1978: First laser engraver, in a primitive form, used for wooden art creation.
1996: First laser-specific software developed, paving the way for computer integration in laser engraving machines.



Different Laser Engraving and Cutting Technologies

Common Consumer Laser Technologies

CO2 Laser

Diode Laser

Industrial and Less Common Laser Technologies

Fiber Laser

Nd:YAG Laser (Neodymium-doped Yttrium Aluminum Garnet)

UV Laser

Excimer Laser

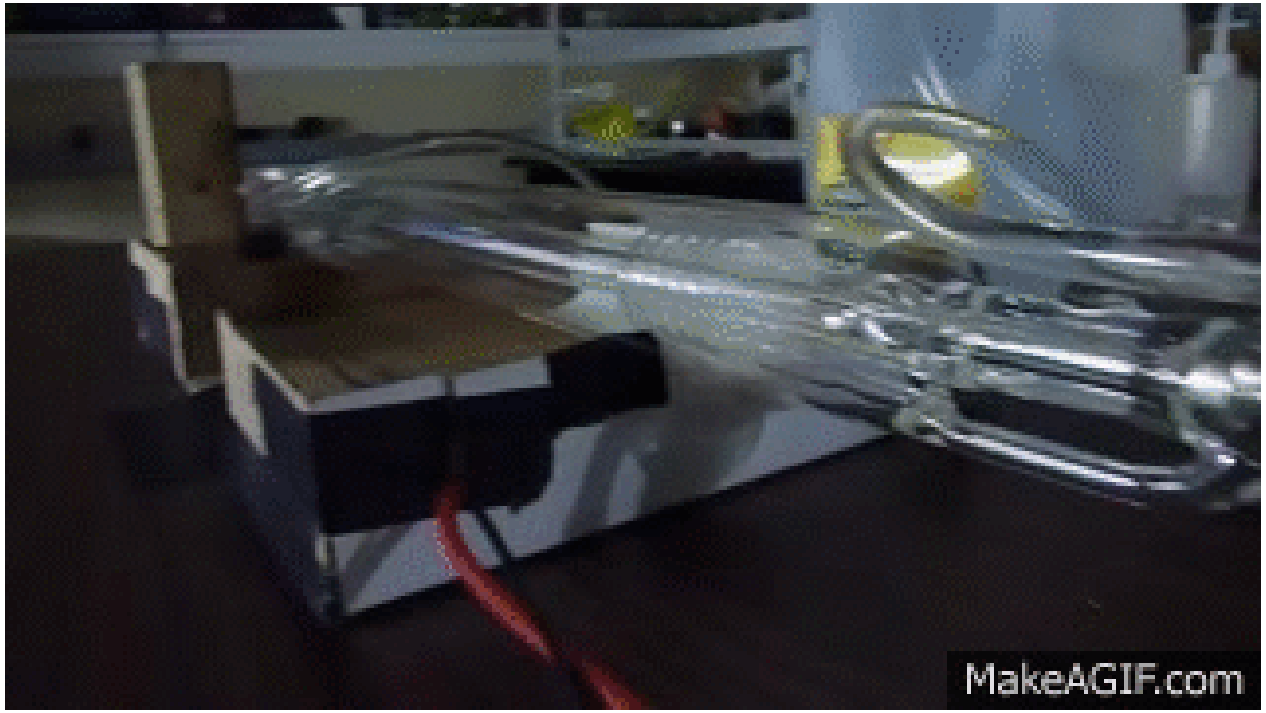
Femtosecond Laser

Free Electron Laser (FEL)

CO2 Lasers

How it Works

Modern CO2 Lasers produce the laser beam in a sealed glass tube which is filled with Carbon Dioxide gas. A high voltage flows through the tube and reacts with the gas particles, increasing their energy, in turn producing light.



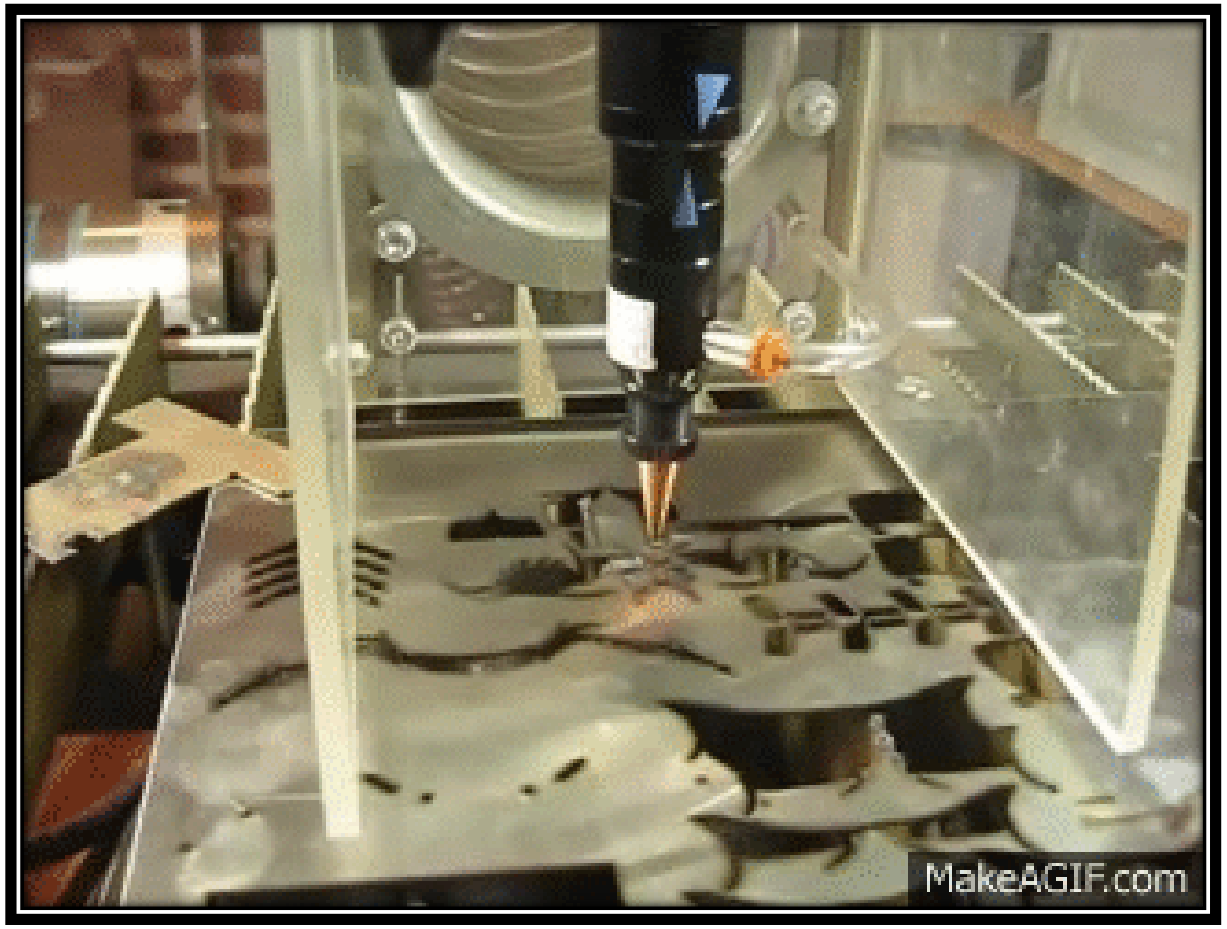
CO2 Lasers Cont.

Strengths

- MORE POWER!!!
- Can engrave some glossy and transparent materials
- Can cut through and engrave more materials than a diode laser.

Weaknesses

- Bigger Footprint (Size)
- Fragile Construction
- More Expensive
- Less lifetime

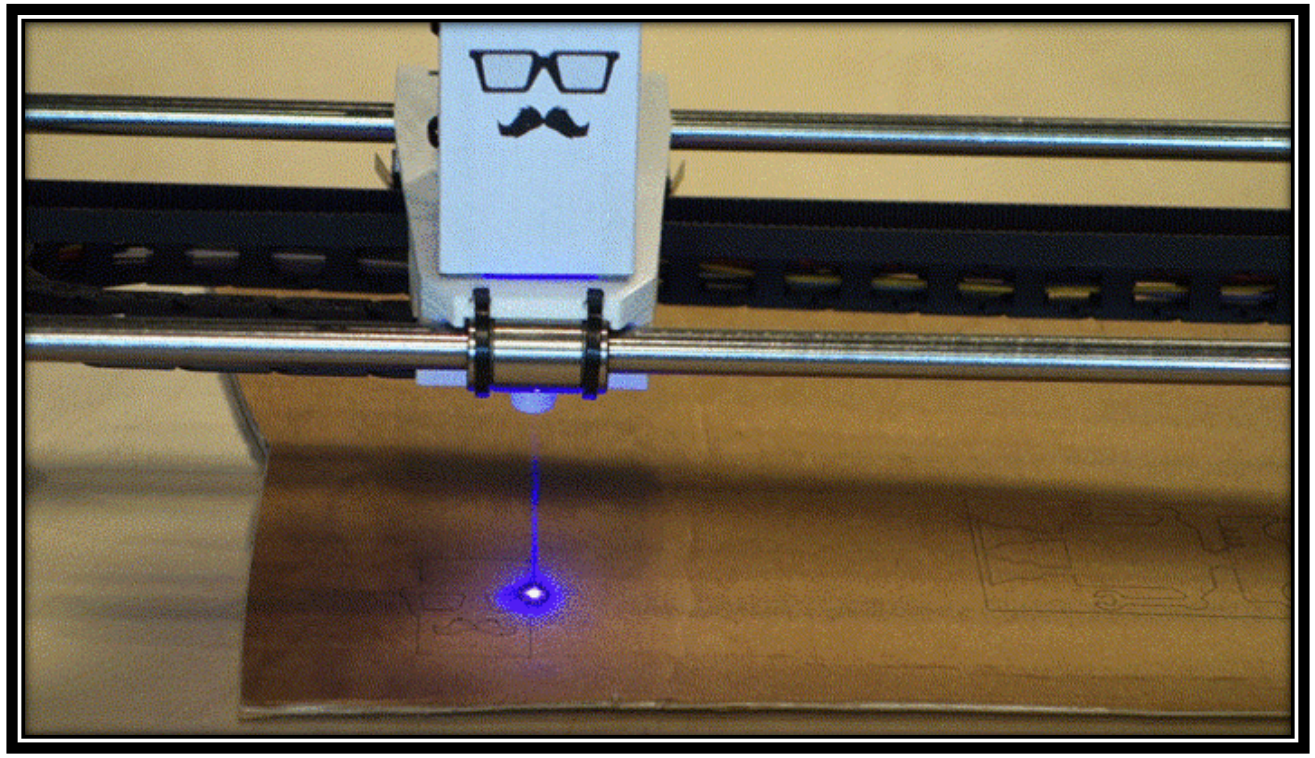


Diode Lasers

How it Works

Diode lasers work by using a semiconductor diode, a tiny electronic component that emits light when electrical current passes through it. This emitted light is highly concentrated and focused into a single beam.

Diode lasers are commonly used in various applications, including optical communication, laser pointers, and laser engraving



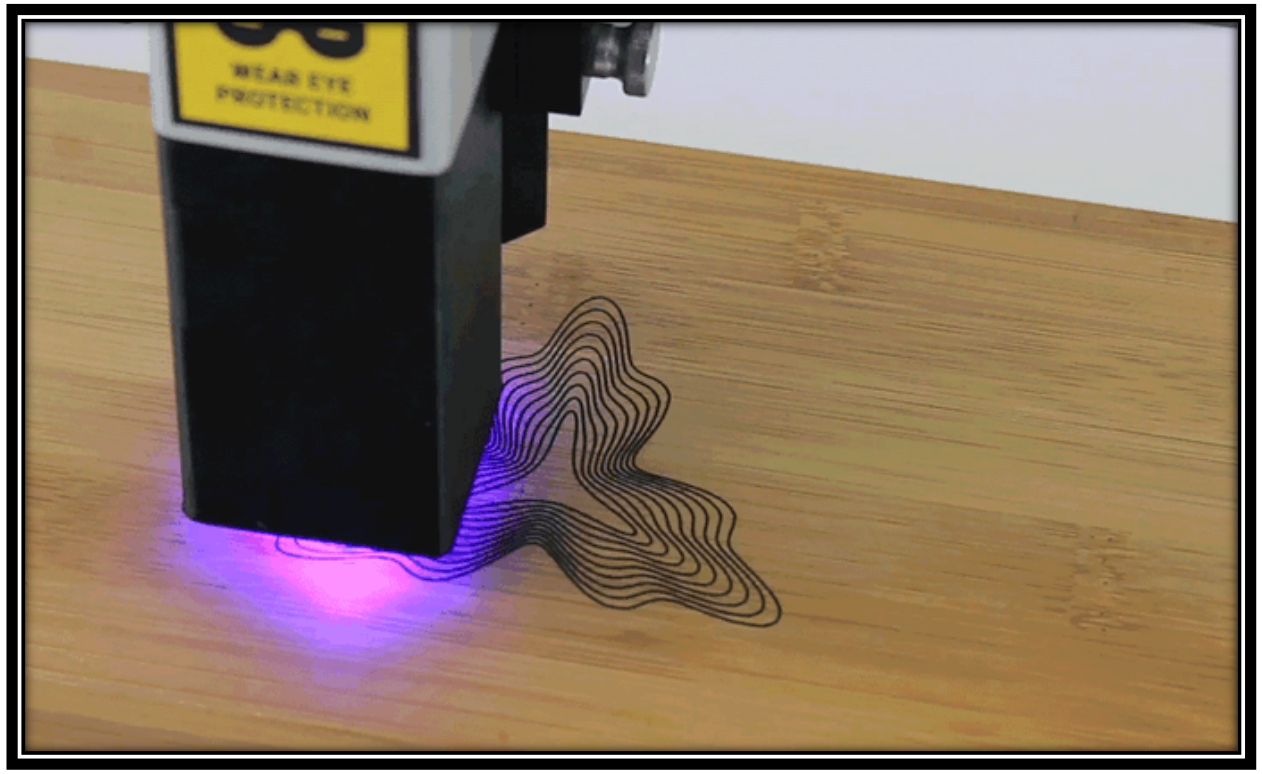
Diode Lasers

Strengths

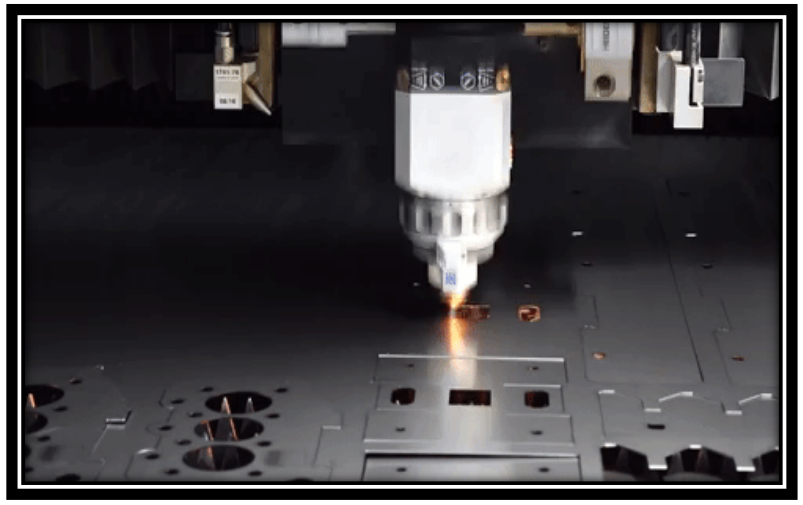
- Less expensive
- Compact, lightweight and robust
- Longer lifetime

Weaknesses

- Not as much power
- Can't engrave transparent, shiny, or fully white materials



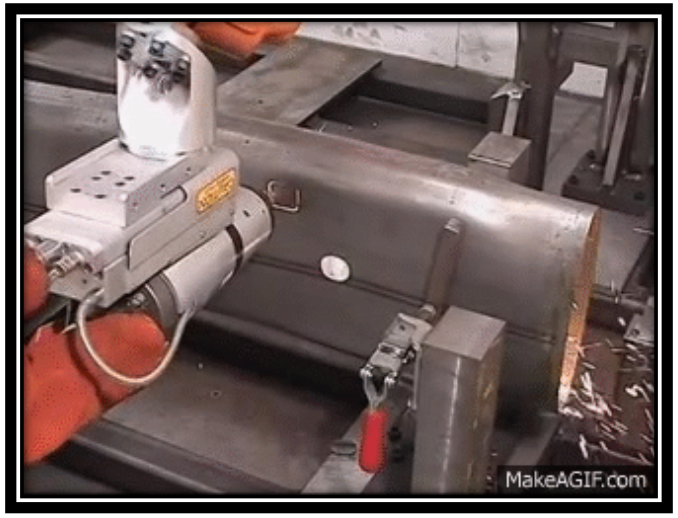
Industrial and Less Common Laser Technologies



Fiber Laser

Known for its high precision and speed, often used for marking, engraving, and cutting metals and alloys.

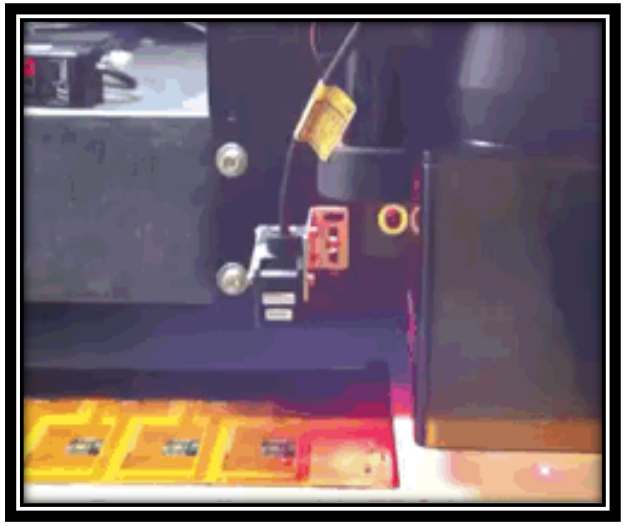
Applications: Automotive, aerospace, and jewelry industries.



Nd:YAG Laser (Neodymium-doped Yttrium Aluminum Garnet)

Used for cutting and engraving metals, ceramics, and some plastics.

Applications: Medical and detailed manufacturing

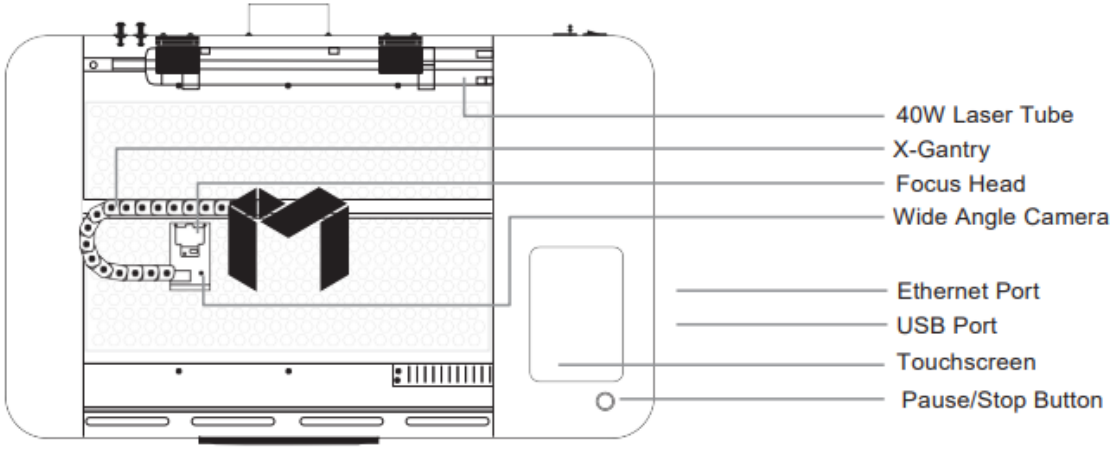


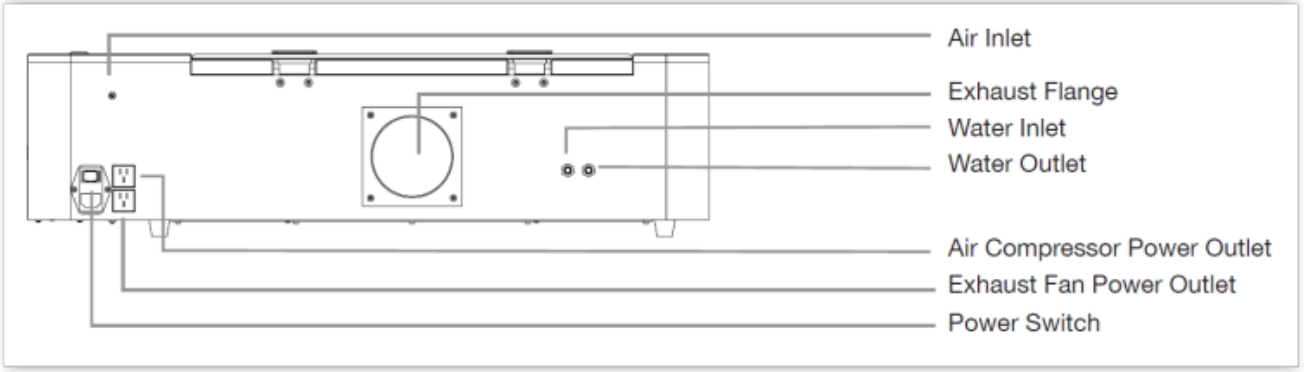
UV Laser

Used for high-precision engraving and marking on materials like glass, plastics, and certain metals.

Applications: Engraving of small electronics and tools

Parts of our Laser Engravers: Muse





Pause Button: Used to Start and Stop the Laser.

Touchscreen: Move print head, also stop start and other settings.

Wide Angle Camera: This Camera looks down showing you the material you will be working in the engraving software.

Focus Head: The Muse does not have auto-focus of the laser, therefore you must manually focus the beam before each project.

Parts of our Laser Engravers: Muse Titan NEW

Button: Used to Start and Stop the Laser.

Lid: Where you open and add your material to be cut/engraved.

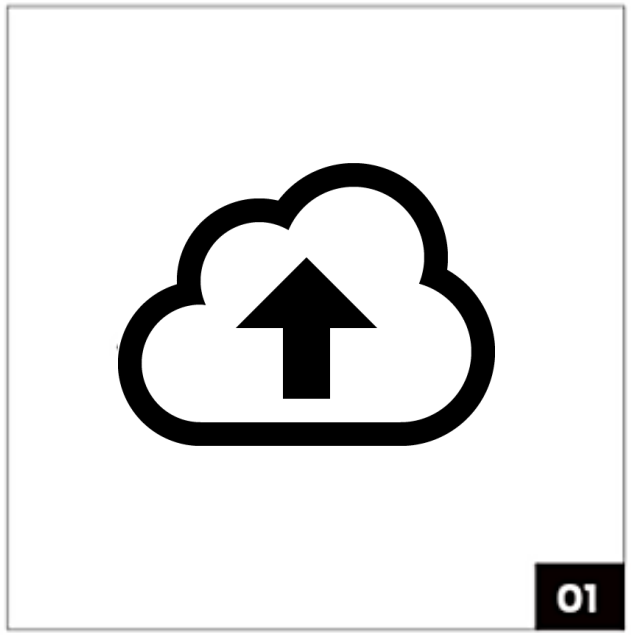
Lid Camera: This Camera looks down showing you the material you will be working in the engraving software.

Crumb Tray: A tray used to raise thin material up to the laser printer head, can be removed for thicker materials.

Laser Tube: C02 Laser Tube that creates the actual laser beam.

Passthrough: Allows for passthrough of larger materials to be engraved/

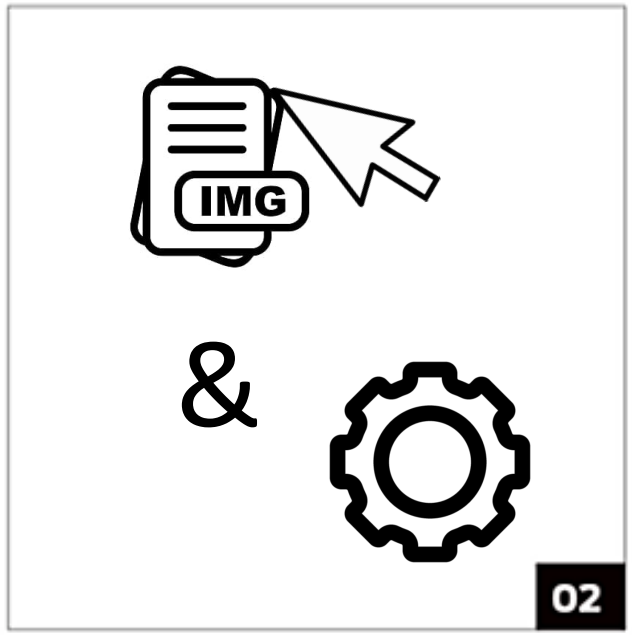
What is the Laser Engraving/Cutting Process?



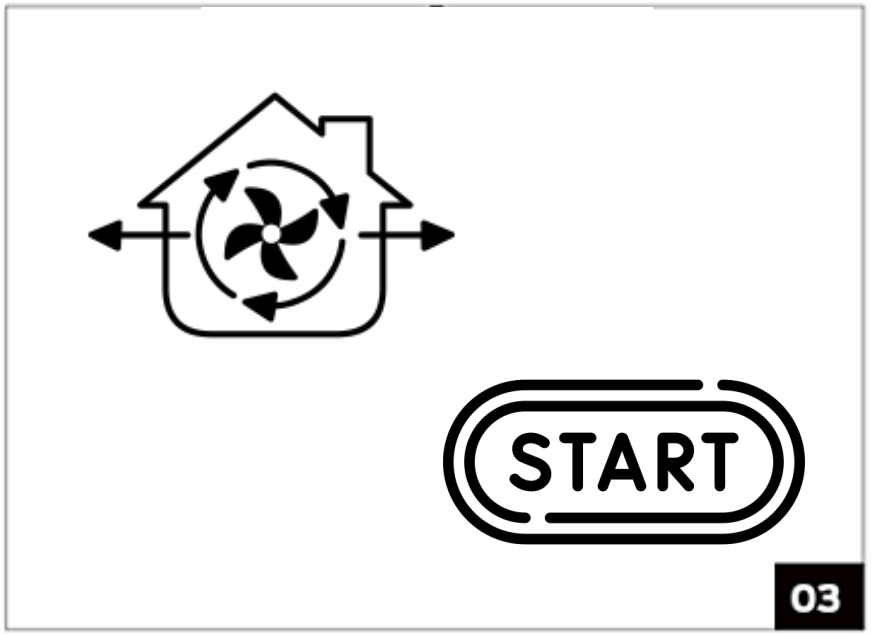
Go to a web browser and connect to the Laser and upload your files.

File Types:

PNG/JPG for engraving
SVG for Cuts



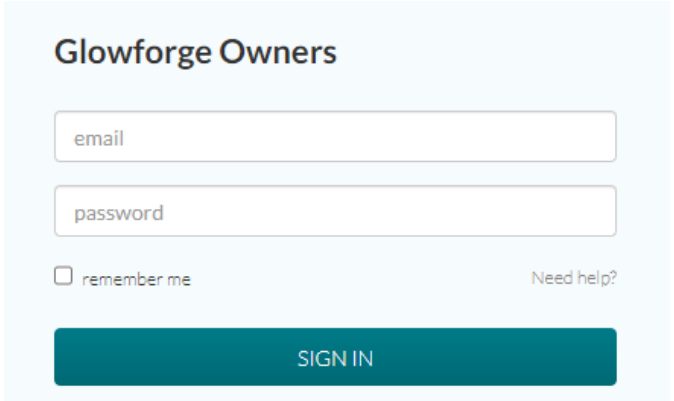
Position your files and set your engraving and material settings.



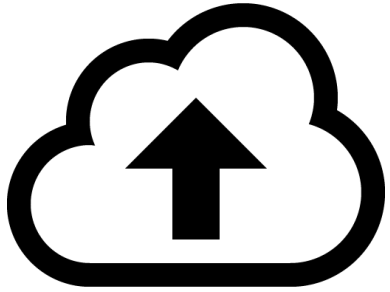
Turn on ventilation in room and vent for laser and then start your engraving.

Step 1: Connect and Upload

To do a laser engraving/cut first you must connect to the laser



•Go to a web browser and type in the IP address for the Muse. If using glowforge go to https://accounts.glowforge.com/users/sign_in and ask MakerSpace tech to sign in for you.

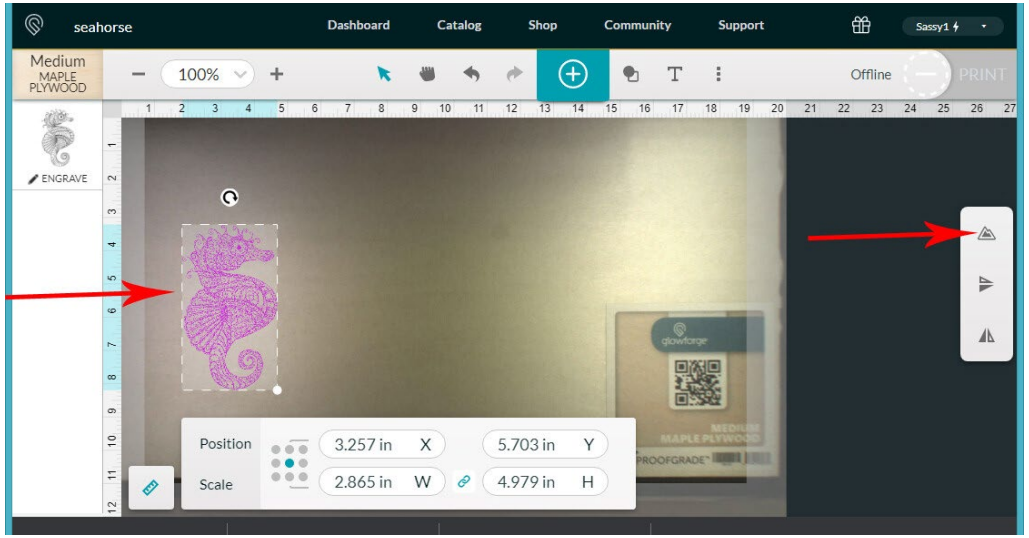


•Upload your files to the printer. Almost any image can be engraved, how ever to cut it must be a svg or pdf vector file. (PNG & JPG are recommended for images)

Step 2: Material Settings

Before engraving or cutting you must first select the material, position the file and set quality settings

- **Edit** the engraving material and positioning of images.
- **Decide** if you want to cut or engrave more than one object.
- **Send** the settings to the laser and start the engraving.



Step 3: Turn on Vents and Start Project

Before engraving or cutting must start up the ventilation to remove the smoke.

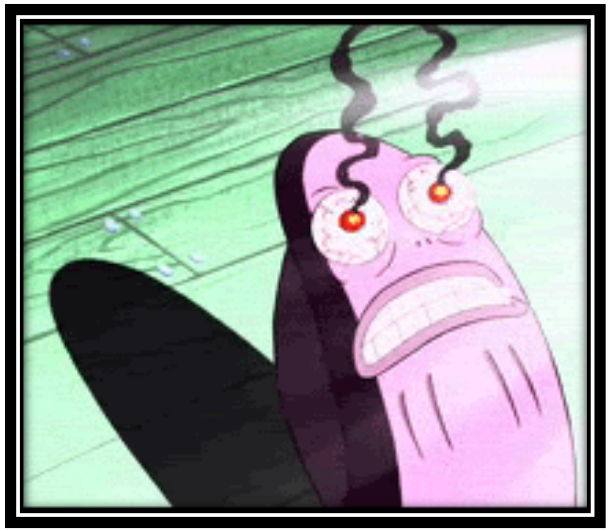
On the glowforge turn the vent knob clockwise to turn on the vent.

On the Muse click the button on the vent to start it.

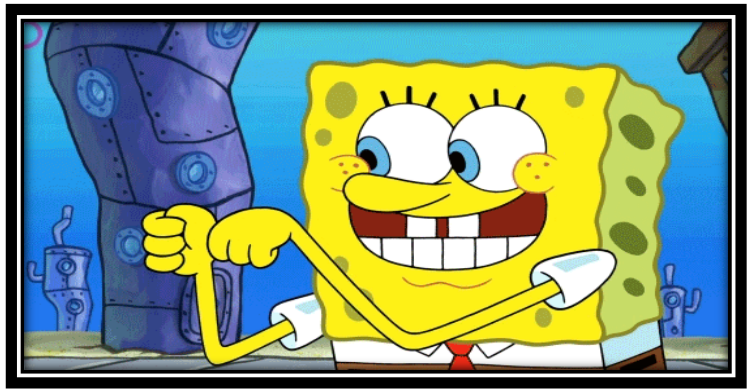
Start the ceiling vent. (Ask Tech for help)

LASER SAFETY!!!

- **Wear laser safety glasses!**
- **Know where the fire extinguisher is in the room.**
- **Know the shutdown procedure for the laser (button on laser)**
- **Locate the laser kill switch on the back wall, large red button.**
- **Regularly check or watch the engraving while the laser is running and check for fire hazards.**



Material Compatibility



Ok to engrave/cut

Wood: Most wood is ok to cut or engrave with the laser if it will fit

Acrylic: Acrylic can be cut and engraved with our lasers.

Paper and Cardboard: Paper and cardboard can be cut and engraved with the laser, however, assure settings are correct or it can catch fire.

Leather: Real raw leather can be cut and engraved however pleather can not be.

Ask a Tech about other material compatibility

DO NOT ENGRAVE!

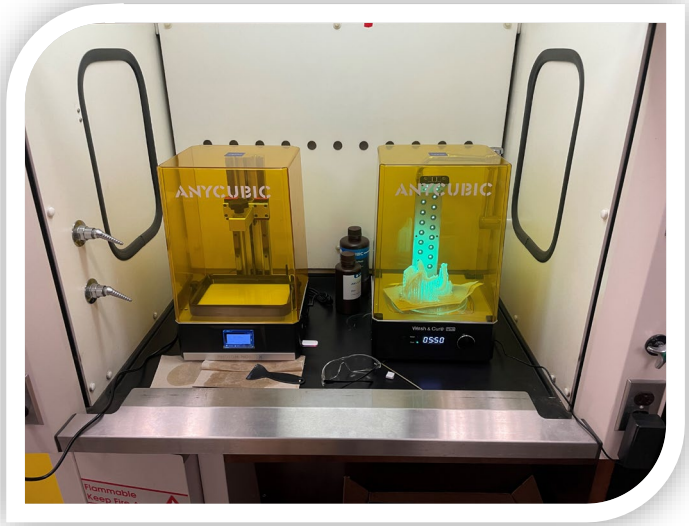
Reflective materials!!! : Reflective materials can reflect the laser and damage the machine or your eyes!!

PVC: PVC can produce very toxic fumes when cut and engraved.

Metal: Sadly, metal can't be engraved except in special circumstances, it can reflect the laser.

Vinyl: Vinyl like PVC can produce toxic fumes.

Materials of unknown composition: If you don't know what it is it can't go in the laser.



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