# THUNDER LASER SYSTEMS


## User's manual for NOVA-63

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**Original Instruction**

# Introduction

This manual has been designated as the thunder laser systems, laser cutting machine installation and user guide; The manual is divided into five chapters, Including general information instructions, safety instructions, the key components of every laser cutting systems and the installation steps, operation instructions and maintenance instructions from THUNDERLASER Company.

Frist, it should be emphasized that the installation of each system must meet the requirements, and make it consistent with the installation requirements of THUNDERLASER. If not, the machine will not working properly, poor performance, life shortened, maintenance costs increased and even machine damage .

The note is for getting a specific requirement of system installation, and we hope every customer try to understand these notes before installation and usage, thus you can correctly install and use. If you meet any installation problems, you can contact our technical staff and customer service staff. **(At the same time, you can also refer to the machine installation video that we posted on youtube. The specific URL is**

**http://www.thunderlaser.com/how-to-use-your-laser-machine Or https://www.youtube.com/watch?v=NpLo1L0NQx8&list=PLjSZrgjcrhs7QucNN-3jx7rZapDGfjG-5 .)**

# Contents

# Chapter1 General

## 1.1 General Information

**Caution:**

Please read and follow this Operation Manual carefully, before installation and operation. Damage to persons and/or material can result from not following individual points of the Operation Manual!

Operation of the system is only permitted with equipment and spare parts supplied or listed in the spare parts and consumables lists.

Auxiliary equipment must be adjusted to the base machine (any queries to dealer or manufacturer).

The following symbols are used for easier understanding of the Operation Manual:

Caution: This component is under voltage. In these areas strictly observe the safety instructions regarding electricity. Care is to be taken in particular during maintenance and repair work.

Caution: In this area pay attention to the possible dangers of the laser beam.

Caution: Warning of hand injury

Caution: Indicates the potential for fire danger when operation the laser. Do operate the laser machine when unattended

Tips: Note or information on individual components of the device that simplify the use or make it more understandable.

## 1.2 Designated

The THUNDER LASER NOVA-63 is used for engraving and cutting of signs, stamps and suchlike.

A wide variety of materials such as rubber, acrylic, coated metal, tin, special steel, anodized aluminum, cork, cardboard, glass, leather, marble, several plastics and wood can be processed on the laser.

1. The engraving process must only be performed with a perfectly adjusted machine.

2. For cutting applications with 100 W the use of the cutting table is absolutely necessary.

3. Use of the system in other areas is against the designated use. The manufacturer does not admit liability for damage to personal and/or equipment resulting from such use.

4, The system must only be operated, maintained and repaired, by personnel that are familiar with the designated field of use and the dangers of the machine!

5. Non-observance of the instructions for operation, maintenance and repair described in this Operation Manual excludes any liability of the manufacturer if a defect occurs.

6. Caution when processing conductive materials (carbon fibers), Conductive dust or particles in the ambient air might damage electrical components and lead to short circuits. Bear in mind that those defects are not warranted.

## 1.3 Disposal remarks

**Do not dispose the machine with domestic waste!**

Electronic devices have to be disposed according to the regional directives on electronic and electric waste disposal. In case of further questions, please ask your supplier. He might take care of proper disposal.

## 1.4 Technical Data / Device Specification

### Mechanics

| | |
|---|---|
| Working area | 63.0“x 39.4“/ 1600 x 1000 mm |
| Table Size | 66.9“x 44.5“/ 1700 x 1130 mm |
| Z Axis Height | 9.1 inch / 230 mm |
| Max. Height of work piece (Motorized Table, Standard laser head) | 9.1 inch / 230 mm |
| Max. Height of work piece (No Motorize Table, Standard Laser head) | 1-2.1 inch /27- 55mm |
| Max. Engraving speed | 39 inch/sec. / 1000 mm/sec. Standard |
| Cutting speed | depending on material, thickness, laser power |
| Motor | Easy Servo Motor |
| Drive | Hybrid Servo Drive |
| Work piece table | Solid metal (Honey comb table) |
| Max. load of work piece table | 30 kg |
| Net Weight | 370kgs (816lbs) |
| Lenses available (focal distance) | 2, 0” |
| Focus lens diameter | 20mm |
| Reflector diameter | 25mm |
| Beam combiner diameter | 25mm |

### Dimensions

| | |
|---|---|
| W x D x H | 86.6“x 59.3“x 40.9“/ 2200 x 1505 mm x 1040 mm |

### Max Part Size (W x L x H)

| | |
|---|---|
| Front Door Closed | 66.9“x 44.5“x 10.6“/ 1700 x 1130 mm x 230 mm |
| Pass-Through Door | 66.9“ x∞“x 1.2“/ 1700 x∞mm x 20 mm |

### Features

Standard:

Red Dot Pointer, Auto Focus, Motorized Table, Pass-Through Door, Air Assist, Water Pump, Exhaust Fan, Honey Comb Table, 2,0”(50.8mm)Focus Lens, Easily Adjustable Home Position, LCD Display, 3D Engraving, “No Water “protection, Emergency Stop, Maintenance mode, Open cover protection, TL-Timer, The warning light.

Optional:

Rotary Attachment, Water Chiller Attachment, High Resolution head (up to 1000DPI, while standard laser head Max is 500DPI), High air compressor set (Includes water filter).

### Control System

| | |
|---|---|
| Laser power | Adjustable from 2 - 95% (typically 12-95%) |
| Interface Hardware | USB: connect to PC and U-disk |
| | Ethernet: connect to PC |
| Interface Software | RDWorksV8 |
| Operating Modes | Optimized raster, vector, and combined mode |
| Buffer Memory | 128 MB Standards |

## Laser Equipment

| | |
|---|---|
| Laser Type | Sealed CO2 Glass Laser Tube |
| | Laser Power: 80W, 100W, 130W, 150W |
| Wavelength | 10, 6μm |
| Red dot pointer | Laser Power< 5mW |
| Wavelength | 630nm – 680nm |

## Cooling System

| | |
|---|---|
| Air Cooling System | Air-Cooled |
| Water Cooling System | Water Cooled |

## Electricity, Power, Fuse

| | |
|---|---|
| Electricity Requirement | 110 to 240 volts, 50 or 60 Hz, Single phase |
| Power consumption | 1400W (Assembly 80Watt Laser Tube) |
| | 1500W (Assembly 100Watt Laser Tube) |
| | 1700W (Assembly 130Watt Laser Tube) |
| Recommended fuse | 15A, 230V (80W/100W Laser Tube) |
| | 20A, 115V (80W/100W Laser Tube) and 20A, 230V (130W Laser Tube) |
| | 25A, 115V (130W Laser Tube) |

## Ambient Conditions

| | |
|---|---|
| Ambient temperature | +15°C to +35°C / 59°F to 95°F |
| Humidity | 40% to max. 70%, not condensing |

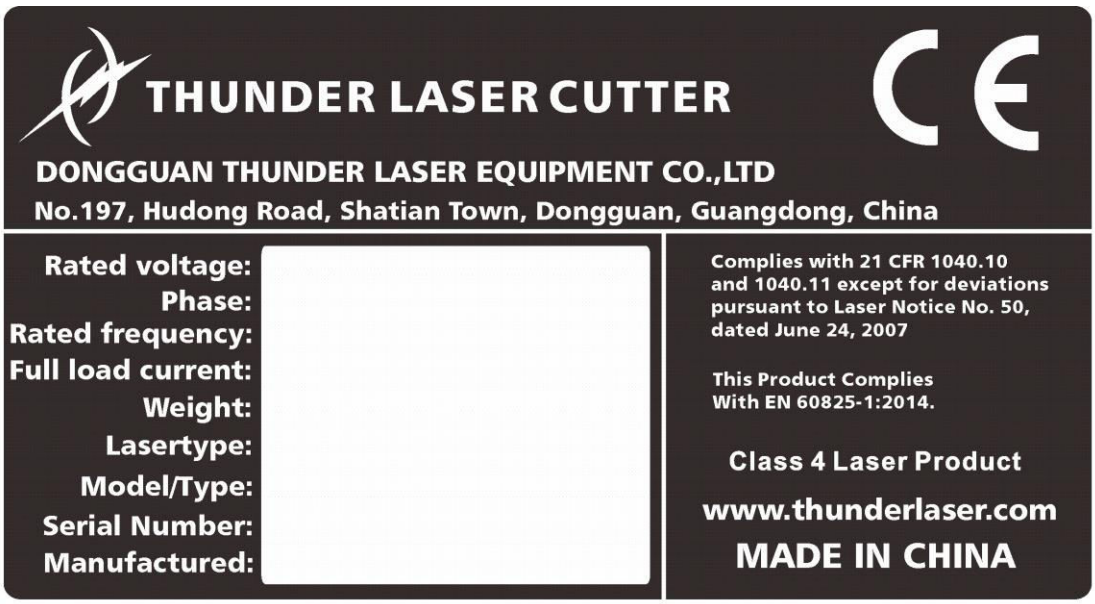
## Laser Safety

| | |
|---|---|
| Laser class | CDRH Laser Safety |
| | Laser Class 4(H) |
| | CE compliant FDA approved |

## 1.5 Manufacturer's Label

The manufacturer's label is located on the back of the device (see Figure below).

It is recommended to enter data such as serial number and year of manufacture into the Manufacturer label below so that you always have this data handy if you have problems with your device or require spare parts.



# Chapter 2 Safety

## 2.1 General Safety Information

All personnel involved in installation, set-up, operation maintenance and repair of the machine, must have read and understood the Operation Manual and in particular the "Safety" section. The user is recommended to generate company-internal instructions considering the professional qualifications of the personnel employed in each case, and the receipt of the instruction/Operation Manual or the participation at introduction/training should be acknowledged in writing in each case.

### Safety-conscious of Working

The machine must only be operated by trained and authorized personnel.
The scopes of competence for the different activities in the scope of operating the machine must be clearly defined and observed, so that under the aspect of safety no unclear questions of competence occur. This applies in particular to activities on the electric equipment, which must only be performed by special experts.
For all activities concerning installation, set-up, start-up, operation, modifications of conditions and methods of operation, maintenance, inspection and repair, the switch-off procedures that may be provided in the Operation Manual must be observed.

### Safety Information for the User and/or Operating Personnel

1. No working methods are permitted that affect the safety of the machine.

2. The operator must also ensure that no unauthorized persons work with the machine (e.g. by activating equipment without authorization).

3. It is the duty of the operator, to check the machine before start of work for externally visible damage and defects, and to immediately report changes that appear (including behavior during operation) that affect the safety.

4. The user must provide that the machine is only operated in perfect condition.

5. The user must guarantee the cleanness and accessibility at and around the machine by corresponding instructions and controls.

6. Principally, no safety components may be removed or disabled (already here we emphasize the imminent dangers, for example severe burns, loss of eye-sight). If the removal of safety components is required during repair and service, the replacement of the safety components must be performed immediately after completion of the service and repair activities.

7. Preparation, retooling, change of work piece, maintenance and repair activities must only performed with equipment switched off, by trained personnel.

**8.** It is forbidden to perform unauthorized modifications and changes to the machine. It is emphasized, that any unauthorized modifications to the machine are not permitted for safety reasons.

## 2.2 Laser Safety Information

**1.** To assess the potential dangers laser systems pose, they are classified into 4 safety classes, thunder laser NOVA-63 is a device of class 4. This is guaranteed by the protective housing and the safety installations.
Please note that improper and warranty operation of the device can override the status of Safety class 4 and can cause the emission of harmful radiation.

**2.** This laser engraving system contains a carbon dioxide (CO2) laser of class 4 that emits intensive and invisible laser radiation. Without safety precautions the direct radiation or even diffuse reflected radiation is dangerous!

**3.** Without safety precautions, the following risks exist with exposure to laser radiation:
Eyes: Burns to the cornea
Skin: Burns
Clothing: Danger of fire

**4.** Never try to modify or disassemble the laser and do not try to start up a system that had been modified or disassembled!

**5.** Dangerous radiation exposure can result from the use of operation or adjustment equipment other than that described here, and if different operational methods are performed.

## 2.3 Safety Precautions when Operating the Device

In your thunder laser NOVA-63, a closed safety system is integrated which immediately stop a job when the protection cover is opened. Consequently an incomplete engraving can occur if the cover is opened during operation. Therefore, first press the "PAUSE" button, if you want to interrupt an engraving process.

**Please remember the following safety precautions when working with this device:**

CO2 Fire extinguishers should be placed near laser
Do not store any flammable materials in the inside of the device. Particularly leftovers of produced materials have to be removed to prevent fire hazard.

Please maintain Free air-flow surrounding this system. At all times, do not cover during operation.

These lasers emit invisible radiation; safety glasses should be worn when maintenance these machines for your protection.

Do not disable limit switches or safety features as this can invalidate warranties and cause damage to you and the machine.

Do not leave the laser unattended when it is working, small scraps can ignite and without supervision can destroy the machine if not checked.

Adjustment of the beam path must be performed only by especially trained personnel. An improper setting can lead to uncontrolled emission of the laser radiation.

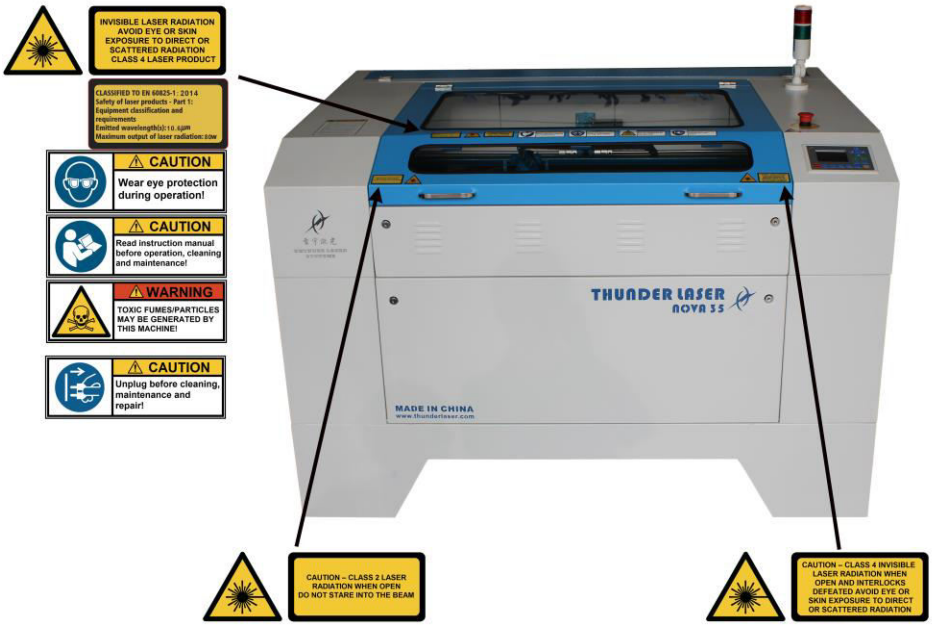
Before processing materials the user must verify, whether harmful materials can be generated and whether the filter equipment of the exhaust system is suitable for the harmful materials. We emphasize that it is the responsibility of the user, to consider the national and regional threshold values for dust, fogs and gases when selecting the filters and the exhaust system. (The values for the maximum workplace concentration must not be exceeded.)

PVC (polyvinyl chloride) must under no circumstances be processed with the laser.

**Should you have further questions before starting work, please feel free to write us an email at: tech@thunderlaser.com**

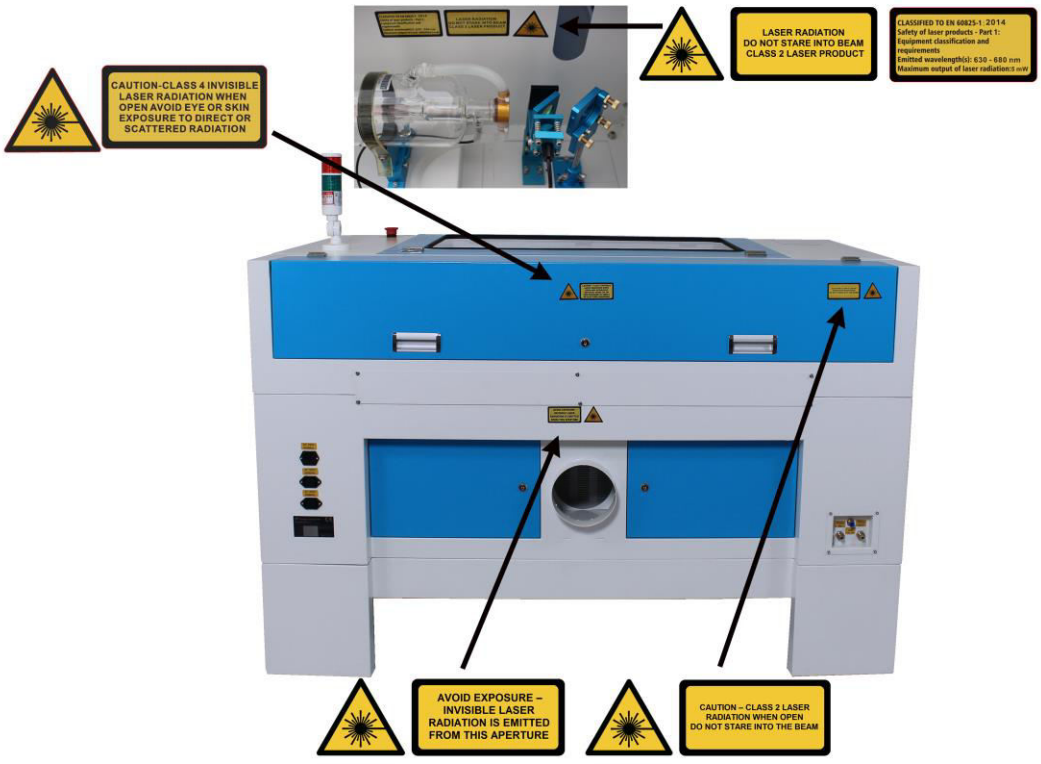
## 2.4 Warning and Information Labels

The warning and information labels are attached in such positions of the device that could represent a source of danger during set-up and operation. Therefore, follow the information on the labels. If labels are lost or damaged, they must be replaced immediately.





EMERGENCY
STOP
CAUTION – CLASS 2 LASER RADIATION WHEN OPEN DO NOT STARE INTO THE BEAM
CAUTION-CLASS 4 INVISIBLE LASER RADIATION WHEN OPEN AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION
CAUTION
Dangerous voltage!
Take care to avoid coming into contact with electricity!


CAUTION-CLASS 4 INVISIBLE LASER RADIATION WHEN OPEN AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION
LASER RADIATION DO NOT STARE INTO BEAM CLASS 2 LASER PRODUCT
AVOID EXPOSURE – INVISIBLE LASER RADIATION IS EMITTED FROM THIS APERTURE
CAUTION – CLASS 2 LASER RADIATION WHEN OPEN DO NOT STARE INTO THE BEAM

# Chapter 3 Process of Installing

## 3.1 Unpacking

You receive your THUNDER LASER NOVA-63 packed in a wooden box, which contains the laser machine and additional accessories. The following steps give you an overview of the unpacking and assembly of the laser. Please follow these steps carefully.

Tips: Keep the packing box. You will require it in case of a return.

Dispose all waste according to the applicable waste disposal law.

**1.** Put the wooden box on a flat and spacious room for unpacking.

**2.** Remove the machine box; carefully remove the foam material, which protects the viewing window of the cover and around the machine.

**3.** Take out the key，open the door of the laser，Remove the accessories box which contains all accessory parts required for the installation of the laser machine.
And check if there's anything damaged or missed during shipping.

**4.** You will see an attachment table on the machine; please check whether the accessories are all on the table.

**5.** Please keep the keys and the warranty certificate well (and please show us your warranty certificate if you need tech support for the machine failure, then we will provide you the best technical service).

**6.** Remove the sponge and nylon cable ties from inside the machine, and then start to install the machine (below chapters are installation details)

## 3.2 Location

Before you install the laser system, you should select an appropriate location. Follow the guidelines shown below:

1. Avoid locations where the system is exposed to high temperatures, dust and high humidity. (The humidity must not exceed 70% and the temperature must not be close to the dew point.)
2. Avoid locations, where the system is exposed to mechanical shocks.

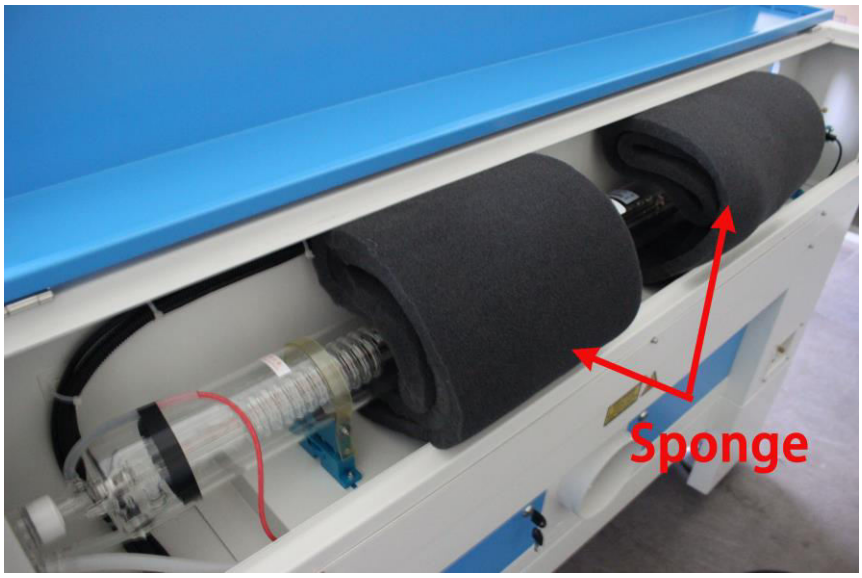
1. Fuse protection:
   Do not connect other devices via the laser fuse, as the laser system requires the full amperage.

## Tips:

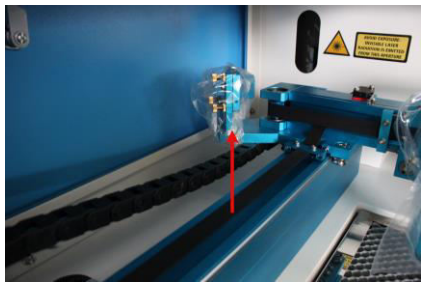
1. Avoid locations with poor air circulation.
2. Select a location, whose room temperature is between 15 °C and 25 °C (59° – 77° F). Avoid higher ambient temperatures and strong exposure of the engraver to the sun. Use blinds, if required.
3. Select a location close to ventilation (if available).
4. Select a location that is not more than 4.50 m away from your computer (max. cable length to avoid disturbing interferences).
5. Try to place a working table or a place to put things next to it. This shall avoid, that the machine is misused as a table.

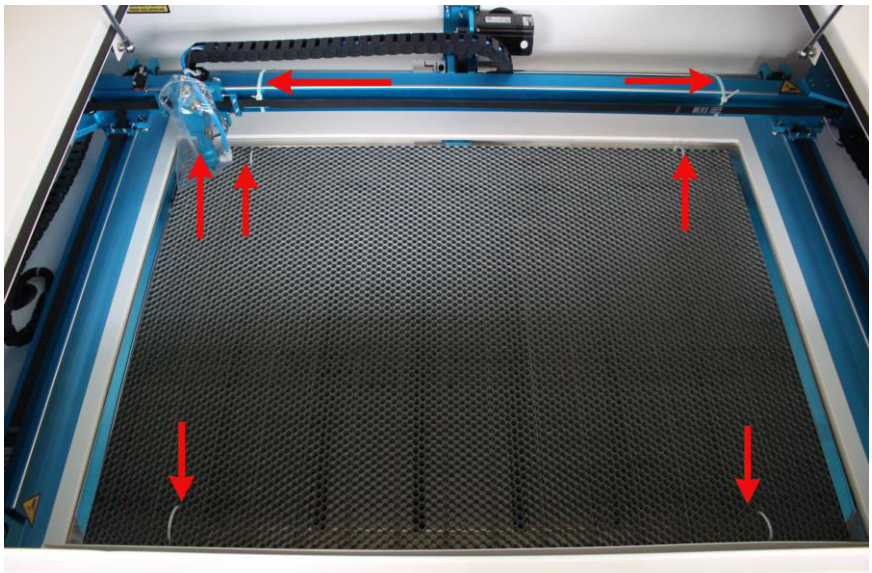
## 3.3 Before Installation

1. **Take out the sponge around the laser tube.** Like below:




2. **Take out the nylon cable ties around the honey comb plate and X axis. Remove the transparent bag out of the first mirror mounts, the second mirror mounts, the third mirror mounts and the standard laser head.** Like below:





PS: The lid with a set of key and a manual focusing tool for users

3. **Open the emergency switch (must do it for the first time to use the machine).**
   Like below


4. **After carried the machine into room, please re-fix the foot of the four corners.**
   Please refer to below shown:

## 3.4 Exhaust System – Requirements

To guarantee the right ventilation during the engraving and the cutting. The device must be equipped with a fine exhaust fan(generation of rubber dust), if you use an carbon filter (neutralization of smells) will be better for exhaust effect. A good exhaust fan of the outgoing air is also required when cutting plastics or engraving wood.

Connection - see section 3.7.3 connecting the Exhaust System.

Do not start the machine without an adequate exhaust system.

## 3.5 Air System – Requirements

To guarantee do not catch file and too much smoke during the engraving and the cutting. The device must be connecting with the laser to make sure the laser is safe during the work.

## 3.6 Computer – Requirements

The following recommendation represents the minimum requirements. When using a more powerful computer the graphics are generated and displayed faster and the computing times and the data transfer to the laser are reduced. To use the newest software version, you might have to abide other requirements.

- Windows 10 (32 bit or 64 bit )
- Windows 8 (32 bit or 64 bit )
- Windows 7 (32 bit or 64 bit )
  Windows Vista (with Service Pack 1 or later)
  Windows XP (with Service Pack 2 or later)
- 1024 MB of RAM, 400 MB of hard disk space
- Pentium® 3 or 4 processor or AMD Athlon™ XP
- 1024 x 768 or better monitor resolution
- 1 free USB interface
- 1 free Ethernet interface
- Mouse

## 3.7 Connections

Perform the connections exactly in the order described; otherwise electrostatic charging can damage your computer and/or the electronics of the laser system.

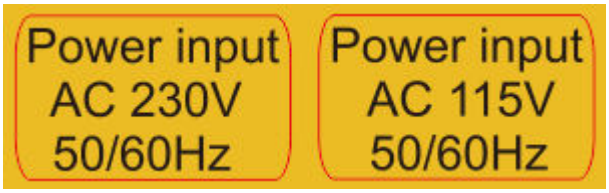
### 3.7.1 Connecting the Mains

Connect one end of the mains cable with the connection socket at the rear side of the laser device (see Figure below) and the other end with a protected power outlet.

Mains voltage and operating voltage must correspond (AC 230V 50/60 Hz or AC 115V 50/60 Hz) – see information label beside the connection socket.

The machine (certain) Power Cable for each country was put inside the Tool box with machine.

Under no circumstances switch on the device if the voltages do not correspond.




Tips: The main fuses are located inside the connection socket and are accessible from the exterior.

### 3.7.2 Connecting the Computer

Connecting the Computer and the machine by using the USB cable. Like below:

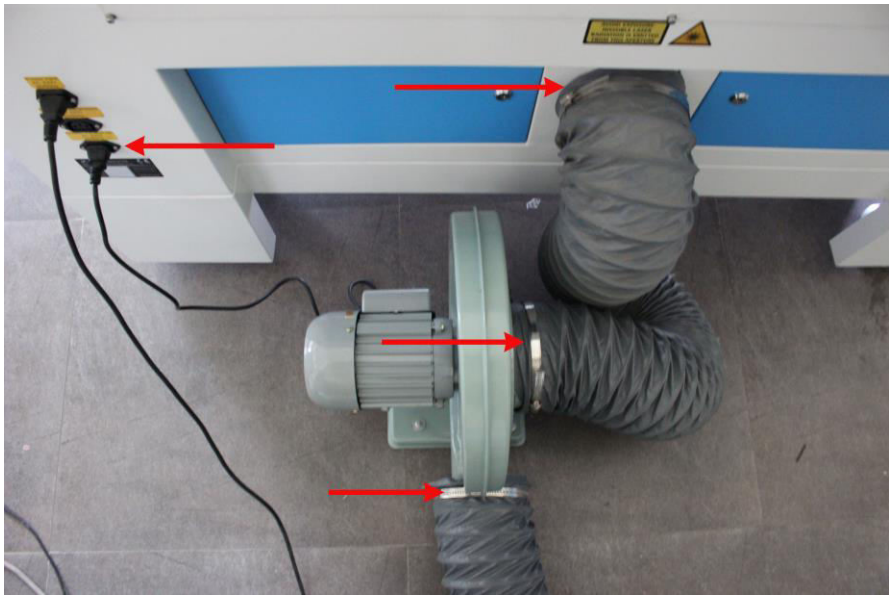

Connecting the Computer and the machine by using the Ethernet cable. Like below:


### 3.7.3 Connecting the Exhaust System

How to set up the exhaust system

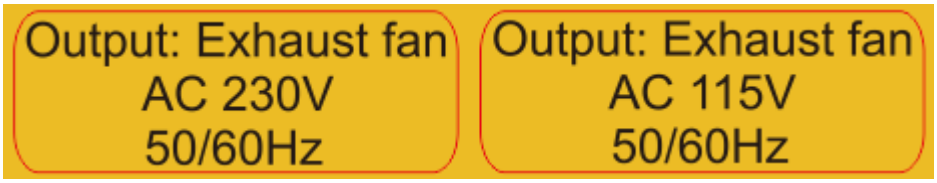
Insert one side of the gray exhaust pipe into the fan inlet and the other side into the fuselage behind the exhaust tank. Insert one side of the gray exhaust pipe into the fan outlet and put the other side of the pipe outside where you work (If the machine is far from the outside of the room that the gas manufactured by the machine cannot be discharged; then you might need an dust/fume filter, it can keep the air quality of your working environment well).

Please refer to the following pictures about how to install the exhaust pipe:



Also you can refer to the video on how to set up your MARS laser machine in our website http://www.thunderlaser.com/video/laser-machine/setup-your-mars-laser-machine.html

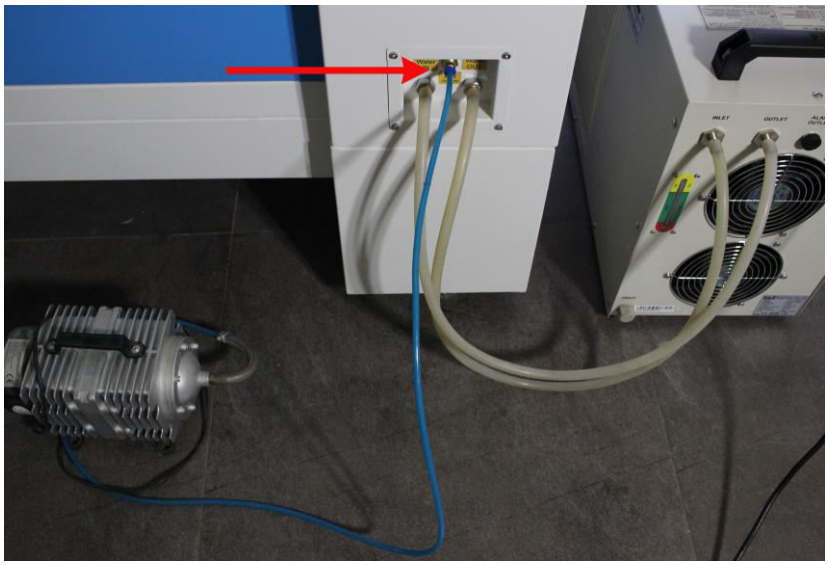
The input voltage must correspond (AC 230V 50/60 Hz or AC 115V 50/60 Hz) – see information label beside the connection socket.



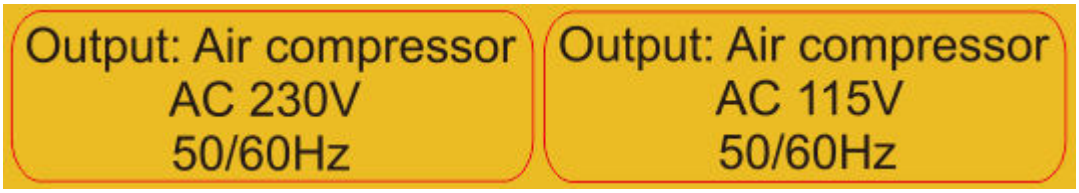

Tips: Do not connect the air compressor or the water chiller to the above interface，if connect them to the above interfaces that cause in failure of the machine, the warranty does not covered.

### 3.7.4 Connecting the Air System

First of all, Install a air blowing mouth (copper) to the air system, then connect the hoses (white side) to the mouth, the other side to the machine. After that, please connect the power cable (of the air system) to the machine. Like below:



The input voltage must correspond (AC 230V 50/60 Hz or AC 115V 50/60 Hz) – see information label beside the connection socket.



### 3.7.5 Connecting the Cooling System

If you have the water chiller, and please connect to the water chiller priority. If not, and please connect to the water pump.

The connection of the machine and the **Water chiller.**

① Take out one of the water pipes and connect to the water chiller where marked as "OUTLET", the other side of the pipe connect to the machine where marked as "Water IN".

② The other pipe, please connect to "INLET" of water chiller and "Water OUT" of machine.

③ Just refer to below picture shown that the order from 1 to 4 port to connect them. For example: 1 to 1, 2 to 2


We will provide a certain chiller power cable for different countries, and the power cable will be put inside a box together with the water chiller.

The connection of the machine and the **Water pump**

① Take out one of the water pipes and connect to the water pump，the other side connect to the machine where marked as "Water IN".

② The other pipe, please connect to the machine where marked as "Water OUT"., the other side directly into the water.

Like below:

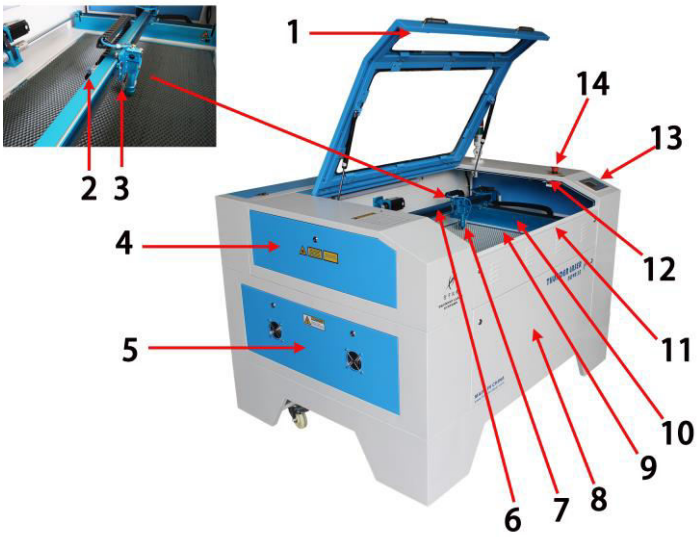

We will provide a certain pump power cable for different countries, and the power cable has been connected to the pump already before we send it out.

Get through the water chiller or the water pump, and turn on the main power.

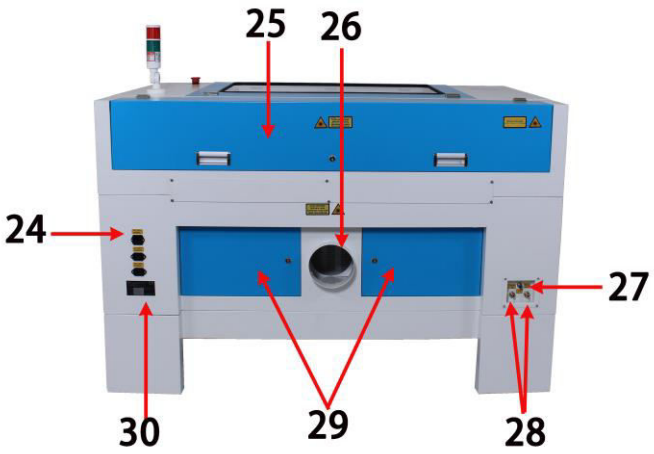
Check the water chiller or pump to work（If normally work, the green light will light or water will flow from the pipe）.

# Chapter 4 Operation

## 4.1 Machine View







1. Top lid
2. Blow air conditioner
3. Auto focus sensor
4. Left-up side door
5. Left side door
6. X-axis
7. Dual laser heads
8. Front door
9. Honey comb table
10. Y-axis
11. Front up door
12. Flap protection sensor
13. Control panel
14. Emergency stop switch
15. LED lamp
16. Laser power switch
17. Main power switch
18. Ethernet port
19. U-disk connection port(USB)
20. PC connection port(USB)
21. Right side door
22. Right-up side door
23. Indicate light
24. Power supply socket
25. Laser tube cover
26. Exhaust hose
27. Blow air port
28. Water in and water out
29. Rear door
30. Manufacturer's label

**1. Top lid**

If the Top lid is opened, no data is processed. When the protection cover is opened during working, the motion system is stopped and the laser source is turned off. During processing of commands the protection cover must only be opened after pressing the "Pause "button.

**2. Blow air conditioner**

It's used for adjust that blow air amount.

**3. Auto focus sensor**

Used for the automatic focusing of the work table.

**4. Left-up side door**

Open this door for cleaning the second reflective mirror or align that laser beam

**5. Left side door**

There is laser power supplier, Ammeter, TL-Timer etc. please open this door for checking these parts, but must pay attention to the electric current.

**6. X-axis**

The motion system is that performs the mechanical movements in X direction. The X-axis is visible in the working area.

**7. Laser head**

Laser beam and red dot pointer are all come out from the laser head, and the Auto Focus switch is installed on the laser head, too. The bottom of laser head is parallel to the bottom of the autofocus switch.

**8. Front door**

Open this door for cleaning the waste after working.

This door is locked by using two outside locks.

**9. Honey comb table**

The honey comb plate to be processed is put onto the working table. Put the material on the working table for engraving & cutting

**10. Y-axis**

The motion system is that performs the mechanical movements in Y direction. The Y-axis is visible in the working area.

**11. Front up door**

Open this door for take out the honey comb table and it's convenient to put that material on working table

This door is locked by using inside screws and outside locks.

**12. Flap protection sensor**

This is where Open flat protection exist. Laser will stop working once the cover is opened during working.

**13. Control panel**

You can control the X-axis, Y-axis and Z-axis manually by the display panel, it also shows the working time, power, speed and the whole working time and affords many function options(please view this chapter 4.3 for detail).

**14. Emergency stop switch**

Once there's an accident happen (laser catch fire, laser out leakage) during working, please turn off this switch immediately. It will be cut off the laser power and motion power immediately.

**15. LED lamp**

It's used for lighting the working table once turn the Main switch on.

**16. Laser power switch**

The laser power will be on while you turn it on

**17. Main power switch**

The laser machine will be start while you turn it on

**18. Ethernet port**

This Ethernet port is for connecting computer.

**19. U-disk connection port(USB)**

You can save the file as a U-disk File by press "SaveToUFile" on the software, then save it to the u-disk and insert the u-disk to the port of laser machine, then use the control panel to select and control it to work

**20. PC connection port(USB)**

This USB is for connecting computer.

**21. Right side door**

There are laser controller, driver(Hybrid Servo Drive and Micro Stepper Drive ), power supplier (both 24v DC and 36vDC), the main connecting cables and cooling fan here, please open this door for checking these parts, but must pay attention to the electric current. if you need to repair, please contact with professional maintenance staff.

**22. Right-up side door**

Maintenance for the Emergency stop button if required

This door is locked by using outside locks.

**23. Indicate light**

The light is always keeping green color while the laser does not work or working but the lid is closed.

The light will turns to red color while the lid/cover is opened during working.

**24. Laser supply socket**

To connect the main power and the extend power according the label information. And in the main power socket have the fuses.

**25. Laser tube cover**

There are installed the laser tube, red dot pointer device, beam combiner and the first reflective mirror mount.

**26. Exhaust hose**

This is for installing the exhaust device.

**27. Blow air port**

This port is for connecting hoses of the air compressor.

**28. Water in and water out**

Both ports are for connection with water pump or water chiller.

**29. Rear door**

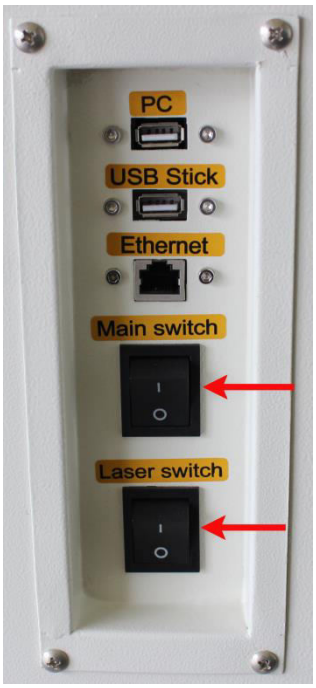
There are installed cables banks etc. please open this door for checking these parts, but must pay attention to that electric current.

**30. Manufacture's Label**

It's Show you the laser information like serial number or manufacturing date etc.

## 4.1 ON/OFF Switch

The mains and the laser supply power ON/OFF switch
The following conditions must be fulfilled for correct start up:
Unrestricted freedom of motion of the mechanics
No materials under the engraving table
Protection covers closed
When turn on the power of machine, and note that turn on the main switch first and then the laser supply power switch




If all covers are closed, immediately after being switched on, the device starts the referencing process. When the referencing process is completed correctly, an acoustic signal sounds and the device is ready for operation. The operation panel will display the home screen when the laser is completed resets.

Before switching on the device, the user must make sure that no objects of any kind are located inside the operating space, which could limit or obstruct the mechanics of the device.

## 4.3 How to use the TL-Timer

The TL-Timer is an additional tool for laser machines.
It will control laser machines periphery like exhaust fan, air pump, warning lights, pneumatic lifts, electrical locks and lost of other stuff automatically.
This will increase the ease of use of your laser machine.
Please note the different types of connection, which makes the TL-Timer able to work with each kind of laser controller.

**Operation:**

**Normal use:**

The TL-Timer gets activated by a work status signal from laser controller and an open/close signal from the lid.
When the laser is working with the lid is closed, the second red LED and third red LED lights up and 2 relays will be activated until the signal from controller gets turned off. Without control signal the 2 relays will stay turned on until a given delay time has expired.
When the laser is working with the lid is opened, the first red LED light will be on and the relay will be activated until you closed the lid.
Each relay has a freely adjustable delay time from 0-99 seconds.

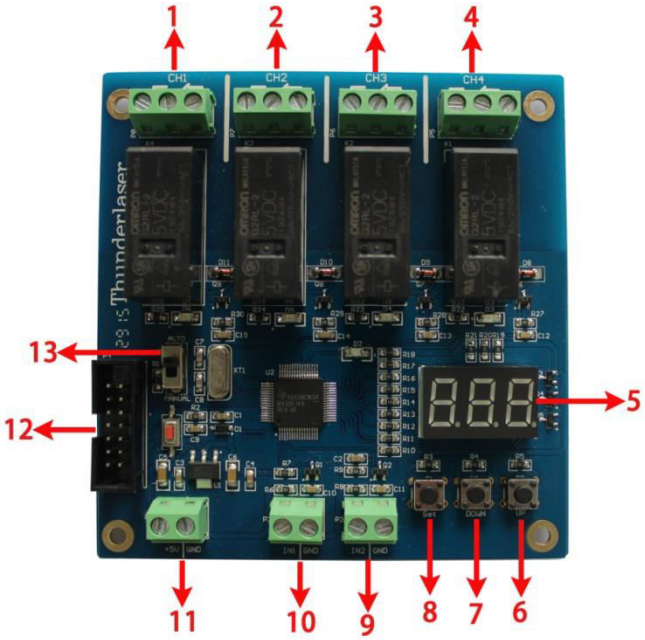
**Set up delay time:**

Enter “Set” switch once. The red LED will blink and the display will show you the delay time in second for the first relay. A red LED close to the active relay will show you. Which one is active?
The display does show the delay time in seconds. By pressing “down” or “up” you can change the value. By holding a switch down for more than 1 second the value will increase or decrease automatically.
By pressing “Set” you can switch to relay number 2 now and confirm the delay time for this one.
For changing delay values for 3$^{rd}$ and 4$^{rd}$ relay you have to press “Set” again.
When 4$^{th}$ relay is active and you press “Set” again, the TL-Timer will turn back to normal operating mode, the red LED will stop blinking, but the blue LED will be still keeping on
After turning of power the TL-Timer will remember the delay-time-values, you did enter before.

**Relay-Output:**

Each of the 4 relays offers an opening and closing switch with current capacity of max.
8 Amps and a power capacity of max. 1000W.
Higher loads must be controlled by using a power contactor.

**About TL-Timer controller interface and buttons description:**




1：Interface 1，connection with warning light ，delay time is set to 0 second（Factory default settings, change it if required）

2：Interface 2，connection with air pump，delay time is set to 5 second（Factory default settings, change it if required）

3：Interface 3，connection with exhaust fan，delay time is set to 15 second（Factory default settings, change it if required）

4：Interface 4，spare interface，users can connect the relevant equipment if required

5：LED lights display，set the delay time for viewing each interface and enter

6："UP" button to increase delay time

7："DOWN" button to reduce delay time

8："Set" button to confirm your setting

9：Interface 9," lid state" interface

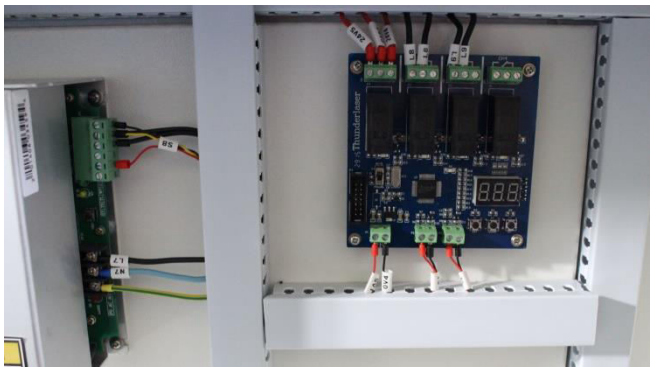
10：Interface 10, "Working state" interface

11: Interface 11, 5V DC voltage power interface

12: upgrade interface

13: auto and manual

Where the TL-Timer is installed with Thunder Laser machine, please refer to the pictures as bellows:

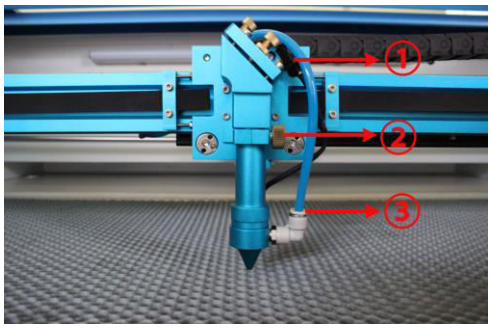


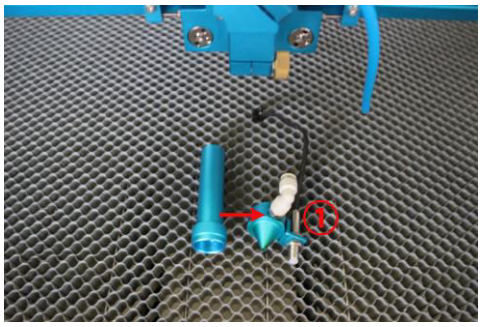
## 4.4 How to replace the 4 inch and HR laser head

**1）How to replace the 4 inch laser head**

1. Move the table down till there's enough space to take the standard head out and install the 4" laser head.

2. Separate the standard head mount, like below:

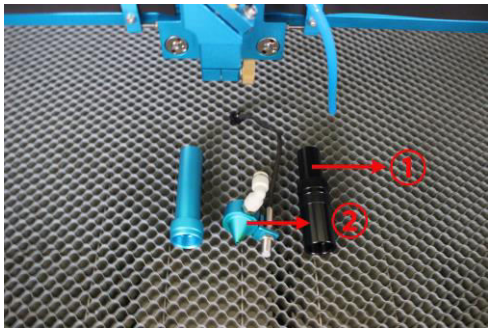


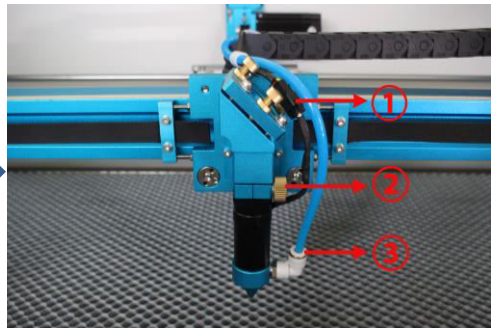




①separate the auto focus port
②loosen the screw
③take out the air hose

①take out the mount mouth

3. Install the 4" laser head like below:




①4" laser head
②assemble the nozzle cone to the 4" head

①reinstall the auto focus
②fix the laser head
③connect the air hose,

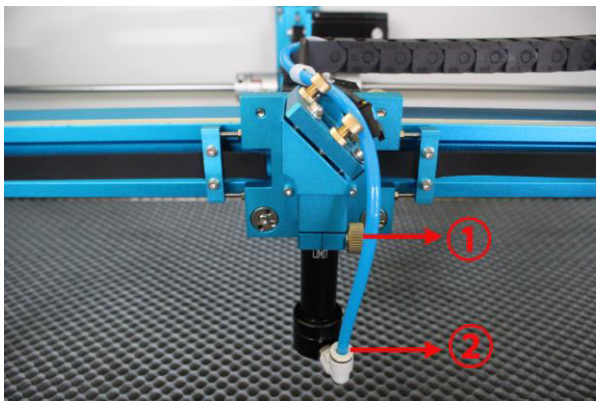
Tips: If there's no Auto focus for your machine, then no need to deal with it.

**2）How to replace the HR laser head**

1. Move the table down till there's enough space to take the standard head out and install the HR head.

2. Separate the standard head mount, like above instructions.

3. Install HR head, like below:




①fix the head

②connect the air hose.

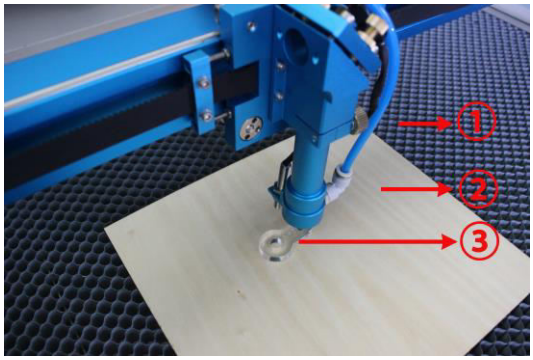
Tips: Since HR head is sensitive for focus distance, it's suggested to adjust the focus by manual rather than auto focus.

## 4.5 How to adjust focus distance by manual or auto

**1).** If there's no auto focus function for your machine or there's fault for your auto focus, you can refer to below instructions about how to adjust focus **by manually**:

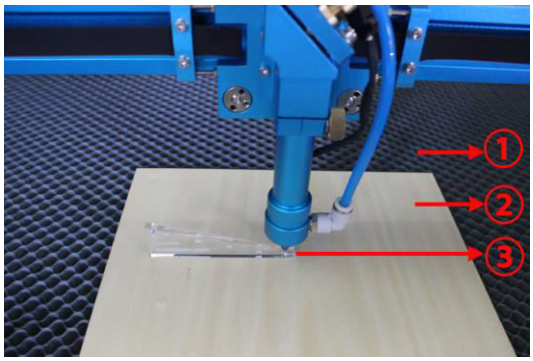
**1. For standard laser head:**

find the 6mm Acrylic Focus Tool for help to adjust the focus directly like below:



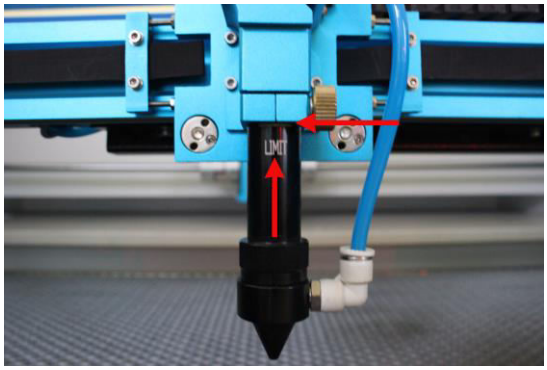

①Working Table
②Material
③Focus Tool

If the focus tool is not the best one for your material, you can use the focus ruler for help like below:



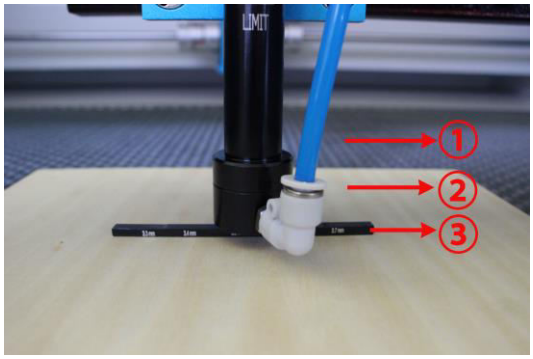

①Working Table
②Material
③Focus Ruler

Please note that the limit line of the head, this limit line indicates the max height of laser head, and keep the limited line inside the laser head mount. So as to protect the laser head from crashing into the honey comb table while z-axis does reset/auto focus



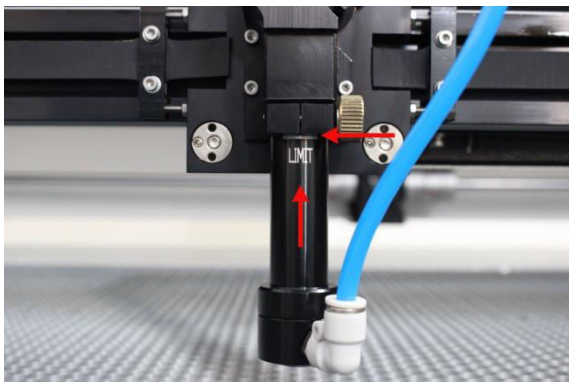
**2. For HR laser head**

Since HR head is very sensitive for focus distance, thus we've tested and made a special focus tool (with a best distance) for each HR head, like below:



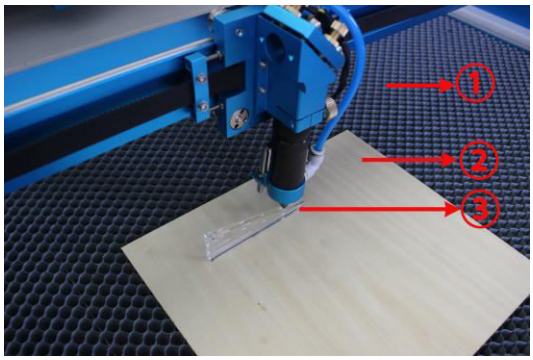

①Working Table
②Material
③The Best Focus Distance
④Focus Tool

Please note that the limit line of the head, this limit line indicates the max height of laser head, and keep the limited line inside the laser head mount. So as to protect the laser head from crashing into the honey comb table while z-axis does reset/auto focus




**3. For 4" laser head**

4" laser head is not so sensitive for focus distance; you can set the distance about 10mm with the help of focus ruler



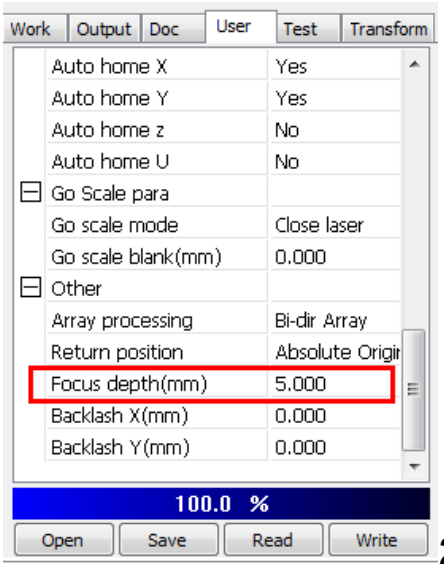

①Working Table
②Material
③Focus Rule

**PS:** Please keep the 4" laser head to the max height of laser head

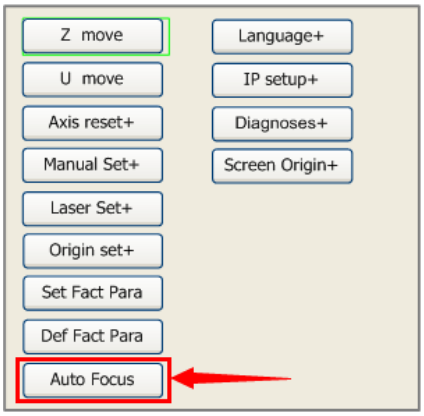
**2)** If there's Auto Focus function for your machine, you can adjust the focus by auto,

1. Reset Z-axis.(Z-axis will move up until touch the Auto focus switch(or the machinery limit switch), here the coordinate: 0.0 ) please refer to Pic 1.
2. Set a correct focus distance, please refer to pic 2
3. Select "Auto focus" on display panel, then the table will auto focus directly, please refer to pic 3.


1




2

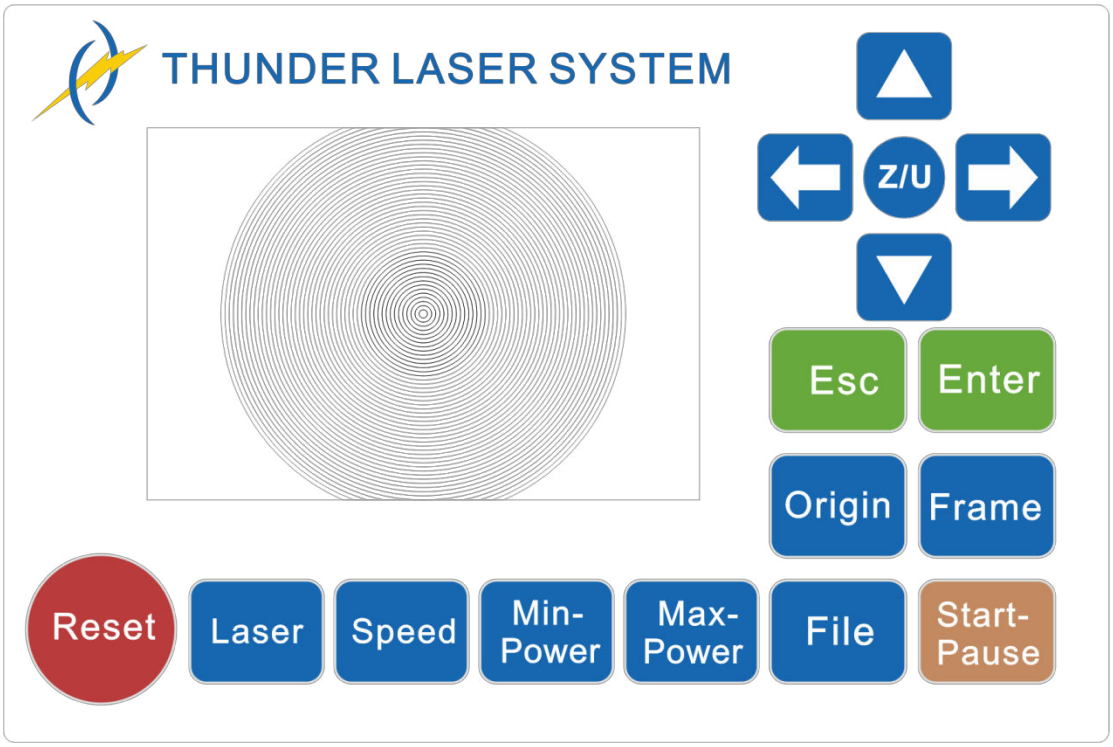



3

**PS: please do not use "auto focus" function while laser head is HR laser head or 4" laser head.**

## 4.6 How to use the display

### 4.6.1 Function of the Buttons




✧  Arrow buttons: control the movement of the laser head.(also can be used to change the parameters in the control panel)

✧  Z/U button: The Z/U key can be pressed when the system is idle or the work is finished. On pressing this key, it will show some entries in the interface, each entry includes some functions, Z axes move, U axes move, each axes to go home etc.

✧  Reset button: reset the machine.

✧  Laser button: single press to draw a dot, press and hold to drill a hole.

✧  Speed button: Set the speed of the current running layer, or set the direction keys' move speed.

✧  Min-Power button: Set the min laser power of the current running layer.