User Manual

Desktop laser engraving machine
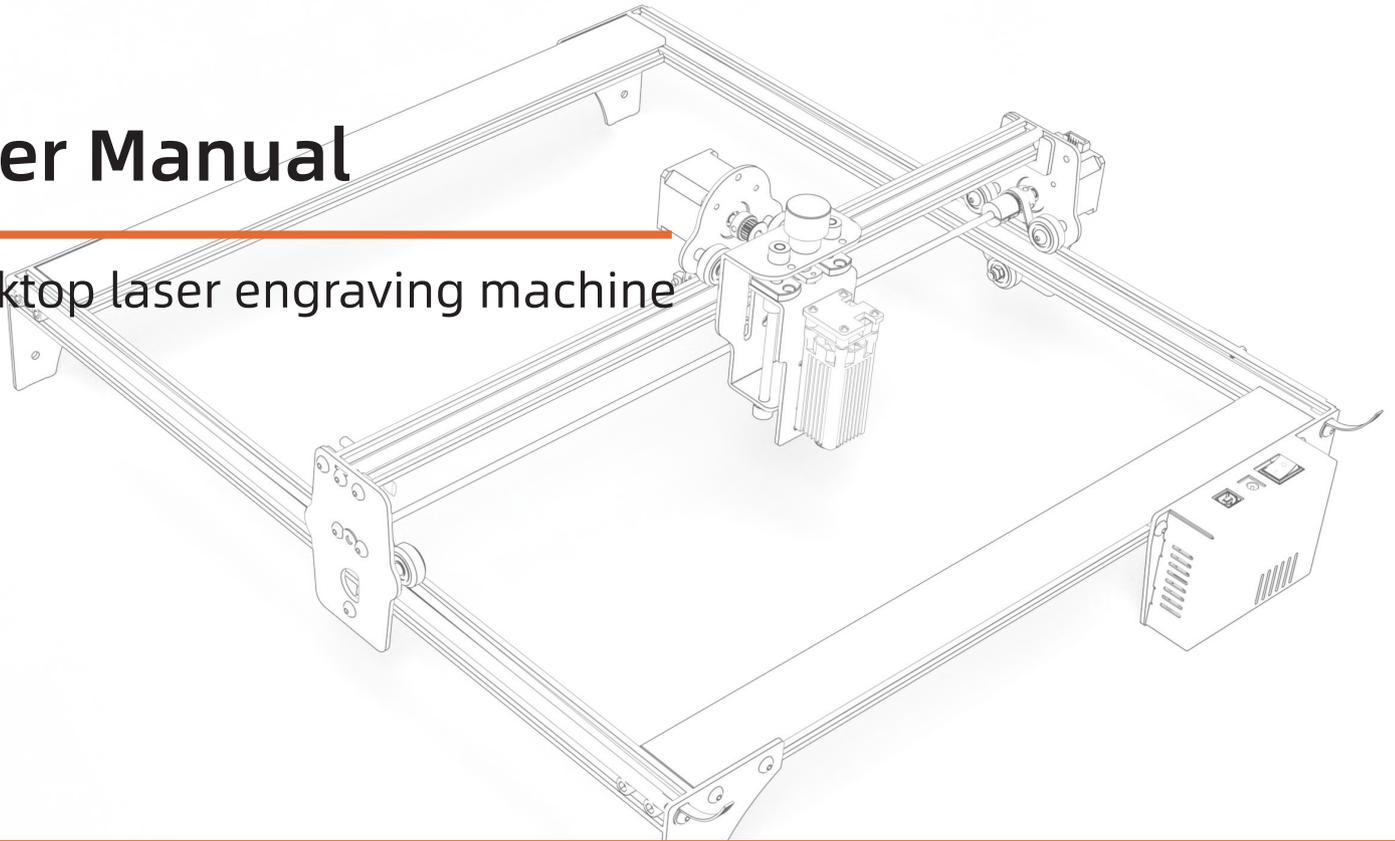
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1.Security Guide

Before using the laser engraving machine, please read this safety guide carefully, it mentions situations that require special attention and includes warnings of unsafe practices that can cause damage to your property or even endanger your personal safety.

⚠️ 1.1 Safety of Laser

- Our laser engraving machine uses Class 4 laser product. The laser is so powerful that it can cause eye injuries and burn the skin.
- We have installed a shield on the laser. To a large extent, the shield filters out the diffuse light from the laser spot. However, it is still recommended to wear laser goggles when using the laser engraving machine.
- Do avoid exposing your skin to Class 4 laser beam, especially at close range.
- Teens must be supervised by parents while using the machine.
- Do not touch the laser engraving module while it is switched on.

⚠️ 1.2 Fire safety

- The high intensity laser beam generates extremely high temperatures and heat due to it burns the substrate when it cuts.
- Some materials can catch fire during the cutting process, then creating gas and smoke.
- When the laser beam hits the material, usually, there will be a small flame. It will move with the laser and will not remain lit as the laser passes over it.
- Do not leave the machine alone during the engraving process.
- Do remember to clean the laser cutter of debris, scraps and flammable materials after use. Always keep a working fire extinguisher nearby.

- Safety against fumes or airborne contaminants: when you are using the laser engraving machine, fumes, vapors, particles are generated from the material (plastics and other flammable materials), there are potentially toxic. These fumes or airborne contaminants can be hazardous to health, so please use it in a ventilated place.

⚠ 1.3 Safety of Materials

- Do not engrave or cut materials with unknown properties.
- Materials Recommended: wood, wooden board, bamboo, leather, plastic, fabric, (kraft) paper, acrylic, felt, cork, cobblestone, black alumina, non-reflective stainless steel, etc.
- Materials not recommended: reflective metal, precious stones, transparent materials, reflective materials, etc.

⚠ 1.4 Safety of Use

- Be sure to use the engraving machine only in horizontal position and ensure that it has been securely fixed to prevent fires caused by accidental shifting or dropping from the workbench during work.
- It is forbidden to point the laser to people, animals or any combustible object, whether it is in working condition or not.

2.Introduction

- The laser engraving machine can be used for engraving and cutting.
- The laser engraving machine uses a fixed-focus laser. Traditional laser is zoom laser and is required to look directly at the laser spot to find a proper size. The fixed-focus laser only needs a positioning block to get the best engraving focal length.
- The light shielding sleeve helps us block most of the bright light, if we look directly at them, firstly the retina will be damaged and your vision will be reduced, secondly it will cause visual fatigue, decreasing productive and leaning efficiency. Thirdly, the light can inhibit the production of melatonin, which affects the quality of sleep. The light shielding sleeve can help to protect you from this damage.
- The laser engraving machine has a laser approximately 5.5W of power, and it can cut some boards and engrave on non-reflective stainless steel.
- The laser engraving machine supports PWM control (Pulse Width Modulation), which makes the engraved image more detailed.

3.Software installation and use

- The laser engraving machine supports the most popular software LaserGRBL, LaserGRBL is an open-source, easy to use and powerful software, but unfortunately LaserGRBL only supports Windows (Win XP / Win 7 / Win 8 / Win 10).
- Mac users can choose LightBurn, which is also an excellent engraver software, but this software needs to pay for $40. It also supports Windows.
- The laser engraving machine receives commands from the computer. It needs to stay connected to the computer, and Do not shut the engraver software down (LaserGRBL or LightBurn) during the engraving process. Since the calculations are done on the computer, the configuration of the computer will affect the speed and even the quality of the engraving.

- The following section will focus on the installation and use of LaserGRBL. For LightBurn, installation and configuration process will be briefly explained.

3.1 Instructions of LaserGRBL

3.1.1 Download

- LaserGRBL is one of the most popular DIY laser engraving software in the world, the download website of LaserGRBL is http://LaserGRBL.com/download/ .

3.1.2 Installation

- Double-click the software installation package to start the software installation, and keep clicking < Next > until the installation is complete.
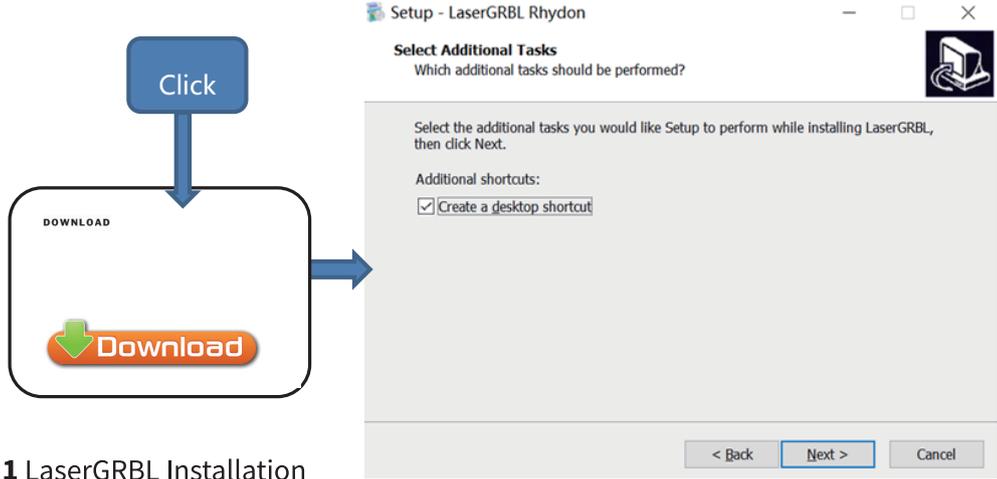

Figure 1 LaserGRBL Installation

- In addition, user can also download the laser engraving software customized by TronHoo, which has built-in text and image editing functions, and also comes with custom buttons. The download website of TronHoo's laser engraving software is: https://www.tronhoo3d.com/download/ (The installation method is the same as LaserGRBL).

3.1.3 Custom buttons

The software supports users to import custom buttons, you can import custom buttons in the software according to your usage. We recommend the official custom buttons from LaserGRBL. Custom button s download website is http://lasergr-bl.com/usage/custom-buttons/, the downloaded file of CustomButtons is shown as below:
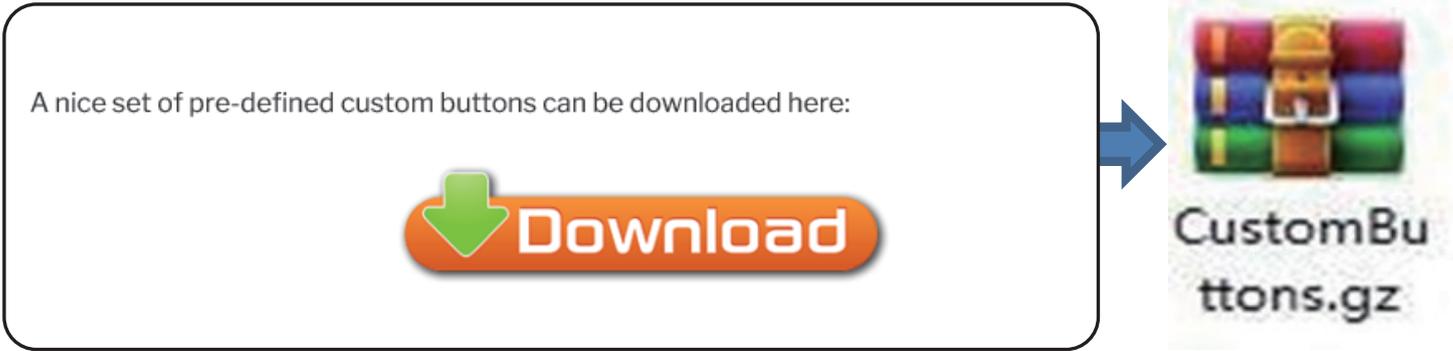
Figure 2 Custom Buttons

- Next, we will import the custom buttons into LaserGRBL. In LaserGRBL, right-click on the blank space next to the bottom button (as shown in Figure 3) -> Import custom button, then select the custom button zip file downloaded before to import, keep pressing Yes (Y) until no window pops up.
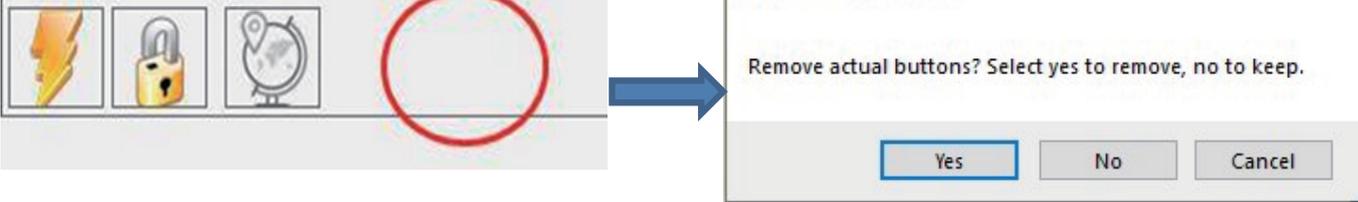

Figure 3 Import & loading of custom buttons

- The installed software is shown as the following figure.

If there are no custom buttons, you need to import, if there are, you don't need to import them. Hold the mouse on the button, its explanation will appear.
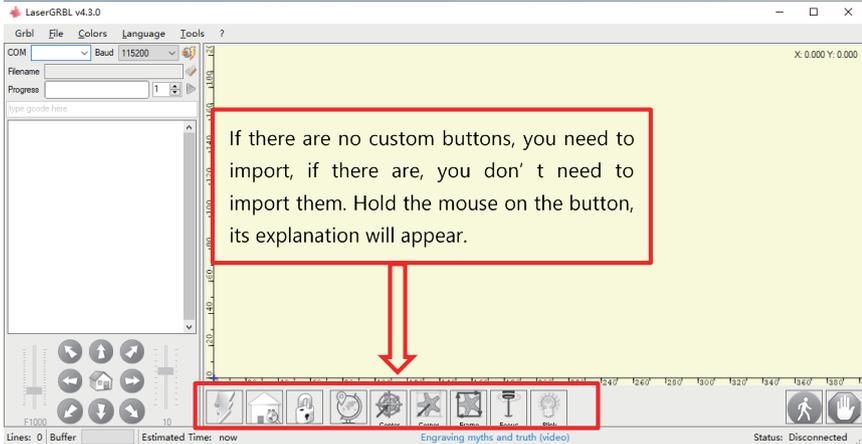
Figure 4 Interface of LaserGRBL

3.1.4 Custom buttons

(1) Connect the engraving machine to a computer with LaserGBRL installed.

(2) Plug in the power supply of the engraving machine.

(3) Open LaserGRBL.

(4) Select the correct port number and baud rate in the software - 115200, (In general, COM ports do not need to be selected manually, but if you have more than one serial device connected to the computer, it needs to do so, you can find the port of the laser engraving machine in the device manager of the Windows system, or you can simply try the port numbers displayed one by one).
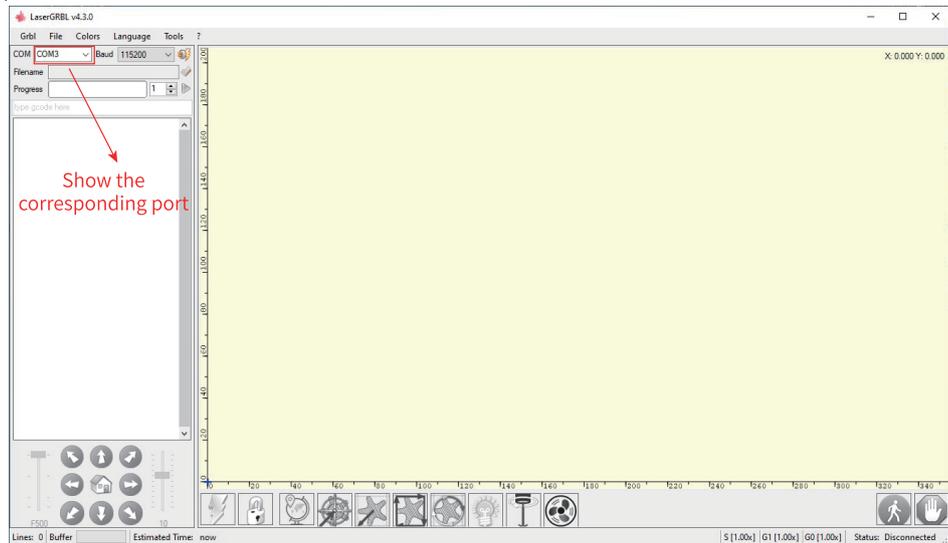

Figure 5 COM ports after connection

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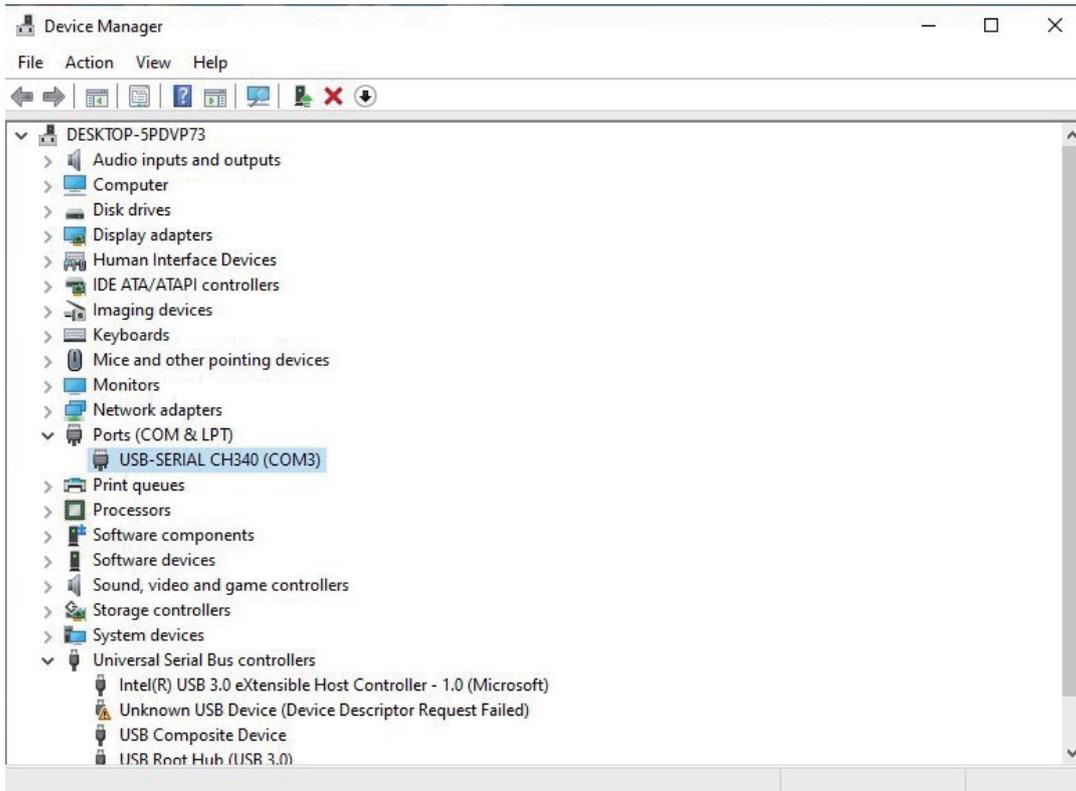
Figure 6 Check of COM ports

(5) First, install CH340 Driver. In LaserGRBL, click < Tools > -> < install CH340 Driver > to install the driver, and restart the computer after installation to connect.
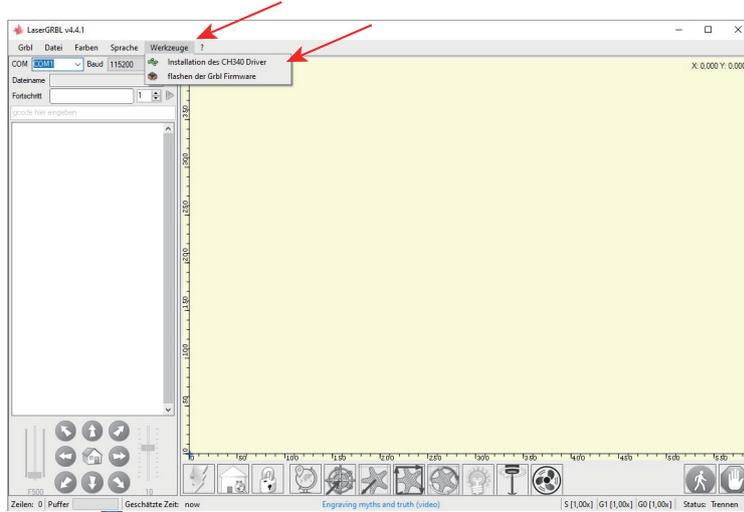

Figure 7 Driver installation
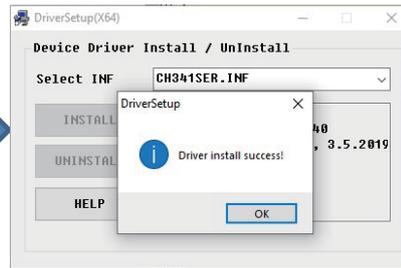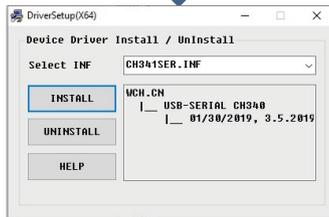
(6)   Flash Grbl Firmware settings.
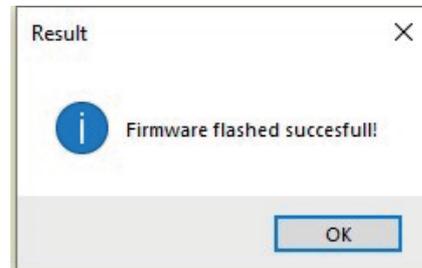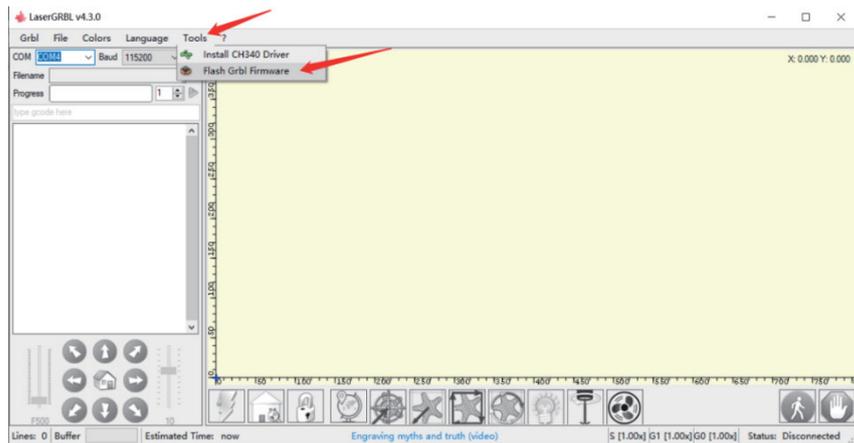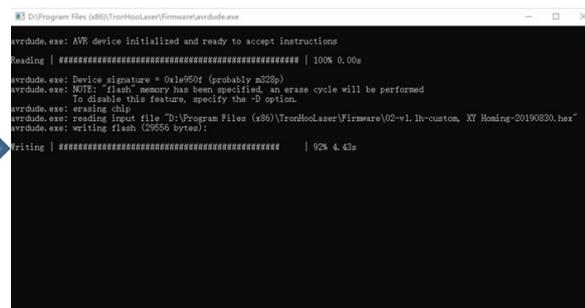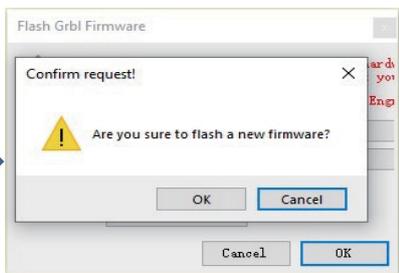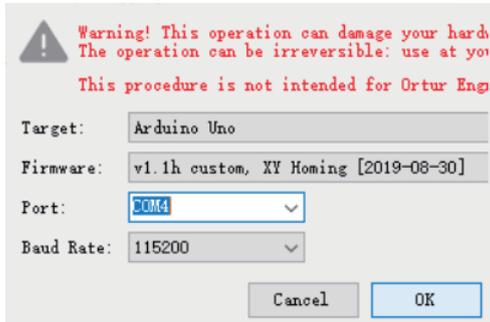
Figure 8 Flash Grbl Firmware settings

(7) Click on the lightning connection logo in the software. When the lightning logo changes to a red X, the connection is success.
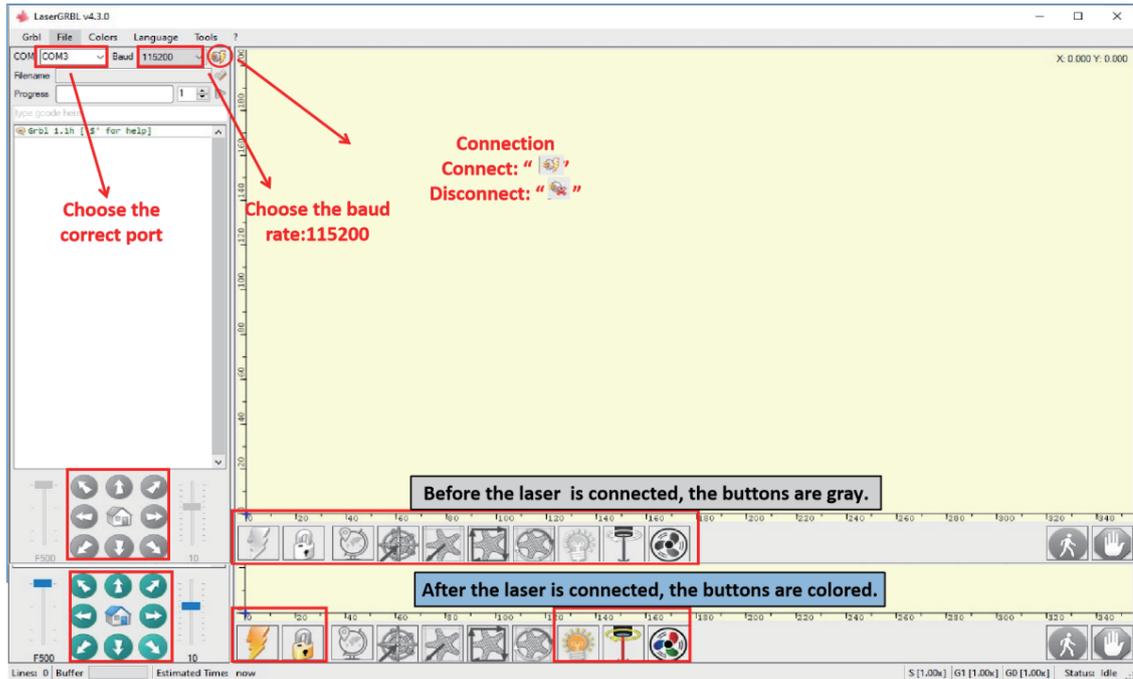
Figure 9 Connection of laser engraving machine

(8) Instructions of buttons.
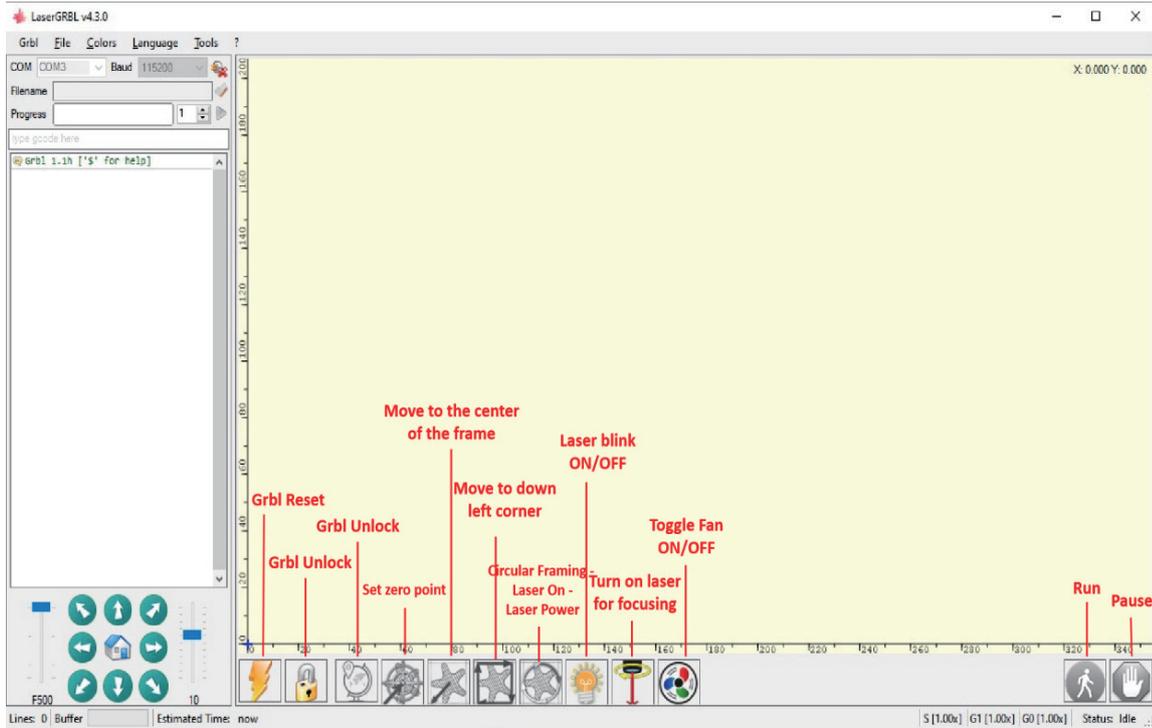
Figure 10.1 Instructions of buttons in LaserGRBL
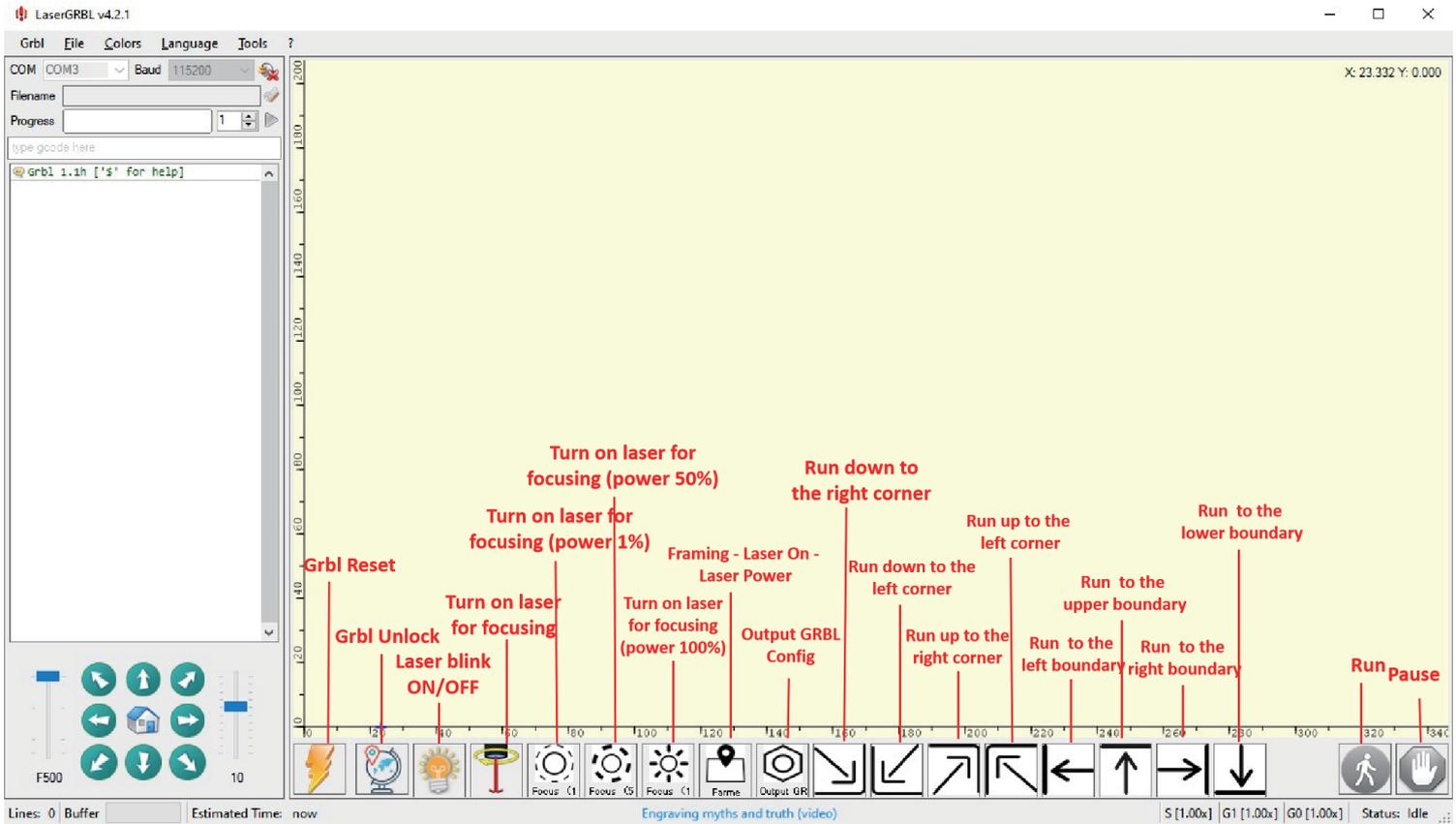
Figure 10.2 Instructions of buttons in the software customized by TronHoo

3.1.5 Parameter settings

(1) Selecting the engraving file: Open LaserGRBL, click <File> -> <Open File>, then select the images, LaserGRBL supports NC, BMP, JPG, PNG, DXF and other formats.
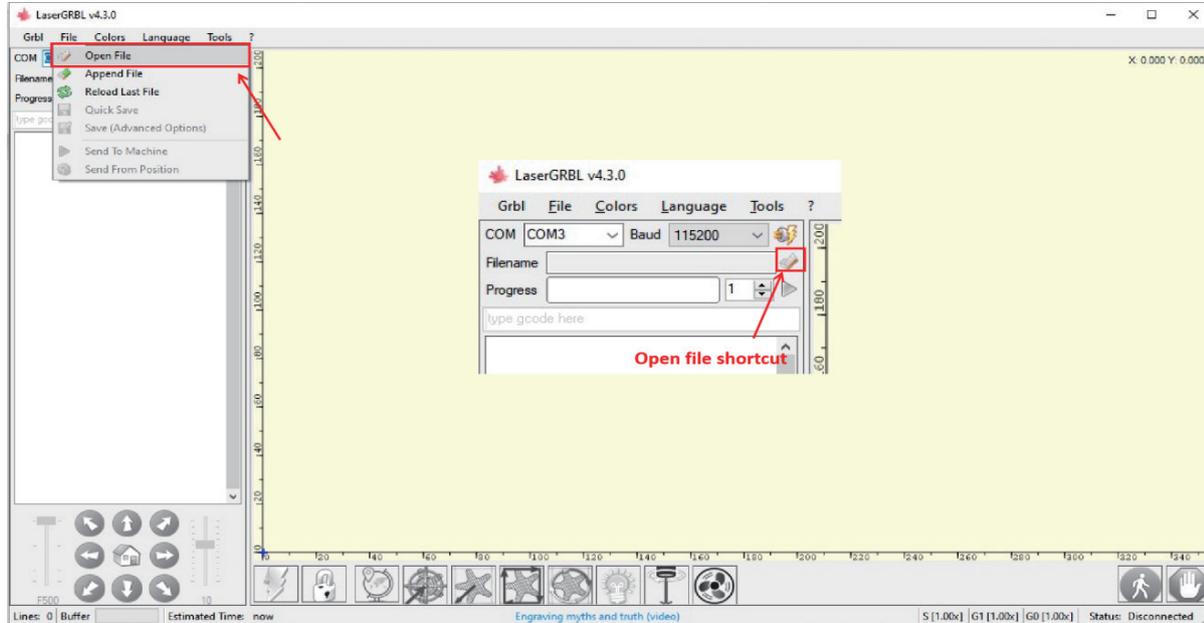
Figure 11 Open file

(2) Engraving parameter settings

a） LaserGRBL can adjust the brightness, contrast, white clip and other attributes of the target image, when adjusting the parameters of the image, the factual effect will be shown in the right preview window, and adjust it to your satisfaction.

b） It usually chooses "Line To Line Tracking" and "1bit BW Dithering" as engraving mode, "1bit BW Dithering" is more suitable for engraving grayscale graphics; If you are going to cut, please select the "Vectorize" or "Centerline" mode so it will cut along thin line.

c） Engraving quality essentially refers to the line width of laser scanning, this parameter mainly depends on the size of the laser spot of the engraving machine. Our laser engraving machine uses rectangular spot of 0.08*0.1mm, the core energy area of the spot size is about 0.08*0.1mm, so it is recommended to use the engraving quality range of 5-8 lines/mm, different materials respond differently to the laser, so the exact value depends on the specific engraving material.

d） At the bottom of the preview window, the image can also be rotated, mirrored, cut, etc.

e） After completing the above settings, click next to the settings of engraving speed, laser and engraving size.
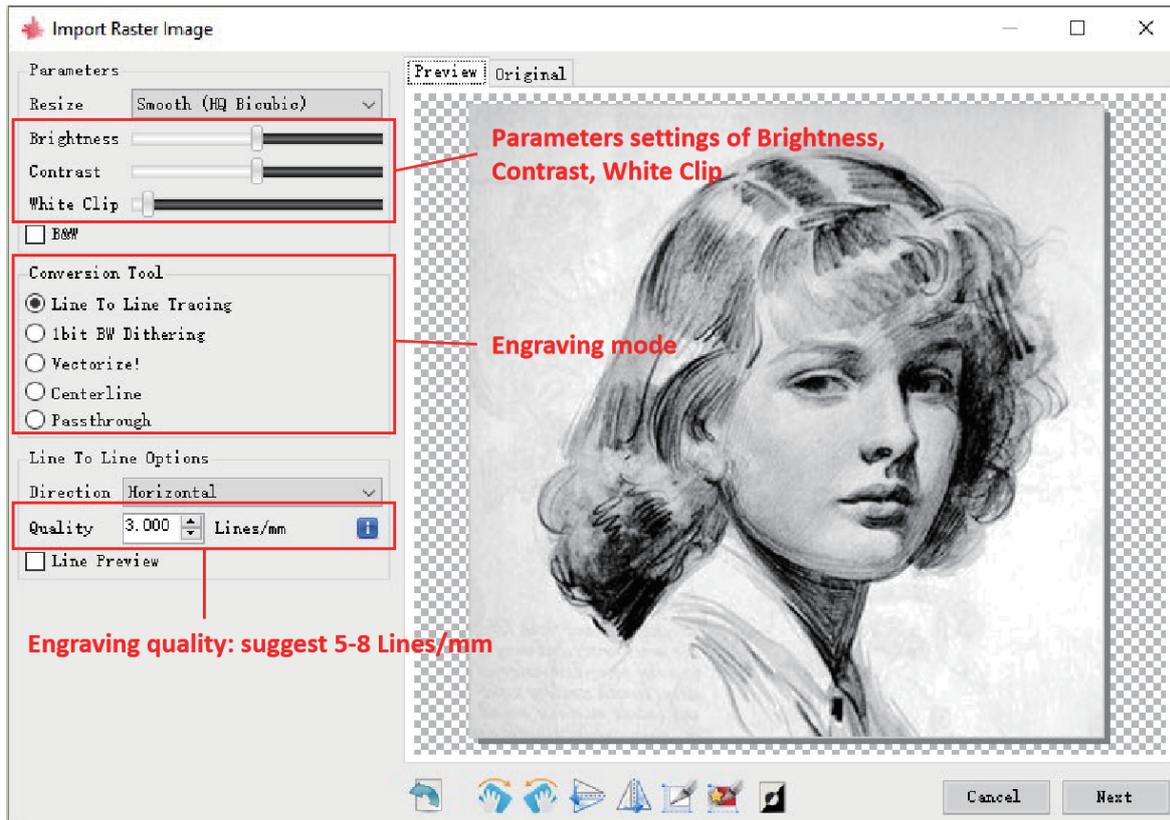
Figure 12 Introduction of parameter settings

(3) Engraving speed, engraving energy and engraving size setting

a） Please refer to the material reference table for the engraving speed. Choose different speeds according to the hardness of different materials. The engraving speed of different materials directly affects the engraving effect.

b） In the laser Options, there are two laser modes, M3 and M4. It is recommended to use M4 when engraving in the "1bit BW Dithering" mode, and M3 is recommended for other situations. If your laser only has M3, please check whether the laser mode is enabled in the GRBL configuration. For the description of GRBL configuration, please refer to the official description of LaserGRBL.

c） Choose different engraving energy according to different materials. We have attached engraving and cutting parameters of common materials at the end of the manual for your reference.

d） Finally, set the size, click on the < Create > button to complete the setting of all engraving parameters.
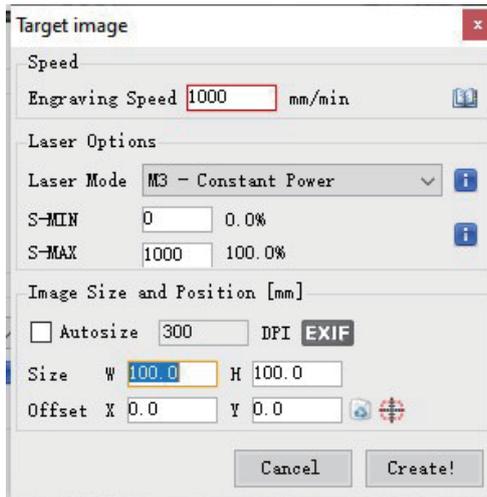
Figure 13 Setting of engraving speed, laser and engraving size

3.1.6 Positioning

(1)   First reset the engraving machine to zero, click the set to zero button, the laser head of the laser engraving machine will return to zero three times to the left front; after the engraving machine is reset to zero, the default engraving position is to start from the left front zero point, and the engraving object needs to be placed along the zero point.
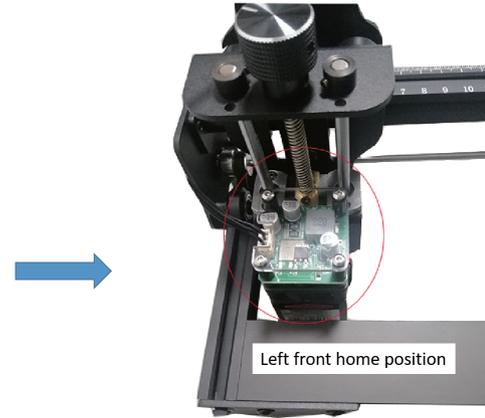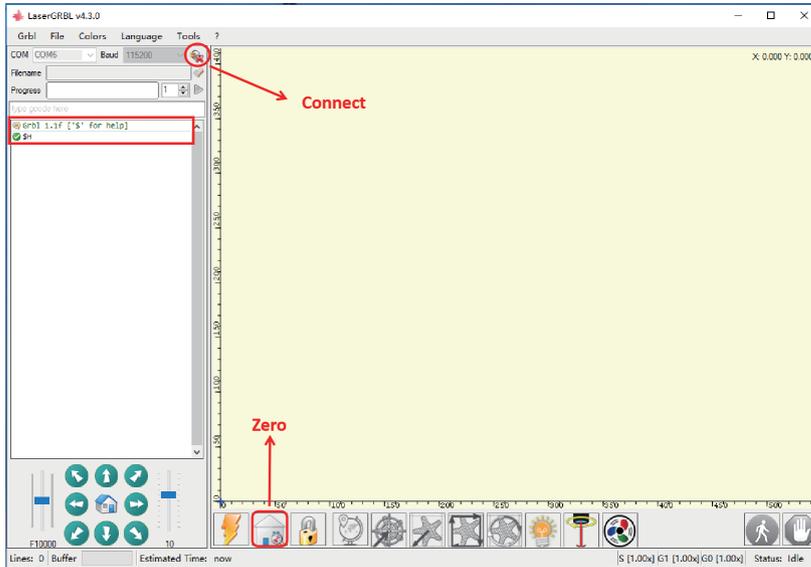
Figure 14 Laser reset

(2) Click the "contour scan" button, the laser head will start scanning the outer contour of the image. The contour scanned by the laser is the outer contour of the image on the computer. The position of the engraved object can be slightly adjusted again according to the position of the scanned outer contour. (Ps: You can adjust the position of the engraved item multiple times and click the preview button until the outer contour is the most ideal engraving position).
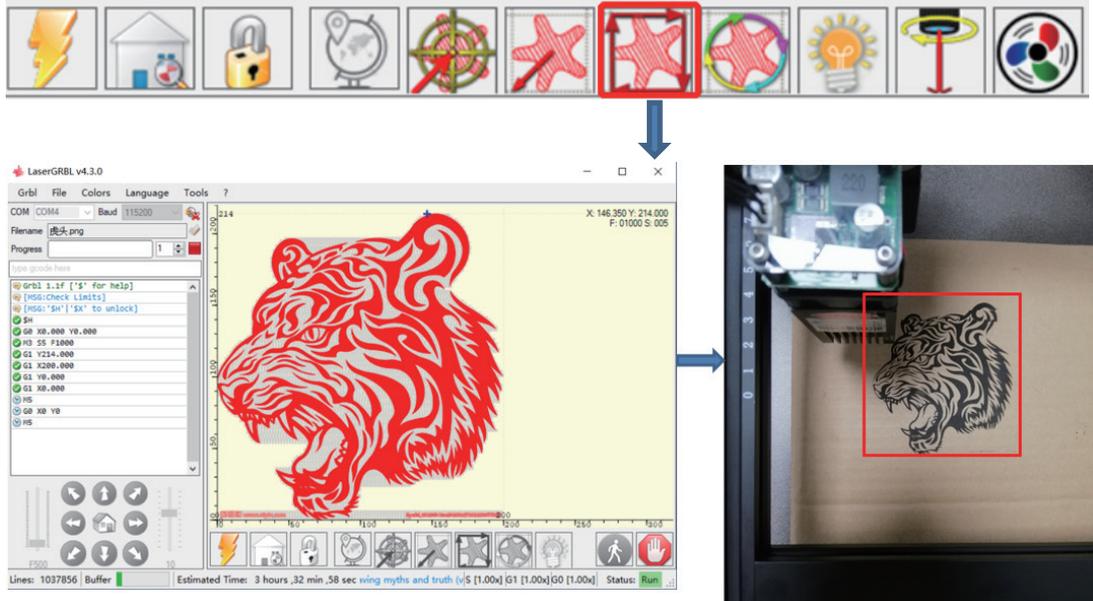
Figure 15 Preview of laser engraving area

3.1.7 Start and Stop engraving/cutting

(1) Start engraving/cutting
     After completing all the above settings, click the green button as shown in the figure to start engraving/cutting. Next to the start button, there is an editable number. This number is the number of times of engraving/cutting. LaserGRBL allows multiple consecutive operations on the same image. This function is especially useful for cutting.

Engraving times
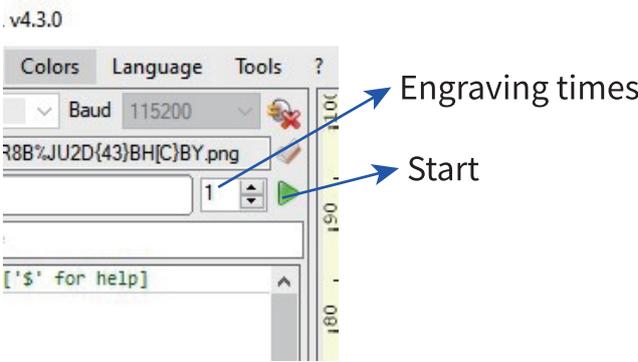
Start

Stop

Figure 16 Start engraving/cutting   **Figure 17 Stop engraving/cutting**
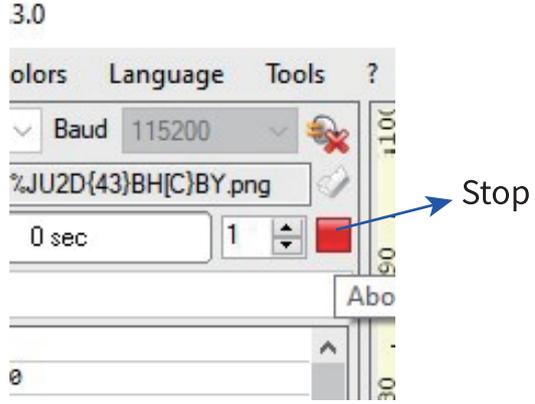
(2) Stop engraving/cutting
     If you want to stop the engraving/cutting midway, you can click the stop button as shown in the figure to stop engraving/cutting.

3.2 Instructions of LightBurn

(1) User can download the software installation package from the LightBurn website: https://lightburnsoftware.com/pages/trial-version-try-before-you-buy .

Figure 18 LightBurn installation package

(2) Double-click the software installation package to install, and click "Next" in the pop-up window. (Note: LightBurn is a paid software. For a better experience, we recommend that you buy the original version. Here we will demonstrate the installation of the trial version).
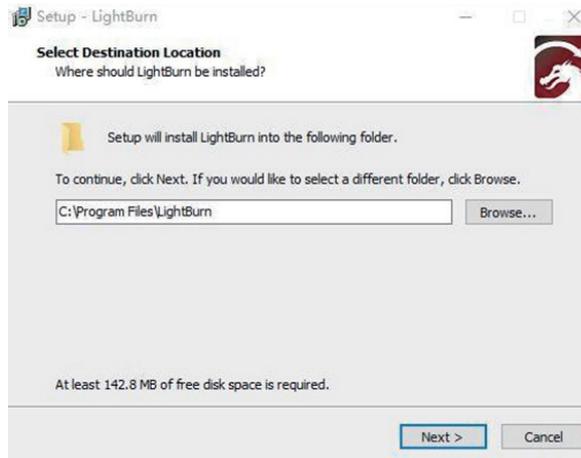
Figure 19 Chooseinstallationfolder

(3)　　Click to start a free trial.
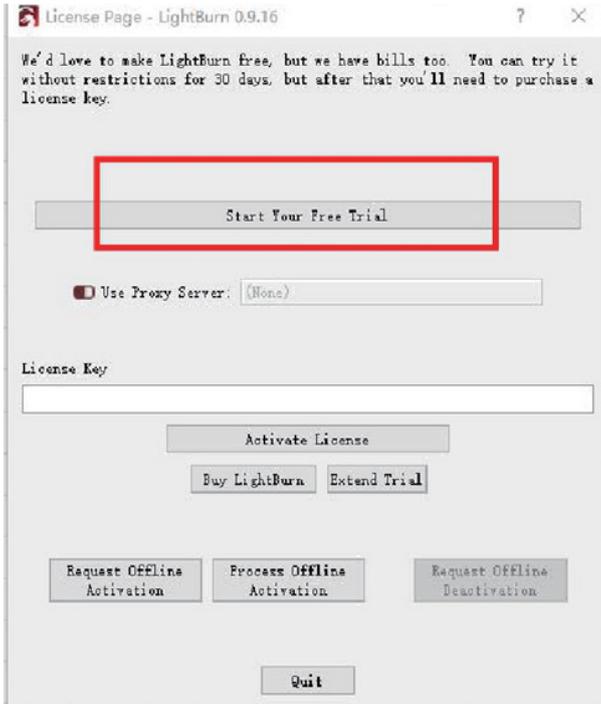
Figure 20 Startafreetrial

(4)　　Click < Find My Laser >.
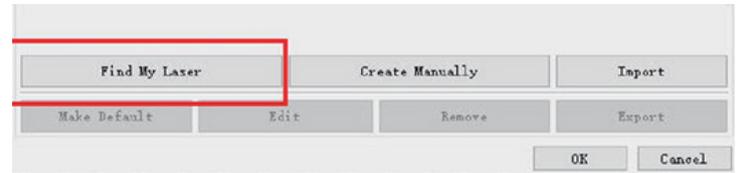
Figure 21 Findmylaser

(5) Click < Add Device >.
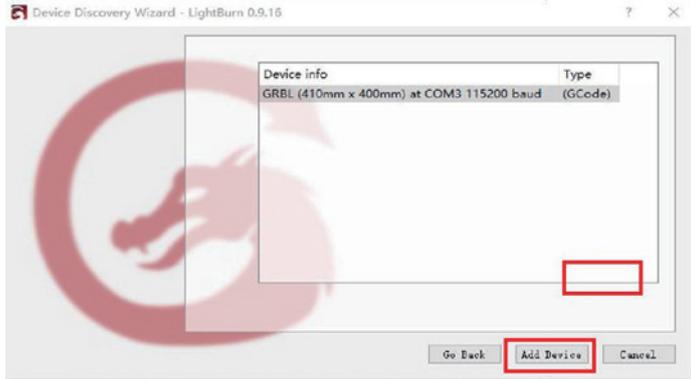
Figure 22 Adddevice

(6) Set the zero, usually set the zero at the front left, then the installation is complete.
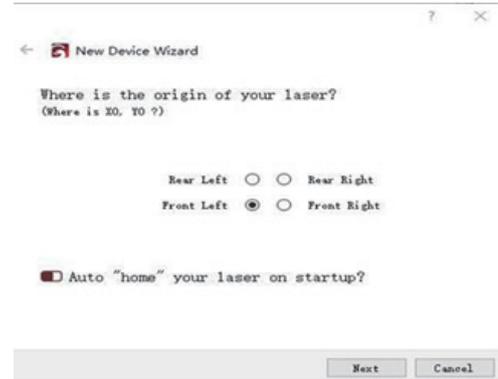
Figure 23 Setthezeroatthefrontleft

(7) If the software is not connected to the engraving machine, we can select the port of the laser engraving machine as shown in the figure below.
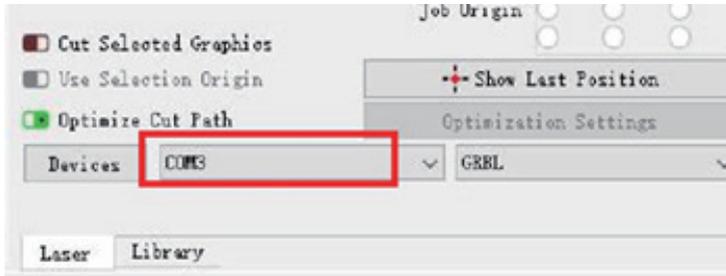
Figure 24 Select port

4.Tips for use

(1) Please keep the laser head and the engraved object at a fixed focus distance. If the laser head and the engraved object are too close, it will scratch the engraved object, causing the engraved object to shift and cause the engraving to fail.
(2) The core spot of the laser is a rectangular spot of 0.08×0.1mm with a width of 0.08mm in the horizontal direction and a length of 0.1mm in the vertical direction. It is recommended to use the vertical orientation for delicately carved models.
(3) Precise positioning of images and engraving objects.
    a) Move the laser head to the left front of the frame.
    b) Use a ruler and pencil to draw a center point on the carved object.
    c) The light shielding sleeve must be parallel to the edge of the engraved object.
    d) Click the following two buttons in turn to move the laser so that the laser point moves to the center of the engraving. After positioning is complete, you can start engraving.
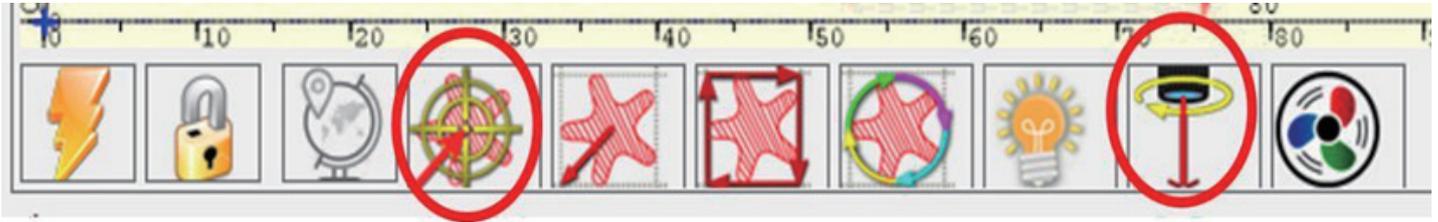
Figure 25 Centering

5.Recommended parameters for common materials

(1) Common materials and recommended engraving parameters

	Material	Engraved	Power	Speed (mm/min)	Times	Laser options	Quality (lines/mm)
	5W						
1	Kraft paper	YES	100%	2300	1	M4	8
2	Wooden board	YES	100%	1600	1	M4	7
3	Acrylic	YES	100%	450	1	M4	5
4	Light-colored Felt	YES	60%	4000	1	M4	5
5	Dark Felt	YES	60%	5000	1	M4	5
6	Bamboo	YES	35%	2500	1	M4	8
7	Leather	YES	80%	2000	1	M4	5
8	Cork	YES	20%	4000	1	M4	8
9	Wood	YES	100%	3000	1	M4	8
10	Cobblestone	YES	100%	100	1	M4	8
11	Black alumina	YES	100%	200	1	M4	8
12	Non-reflective Stainless steel (Matte surface)	YES	100%	80	1	M4	15
13	Non-reflective Stainless steel (smooth surface)	YES	100%	50	5	M4	15

5W Compressed Spot

	Materia	Engraved	Power	Speed (mm/min)	Times	Laser options	Quality (lines/mm)
1	Kraft paper	YES	100%	5200	1	M4	8
2	Wooden board	YES	100%	4000	1	M4	7
3	Acrylic	YES	100%	2400	1	M4	5
4	Light-colored Felt	YES	60%	4000	1	M4	5
5	Dark Felt	YES	60%	5000	1	M4	5
6	Bamboo	YES	35%	3500	1	M4	8
7	Leather	YES	80%	2500	1	M4	5
8	Cork	YES	20%	4500	1	M4	8
9	Wood	YES	100%	3000	1	M4	8
10	Cobblestone	YES	100%	600	1	M4	8
11	Black alumina	YES	100%	650	1	M4	8
12	Non-reflective Stainless steel (Matte surface)	YES	100%	300	1	M4	10
13	Non-reflective Stainless steel (smooth surface)	YES	100%	150	3	M4	10

1.6W						
	Materia	**Engraved**	**Power**	**Speed (mm/min)**	**Times**	**Laser options**	**Quality (lines/mm)**
1	Kraft paper	YES	100%	1900	1	M4	8
2	Wooden board	YES	100%	1500	1	M4	7
3	Acrylic	YES	100%	1200	1	M4	5
4	Light-colored Felt	YES	100%	3500	1	M4	5
5	Dark Felt	YES	100%	3000	1	M4	5
6	Bamboo	YES	60%	2400	1	M4	8
7	Leather	YES	100%	1800	1	M4	5
8	Cork	YES	35%	3000	1	M4	8
9	Wood	YES	100%	1700	1	M4	8
10	Cobblestone	YES	100%	100	1	M4	8
11	Black alumina	YES	100%	20	1	M4	8
12	Non-reflective Stainless steel (Matte surface)	NO	X	X	X	X	X
13	Non-reflective Stainless steel (smooth surface)	NO	X	X	X	X	X

(2) Common materials and recommended cutting parame-

				5W		
	Material	**Cut**	**Power**	**Speed (mm/min)**	**Times**	**Laser options**
1	Kraft paper (0.5mm)	YES	100%	1700	1	M3
2	Kraft paper (1.0mm)	YES	100%	400	1	M3
3	Kraft paper (2.0mm)	YES	100%	100	1	M3
4	Wooden board (1.0mm)	YES	100%	1200	1	M3
5	Wooden board (2.0mm)	YES	100%	340	1	M3
6	Wooden board (3.0mm)	YES	100%	110	1	M3
7	Acrylic (0.5mm)	NO	X	X	X	X
8	Acrylic (1.0mm)	NO	X	X	X	X
9	Acrylic (2.0mm)	NO	X	X	X	X
10	Light-colored Felt (1mm)	YES	100%	2500	1	M3
11	Dark Felt (2mm)	YES	100%	400	1	M3
12	Bamboo (1.0mm)	YES	100%	650	1	M3
13	Bamboo (2.0mm)	YES	100%	420	1	M3

5W						
	Material	Cut	Power	Speed (mm/min)	Times	Laser options
14	Bamboo (3.0mm)	YES	100%	200	1	M3
15	Leather	YES	100%	1200	1	M3
16	Cork	NO	X	X	X	X
17	Wood	NO	X	X	X	X
18	Cobblestone	NO	X	X	X	X
19	Black alumina	NO	X	X	X	X
20	Non-reflective Stainless steel (Matte surface)	NO	X	X	X	X
21	Non-reflective Stainless steel (smooth surface)	NO	X	X	X	X

5W Compressed Spot

	Material	Cut	Power	Speed (mm/min)	Times	Laser options
1	Kraft paper (0.5mm)	YES	100%	1700	1	M3
2	Kraft paper (1.0mm)	YES	100%	400	1	M3
3	Kraft paper (2.0mm)	YES	100%	100	1	M3
4	Wooden board (1.0mm)	YES	100%	1200	1	M3
5	Wooden board (2.0mm)	YES	100%	340	1	M3
6	Wooden board (3.0mm)	YES	100%	110	1	M3
7	Acrylic (0.5mm)	YES	100%	100	4	M3
8	Acrylic (1.0mm)	YES	100%	100	6	M3
9	Acrylic (2.0mm)	YES	100%	100	10	M3
10	Light-colored Felt (1mm)	YES	100%	2500	1	M3
11	Dark Felt (2mm)	YES	100%	400	1	M3
12	Bamboo (1.0mm)	YES	100%	650	1	M3
13	Bamboo (2.0mm)	YES	100%	420	1	M3

5W Compressed Spot

	Material	Cut	Power	Speed (mm/min)	Times	Laser options
14	Bamboo (3.0mm)	YES	100%	200	1	M3
15	Leather	YES	100%	1200	1	M3
16	Cork	YES	100%	750	1	M3
17	Wood	YES	100%	500	1	M3
18	Cobblestone	NO	X	X	X	X
19	Black alumina	NO	X	X	X	X
20	Non-reflective Stainless steel (Matte surface)	NO	X	X	X	X
21	Non-reflective Stainless steel (smooth surface)	NO	X	X	X	X

1.6W

	Material	Cut	Power	Speed (mm/min)	Times	Laser options
1	Kraft paper (0.5mm)	YES	100%	180	1	M3
2	Kraft paper (1.0mm)	YES	100%	50	1	M3
3	Kraft paper (2.0mm)	YES	100%	50	3	M3
4	Wooden board (1.0mm)	YES	100%	120	1	M3
5	Wooden board (2.0mm)	YES	100%	60	3	M3
6	Wooden board (3.0mm)	YES	100%	50	6	M3
7	Acrylic (0.5mm)	NO	X	X	X	X
8	Acrylic (1.0mm)	NO	X	X	X	X
9	Acrylic (2.0mm)	NO	X	X	X	X
10	Light-colored Felt (1mm)	YES	100%	750	1	M3
11	Dark Felt (2mm)	YES	100%	150	1	M3
12	Bamboo (1.0mm)	YES	100%	120	1	M3
13	Bamboo (2.0mm)	YES	100%	420	1	M3

1.6W

	Material	Cut	Power	Speed (mm/min)	Times	Laser options
14	Bamboo (3.0mm)	YES	100%	50	1	M3
15	Leather	YES	100%	400	1	M3
16	Cork	NO	X	X	X	X
17	Wood	NO	X	X	X	X
18	Cobblestone	NO	X	X	X	X
19	Black alumina	NO	X	X	X	X
20	Non-reflective Stainless steel (Matte surface)	NO	X	X	X	X
21	Non-reflective Stainless steel (smooth surface)	NO	X	X	X	X

6.FAQ

FAQ	Possible Causes	Solution
Where can I download the software?		https://lasergrbl.com/download/
The engraving machine cannot connect to LaserGRBL	Driver is missing, connection failed.	In LaserGRBL, click < Tools > -> < install CH340 Driver > to install the driver, and restart the computer after installation to connect.
	Multiple LaserGRBL software is opened repeatedly.	Please close LaserGRBL that is repeatedly opened.
	Incorrect port number.	Please choose the correct port number.
	Incorrect baud rate.	Please select the correct baud rate in the software - 115200.
	Data cable is not connected.	Please check whether the data cable is connected correctly.
	Computer USB port problem	Please try another USB port.

FAQ	Possible Causes	Solution
The engraving is not straight	Belt is not tight.	Please tighten the belt.
	Both ends of the belt screws are not locked.	Please tighten the positioning screws at both ends of the belt.
	The pulley is not locked and the laser head is shaking.	Please adjust the eccentric spacer under the bracket, and lock the eccentric spacer so that the bracket does not shake.
	Too much extension of the laser support causes the laser head to shake.	Raise the laser head as close to the top as possible to reduce the shake of the laser head
Why can't I engrave the image or the image is not clear?	Laser focus is not adjusted properly.	Please adjust the laser focus
	Engraving power is too low or engraving speed is too fast.	Please refer to the material reference table at the end of the manual to set engraving and cutting parameters.
	The imported image is not clear or the image processing is not ideal.	Please confirm whether the imported image is clear or the image processing is ideal.
	The engraving machine is not leveled and tilted.	Please check whether the engraving machine is leveled.
	There is dust or debris on the laser lens.	Please check whether there is dust or debris on the laser lens.

FAQ	Possible Causes	Solution
Can I engrave on curved objects?		Yes, but it is not recommended to engrave on objects with excessive curvature, which may cause distortion of the image.
How to improve the quality of engraving?		Please engrave with the parameters at the end of the manual as a reference.
		Please adjust the parameters gradually according to different materials to achieve the best results.