大族粤铭激光
YUEMING HAN'S YUEMING LASER

Product Manual

Applicable models: CMA1814C-F series

Version: 1.0

Copyright

Disclaimer and Responsibility Statement

Whole suing the equipment from our company, users are required to ensure b integrity and independence of the product including but not limited to: mechanical, electrical, optical, control software and accessories. Unauthorized modification is strictly prohibited. It is a must to satisfy operating environment and operating specifications specified in the owner's manual.

For the followings:

1. Equipment modified with no authorization (including but not limited to: add, remove, modify, unauthorized disassembly, replacing parts);
2. Use the equipment in the environment failing to satisfy the operating requirements;
3. Operate disobeying the specificationsof our company;
4. Unauthorized use of equipment parts, accessories and auxiliaries on to other equipment or in other places;
5. Viciously disassemble, destroy, decode hardware and software of the equipment from our company

Our company shall not undertake any direct, indirect or joint responsibility. Our company reserves the rights to ascertain legal responsibility for the serious consequences or economic losses or reputation losses caused by what mentioned above.

Foreword

Thank you for choosing our laser equipment!

Before operating, please read this manual carefully to ensure proper use of our equipment.

Please keep this manual properly for future reference.

Due to different configurations, certain models do not have certain features listed in this manual. The actual product shall prevail.

Due to constant improvement, certain content of this manual might be inconsistent with the actual product, which shall prevail.

The symbol conventions in this manual:

Attention	The content requires special attention and the user must abide by, or else it will cause error or serious problems.
 Prompt	Prompt the user to pay attention or suggest the user to abide by, which will be more convenient and efficient.
 Warning	For a particular case there is no dedicated staff to guide the operation could lead to catastrophic happens

Safety Precautions

Attention	Before using the machine, users are required to carefully read this manual and other operating requirements, strictly abide by the operating specifications. Professional are required for operating the machine.
Alarm	The machine uses class 4 laser (strong laser radiation). The laser radiation may possibly cause the following accidents: ◆ emblaze the surrounded flammable materials; ◆ generate other radiations and toxic or hazardous gas by processed objects during laser processing; ◆ direct irradiation of laser radiation cause harm to human body. Therefore, firefighting devices are required in the operating place of the machine. Stacking flammable or explosive objects near the machine is strictly prohibited. Good ventilation is a must. Only the qualified personnel are authorized to approach the machine.
Note	The processed objects and discharged materials are required to satisfy requirements as per local laws and regulations.
Alarm	◆ Laser processing is with potential risks. Users should carefully make sure if the processed objects are suitable for laser processing. ◆ There is high voltage and potential risk in the laser machine. Unauthorized disassembly by unqualified personnel is prohibited. ◆ Reliable earthing is required for the machine and related other machine before power-on. ◆ During operating, removing any cover of the machine is strictly prohibited. ◆ During operating, the operators are required to observe working status of the machine all the time. In case of any abnormality, it is immediately to disconnect power supply and take active and corresponding measures. ◆ After power-on, special personnel are required for monitoring. Unauthorized leaving is strictly prohibited. ◆ It is a must to disconnect the power supply before leaving.
Alarm	It is strictly prohibited to placing any unrelated all-reflective or diffusion reflective objects in the machine to prevent laser reflecting to human body or flammable materials.
Attention	◆ The environment for the machine should be dry, free of interference and influences from pollution, vibration, high voltage and strong magnet. The operating ambient temperature ranges5-40℃, and the humidity ranges 5-85% (no dew); ◆ The machine should be far from electric appliances sensitive to electromagnetic interference; ◆ Operating voltage: AC220V, 50Hz. Power-on is strictly prohibited in case of unstable voltage of the power grid or unspecified voltage.

Attention	Chapter of this manual for *Safety Rules*. Please refer to the chapter more details concerning safe operation of the machine. Users are required to carefully read and abide by all the requirements of safety.

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Chapter1 Product Introduction

1.1 Overview

CMA1814C-F series is a large format epsilon type blade mesh belt feeding laser cutter, which is suitable for continuous feeding and processing of cloth, leather, non-woven fabrics and other non-metal soft materials.

The frame is in steel tube + sheet metal hybrid design, and the appearance adopts industrial design philosophy, which is closer to the European and American design style. X-Y motion system uses Ø8 external optical axis rail. The assembly and maintenance are more convenient than conventional machines with built-in guides. In addition, the machine is equipped with independent operating console, which is easy for operation, free to movement, and more humane.

Automatic feeding worktable adopts the combination of roller chain and epsilon type blades, featuring accurate feeding, and the worktable won't be easily deformed or shift. Its main feature is reliable feeding and easy maintenance.

Classified by the function configurations, CMA1814C-F series laser cutters include CMA1814C-F/ single tip laser cutter, CMA1814C-FT/double-tip laser cutter, CMA1814C-FET/electric double-tip laser cutter, and CMA1814C-FS/three-tip laser cutter. CMA1814C-FET/electric double-tip laser cutter is the standard configuration and is described below as the example.

Instructions of equipment model:

CMA 1814-C -FXXX

Product series:	Specifications:	Structure code：	Configuration:
CMA: CMA, CO2 series laser cutter	1814：Effective processing breadth is 1800mmX1400mm	C: Steel frame structure	F: Automatic feeding E: Electric T: Dual-tip S: Three-tip

1.2 Product parameters and requirements

Model		CMA1814C-FET
Laser	Laser wavelength (μm)	10.6
	Laser power (W)	80～130
	Cooling method	Water cooling
Operating parameters	Effective cutting range (mm x mm)	1800X1400
	Focal length (mm)	50、63.5、75
	Working speed (m/min)	0~24
	Compatible graphic formats	BMP、JPGE、PLT、DXF、DST、DSB、AI 、etc
Power supply	Voltage	AC220V±10%
	Frequency (Hz)	50/60
Dimensions	Main unit (mm x mm x mm)	2660X2100X1350
	Independent console (mm x mm x mm)	320X435X1127
Weight	Main unit (kg)	900
	Independent console (Kg)	20
Others	Total power (KW)	<4（Including auxiliary unit）
	Class of safety protection	IP54
	Class of laser safety	Class 4

1.3 Operating environment

- Humidity: 5%~80% (no dew)
- Temperature: 5℃-40℃
- Power supply: AC220-240V;50/60Hz
- Earthling: Grounding resistance should be less than 0.1Ω
- Environment of the equipment should be dry, and free of interference like dust, pollution, vibration, high power and strong magnetic field;
- Air pressure: 86-106kpa
- The equipment is not waterproof, and operation in the environment with leaking or dripping is strictly prohibited

1.4 Equipment compositions

1.4.1 Main unit

Fig.1-1 CMA1814C-FET Picture of Main Unit

① End cap part

② Mesh belt part

③ Motion part

④ Frame part

⑤ Independent console

⑥ Emergency stop switch

⑦ Warning lamp

1.4.2 Auxiliary parts

		
Air pump	Blower	Water-cooling machine

Fig.1-2 Auxiliary parts

1.5 Control system

The hardware system of the equipment is 3# motherboard, and 5# motherboard is optional，and the software is SmartCarve4.3.

1.5.1 Hardware system

1) Windows2000/XP/VISTA/Win7;
2) At least 1GHz CPU;
3) At least 1GB memory.

1.5.2 PC software

See Software User's Guide “SmartCarve4.3 Manual” for the software instructions

Chapter2 Safety Rules

This chapter describes the security warning to protect personnel and equipment. Although theequipment has adequate security guarantees, it still has a certain degree of risk when used. Any personnel operating this equipment must carefully read and fully understand the safety rules.

2.1 Refer to safety standards

Laser processing equipment and operations shall be in accordance with both two national standards, which are GB7247-87 Radiation safety of laser products, equipment classification, requirements and user guide, and GB10320-88 electrical safety of laser equipment and facilities.

2.2 Product safety

The following conditions are required to be satisfied to ensure safe work:

- Abide by operation manual and instruction signs;
- Operators and maintenance personnel have received training held by equipment manufacture;
- In case of operation by couples of person at the same time, division of responsibility should be made and followed;
- No admission to the working area for the unauthorized personnel;
- Avoid any working method breaking the safety rules;
- Timely eliminate all the failures possibly causing lower safety coefficient;
- Abide by maintenance regulations of the equipment.

2.3 Safe equipment

Safety equipments are used for protecting personnel, and unauthorized disassembly, bridge-group or by-pass connection are strictly prohibited; in case of failure with the safety equipment, professional are required for repair. If part replacement is needed, the product with same model, specification and from the same manufacture is required; otherwise, written consent from the manufacturer is required.

2.4 Safety awareness

The equipment can be operated only by skilled personnel or under supervision of them. Improper use or operation may possibly be very dangerous and cause damage to the machine. Therefore, the followings are strictly prohibited:

- Placing heavy objects or stepping on the working table of the equipment;
- Used for processing the materials unapproved by manufacturer;
- Staying of unauthorized personnel in the dangerous area (It is the responsibility of operators to ensure keeping unauthorized personnel away from the working area.);
- Block of using emergency stop button (Regular check is required to ensure a good condition for the emergency stop button.);

2.5 Requirements for personnel

After trail operation, maintenance personnel from the manufacturer may perform training on the operators; It is the responsibility of equipment owner to have operators trained at corresponding level;

We have prepared ready a series of training course for your option. Please make phone call to our **Customer Training Center** for details.

2.5.1 Definition of terms

All the personnel using or operating the equipment are called User in the manual;

Different requirements are for different users. Users are classified into the followings:

- Owner

Owner means the authorized person or representative to sign contract with the manufacturer. With authorization, the owner has rights to sign the agreement with binding force of law;

- Operator

Operator means the personnel trained for operating the equipment. Training of the operator includes participation of training held by the manufacturer.

- Maintenance personnel

Maintenance personnel mean the technicians having received formal training for machine and electric engineering. The maintenance personnel are responsible for daily maintenance of the equipment, and repair at low level if needed. Training on the maintenance personnel contains participation training held by manufacturer.

2.5.2 Qualifications

The operator is required to accept guidance and training of the owner, and the operator is responsible for the safety of a third party in the working area; the personnel required for further training and guidance are required work or operate the equipment under supervision of the operators.

2.5.3 Responsibility

It is a must to clarify the related responsibilities of each performance (operation, maintenance, parameter setting), and carry it out. Unclarified responsibilities will cause safety hidden risks.

Owner is required to provide operation manual for the operators and maintenance personnel, and ensure that they have read and understood the operation manual.

2.5.4 Personal protective devices

When technology or measures fail to absolutely avoid risk of health, the owner is required to provide personal protective devices for operator and maintenance personnel. For example:

- Steel cap boots;
- Protective gloves
- Laser-proof goggle
- Light respirator.

Chapter3 Equipment Installation And Debugging

3.1 Equipment Installation

3.1.1 Steps of unpacking

Before installation, unpacking the wooden box for the machine from our company is needed in the following steps:

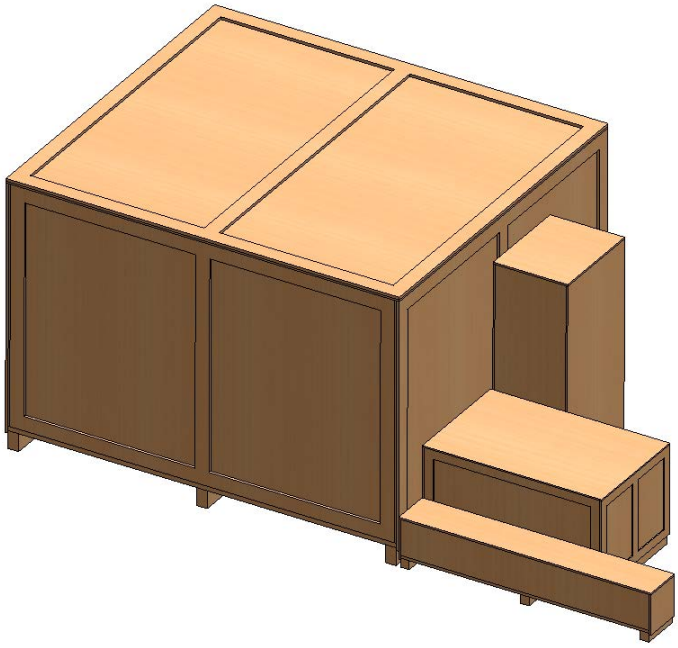


Fig.3-1 Equipment Crate

1、 Open the machine crate with a crowbar (provided by the user) in the following sequence: top cover, left and right covers, front and rear covers, foot mounting plate (some machine crates are connected with screws, and can be unpacked by removing the screws).

Crowbar

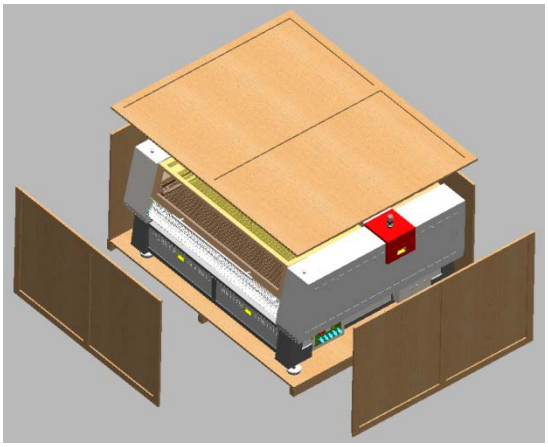


Fig.3-2 Machine Crate

2、 Loosen the upper nuts of the feet with a wrench, and raise the feet to make the distance to the pallet greater than to the casters.

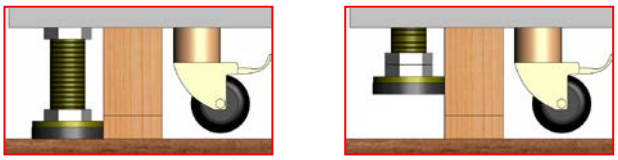


Fig.3-3 Loosing Casters and Feet

3、 Fork the machine from the pallet with a forklift, deliver to the destination, and unscrew the feet.

4、 Then open the parts crate and laser tube crate.

3.1.2 Unpacking check

Check on the equipment and auxiliary parts after unpacking is required to ensure them free of failure caused during transportation. Items to check are as below:

1. Check on equipment model

   Please make sure that equipment model is just what purchase.

2. Check in equipment appearance

   Please make sure that the equipment is free of scratch, damage, distortion and corrosion by appearance.

3. Check on equipment case

   Remove the upper, left and right cover to make sure that the equipment is free of parts or cable caused by poor contact or internal damage.

4. Check on equipment parts and auxiliary parts

Open the auxiliary case and laser tube packing box to verify parts following the packing list and check if there is damaged accessory or accessory with distortion.

Attention	Unauthorized unpacking is prohibited. If unpacking by user is needed, prior consent from our after-sales personnel or salesman is required. Otherwise, our company shall not be liable for any accidents caused.

Attention	In case of the problems above found after unpacking, please timely notify our after-sales personnel or salesman, or directly contact our company. Unauthorized disposal is prohibited.

3.1.3Preparations for equipment installation

Preparations for installation are as below:

- Installation site
- Preparation of power supply

  The normal operating voltage of the equipment is 220-240VAC, 50/60Hz, and an extension socket with circuit breaker or overcurrent protection device should be connected. It is strictly prohibited to turn on the machine when the grid voltage is instable or does not match.

- Preparation of cooling water

To ensure the life of the laser generator, it is recommended to use distilled water as the cooling water

- Preparation of air supply

Air pump or air compressor, air pressure: 86-106kpa.

- Preparation of equipment placement area

The dimensions of CMA1814C-FET are 2660X2100X1350mm ,To ensure normal use of the machine, the working space of the machine must be at least 4660X4100X2350mm ;

- Personnel

Our company requests that the personnel for installation are professional customer service personnel from our company. If installation by customer is needed, the installation personnel are required to have received all trainings held by our company and grasped the related key points relating to the installation of our laser equipment.

- Tools

The related tools for installation are attached to the equipment. In addition, users should prepare some installation and testing tools if necessary, e.g. screwdriver, multimeter, etc.

- Others

Water, electricity, exhaust air channels, sample material, computer and power socket relating to the equipment should be prepared ready in advance by users.

Attention	During installation by our customer service personnel, the customer is required to participate from the beginning to the end. Equipment installation and debugging are parts of training, and the customers are required to learn them well.

3.1.4 Level adjustment of the machine

After the machine is moved from the crate to the workplace, the level of the machine should be re-adjusted as follows due to differences in the workplace:

- First, adjust four feet to completely hold up the machine (casters off the ground);
- Then, place a spirit level in the front of the machine, and observe the shift direction of the bubbles in the spirit level. If the bubbles shift to the left, the left side of the machine is higher than the right side. Please adjust the level of the machine by reducing the height of the left foot or increasing the height of the right foot. When the bubble is centered in the spirit level, the front level of the machine has been adjusted properly;
- Then, adjust the level of the rear, left and right side successively in the same way. When the four positions are adjusted, the machine level adjustment is finished, and the machine installation can be continued.

Attention	The machine level adjustment is necessary. The subsequent operation of the machine will be affected if the machine level is quite different.

3.1.5 Blower installation

- Firstly connect air inlet of the blower to dust inlet of the carving machine with an air pipe, and securely buckle it. Then, connect another air pipe with air outlet of the blower and stretch it outside the room as shown in the figure below:

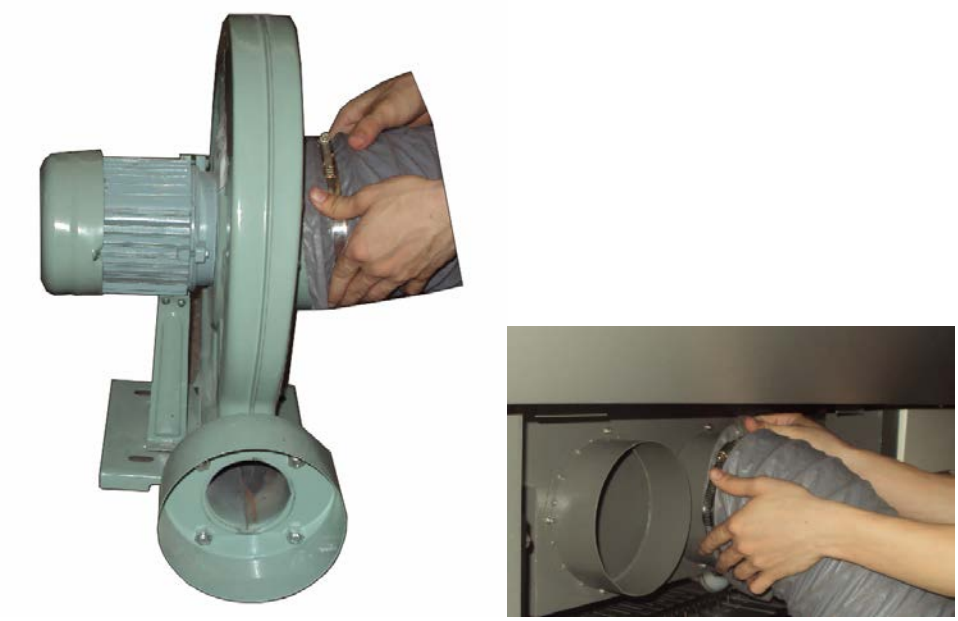


Fig.3-4

- Connect the patch board with circuit breaker or overcurrent protection. The input voltage is 220-240VAC, 50/60Hz.
- To effectively deal with the fumes and suspended particles produced by the machine during operation, the blower must be started when the machine is running. Secondary purification is recommended for the exhaust gases, e.g. through a dust filter in the outlet.

3.1.6 Laser tube installation

- CMA1814C-FET laser tubes are located on both sides of the machine. Before mounting, open the left and right end caps of the machine, and put the laser tubes on the laser tube holders carefully. While mounting, please note that the laser emission port faces to the reflector and the water inlet faces down, as shown below:

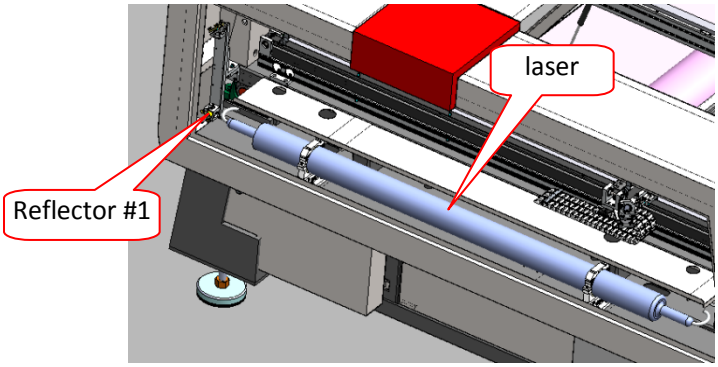


Fig.3-5 Position of CMA1814C-FET Laser tube

- CMA1814C-FS increases a set of laser cutting assembly basing on CMA1814C-FET, and the mounting positions of the two laser tubes is same as CMA1814C-FET, and the third laser tube is mounted in the rear side of the machine, as shown below:

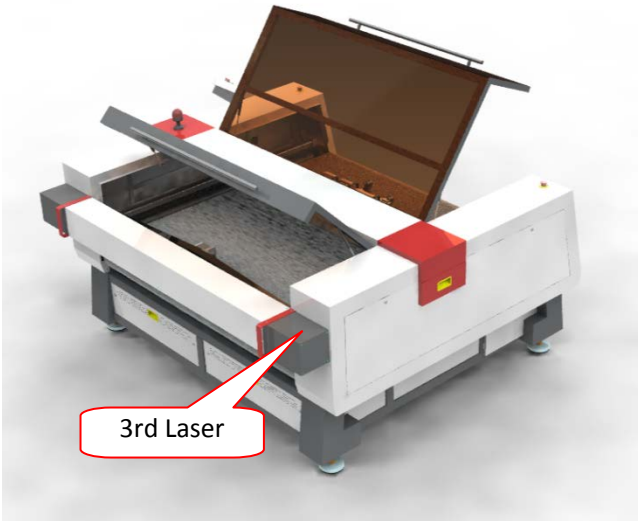


Fig.3-6 Mounting Position of CMA1814C-FS Laser Tube

- Adjust the longitudinal separation of the laser tubes (about 50mm between the laser emission port and 1# reflector), then put on the supporting legs of the laser tube holder and tighten the screws to fix the laser tubes properly;
- When the laser tube is fixed, connect the water pipe to the laser tube according to the identification, as shown below:

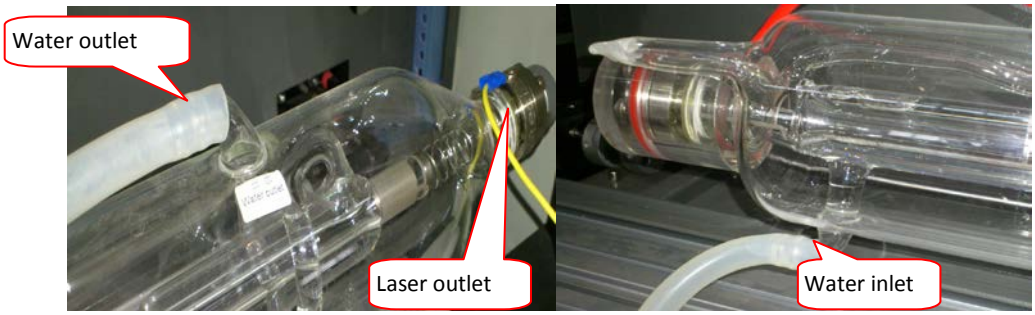


Fig.3-7 B-04-00 Laser Tube Installation Method

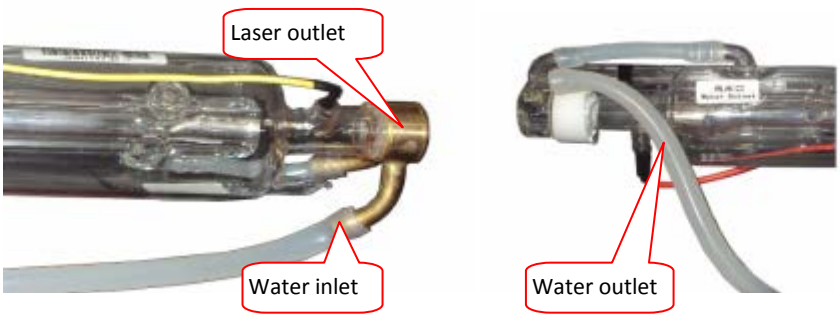


Fig.3-8 B-04A-00 Laser Tube Installation Method

Attention	Be careful when moving and installing the laser. It is prohibited to force installation or knock at the laser; otherwise, it will affect the stability of the laser power and cause light spot quality declines and even laser damage! Ensure that the laser tube outlet is higher than the inlet to prevent bubbles in laser tube cooling water.

3.1.7 Water cooling system installation

3.1.7.1 Water tank + water pump installation:

- Fill up water tank with distilled water;
- Securely connect water pump and water outlet connector, insert water hose, and place it into the water tank;
- Pass the water hose connecting to the water pump through the small hole in the water tank cover and connect it to water inlet of the machine, and then connect another water hose to water outlet of the machine and place it into the water tank to complete water circulation piping connection;
- Connect a patch board with circuit breaker or overcurrent protection. The input voltage is 220-240VAC, 50/60Hz.
- Connect through power supply. At this time, you will find that water is gradually filled up the laser tube, smooth water flow in the water outlet indicates normal operation of the water pump.

3.1.7.2 Industrial chiller installation:

- Fill up water tank with distilled water;
- Securely connect water pump and water outlet connector, insert water hose, and place it into the water tank;
- Pass the water hose connecting to the water pump through the small hole in the water tank cover and connect it to water inlet of the machine, and then connect another water hose to water outlet of the machine and place it into the water tank to complete water circulation piping connection;
- Connect a patch board with circuit breaker or overcurrent protection. The input voltage is 220-240VAC, 50/60Hz.
- Connect through power supply. At this time, you will find that water is gradually filled up the laser tube, smooth water flow in the water outlet indicates normal operation of the water pump.

Attention	Ensure that the height of the cooling water inside the tank is in predetermined range. To ensure normal circulation of laser cooling water, the water outlet pipe is installed with flow switch. For water-cooled laser tube, the water circulation must be normal, or else it may cause damage to the laser tube. Therefore, pay attention to purified water and clean water pipes in routine maintenance proc

3.1.8 Air pump installation

The CMA1814C-FET is made in hard pipe structure. To install, just insert the hard pipe directly into the air pump and the quick plug connector of the machine.

The machine is made in hard pipe structure. To install, just insert the hard pipe directly into the air pump and the quick plug connector of the machine.
The air pump (or air compressor) is very important in the system. High pressure air is jetted out from light outlet in the laser head through air pipe. On one hand, this ensures focus lens clean. On the other hand, it plays the function to prevent from being burning of the material caused by laser. Therefore, during daily maintenance, users are recommended to keep the air pipe straight free of twist. Otherwise, abnormal blowing may cause burning of the materials.

After connecting the air channel, connect the patch board with circuit breaker or overcurrent protection. The input voltage is 220-240VAC, 50/60Hz.

3.1.9 Equipment earthing

Safe earthing is strictly required for power supply system of the machine. Power supply of users must satisfy safety regulations of the local government:

Fig.3-9

- L: phase wire of 220V mains system; this wire must be provided with safe electrical switch (must be installed in the phase wire).
- N: commonly known as the neutral line, supply power to electrical equipment with phase wire.
- E: safe ground wire, shells of all electrical equipment (grounding terminal) are connected to this wire to ensure safety. Ground resistance should be less than 5Ω.

The user must consult the professional electrical installer (electrician), and the professional electrical installer should check and confirm if the grounding wire is connected safely!

Attention	Poor grounding will lead to high equipment failure rate, and may lead to other accidents! Han's Yueming Laser does not assume any responsibility and obligation for any resulting faults and accidents.

If your power supply system is not with an earthing, it is a must for you to have professional electric equipment installer mount a safety earthing net in the following method:

- It is a must to use 2-4 pieces of 4×35×1500mm angle iron hammered into any wet place surrounding the house as earthing. Distance between each two angle iron is 1m. And then use a 3×30mm flat plate leads each angle iron out from earth surface to form a good earthing net.
- After completing the earthing net, measure earthing resistance with an apparatus, the standard value is 3-5 ohm.
- After measuring the resistance, connect one end of the RVV2.5mm^2 copper core cable to the eduction of the earthing net, one end is connected to the earthing of the carving machine and earthing hole of the socket as shown in the figure below:

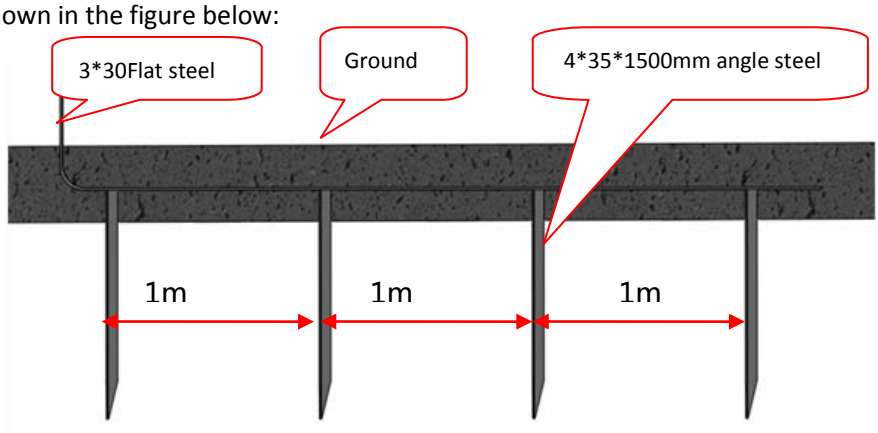


Fig.3-10 Grounding Grid Schematic Diagram

3.1.10 Software and equipment drive installation

The equipment is equipped with different mainboards according to the customer use. The drivers of the main board are provided on the attached CD-ROM. For detailed installation method, Please refer to *Manual of CMA 3th* or *Manual of 5th Controller*.

PC software is the SmartCarve4.3, About software installation and use, Please refer to *SmartCarve4.3 Software System Operating Manual*.

Attention	● Please properly keep the CD and software encoder encryption dog attached. In case of missing, please cont our company for purchasing. ● Reinstallation of the software may cause parameter loss of the system. Please perform backup of the related parameters before reinstalling the software or system. ● The user shall protect the computer security, and do not insert unknown USB disk to prevent virus. For common computer hardware and software failures, the user should have basic capabilities to process. ● The user shall not install other software on the computer or use the computer for other purposes. The company is not responsible for the consequences therefrom.

3.1.11 Other auxiliary part installation

Some types of machine are attached with other auxiliary parts (e.g. foot switch) as per request from customers, and these parts should be installed by our customer service personnel. Moreover, users shall install scanner, printer and other equipment prepared by themselves

3.2 Description of Operation Panel

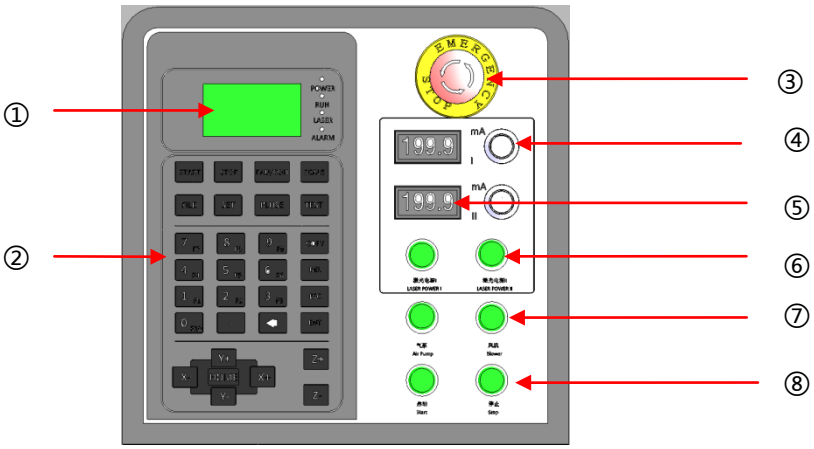


Fig.3-11 Operation Panel

① Panel display module: Display the operation parameters of the motherboard and status of the master unit.
② Keypad area: Include number buttons, direction buttons, and motherboard function buttons.
③ Emergency stop switch: Press it to cut off the power of the master unit.
④ Potentiometer: Adjust the current, and control the laser emission power.
⑤ Digital display ammeter: Display the current size.
⑥ Laser button: Turn on / off the laser.
⑦ Auxiliary button: Turn on / off auxiliary machine.
⑧ Start/Stop button: to start/stop the system

3.2.1 USB and Network Interfaces

Fig.3-12 USB and Network Interfaces

The USB interface and network interface are located on the right below of the frame, and are connected to the USB flash drive and network interface.

3.3 Equipment debugging

After installation, the equipment needs debugging and processing test. Equipment debugging mainly completes state detection of each module of the machine, including motion module, laser module and electrical I/O module.

3.3.1 Switching sequence

The description of switching sequence is affixed to the master power switch.

The switching on sequence follows:

Master power → Blower → Air pump → Water pump → Laser power

The switching off sequence is reverse:

Laser power →Water pump →Air pump →Blower → Master power

- First plug the master power line (located on the right of the machine) into the patch board, connect to the power supply, and then toggle up the blue switch to turn on the equipment, as shown below:

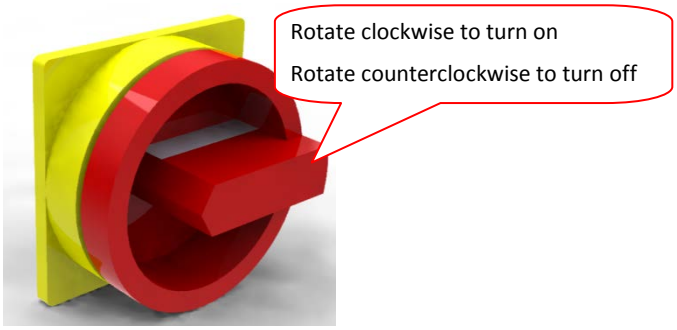


Fig.3-13 Master Power Switch

- After turning on the master power supply, the lamp inside the machine will be lighted automatically;
- Then, turn on the water pump, blower and air pump.

After the above steps, the equipment is turned on. The shutdown procedure is reverse.

Attention	Please operate in accordance with the required sequence, or else it may cause equipment malfunction.

3.3.2 Movement debugging

The movement debugging is mainly used to test whether the state of each motion axis of the equipment is normal. The movement debugging has been done in the factory. If no accident occurs in the transportation and installation process, the equipment wouldn't have problem in movement. Below is the description in aspect of motor shaft movement, stroke, limit and reset, straightness and squareness test.

3.3.2.1 Motor shaft movement

After powering on, start the computer and run SmartCarve4.3. If the software is set to reset automatically, the resetting starts. In standby mode, press the four direction keys on the control panel to control the movement of the cutting head. If the movement in the four directions is normal, the motor movement in X -axis and Y -axis is normal. If you find any problem in motor shaft movement, please contact our customer service personnel

3.3.2.2 Stroke, limit and reset

Different models of machine are with different working breadth, and setting stroke of each shaft of the machine will play the function of breadth protection (equals to software limit). The travel parameters for each axis have been set up. Improper travel settings may cause the equipment unable to work in full breadth or cutting head over-limit and collision. For example, the effective processing breadth of CMA1814C-FET is theoretically 1800mm X 1400mm，However, due to the machine configuration and specific customer requirements，Its effective processing format maybe can't reach 1800mm X 1400mm.So，The specific processing format has been configured at the factory, and shouldn't be modified without permission.

Limit switch is the hardware sensor equipped on limit position of the two ends of each shaft. After detecting limit triggering signal, the movement shaft will perform emergency stop to avoid "overreaching". Minimum one limit switch is needed for each shaft to indicate limit position of the current shaft. The installation position of limit switch may differ due to different types of machine, so the triggering signal. Therefore, configuration is needed.

Zero point of the machine is a referential point of a certain hardware fixed in processing breadth. Generally, after power-on, "reset" is needed for the machine to create coordinate of lathe. The Epsilon-type cutter belt series machines produced from our company generally take the limit switch position of each movement shaft as the zero point of the machine.

Attention	At ex-factory, configuration of parameters for stroke, limit and reset has been already performed. Unauthorized change of parameters by user before making clear its meaning is prohibited. Otherwise, failure of the equipment may possibly be caused.

3.3.3 Laser debugging

Laser debugging contains two aspects: light emitting test and light route adjustment. The followings are the details for them:

3.3.3.1 Light emitting test

After normal power up, press the laser power switch on the right side cover, and then set the light emitting energy and time directly on the control panel, and test if the laser emitting function is normal.If there is no laser emitting from the spot spray laser tube, it means that there is problems with the laser emitting, and check is

required. In case of laser emitting found from the laser tube, but no laser emitting from the cutting head, it means improper position of the light route, and adjustment of light route is needed.

If there is no laser emitting, first check the setting of laser parameters. Improper laser parameters may cause equipment malfunction or laser power cannot be adjusted. If the laser parameters are determined correct and there is no emitting still, you need to check the hardware problem.

Tips	The control panel of some types of machine is equipped with ammeter. With the ammeter, you can check if the power is normal.

3.3.3.2 Light route adjustment

Due to vibration during transportation, aberrancy of light route may possibly be caused. At this time, light route correction is needed.

Light route of the machine is as shown in the figure below:

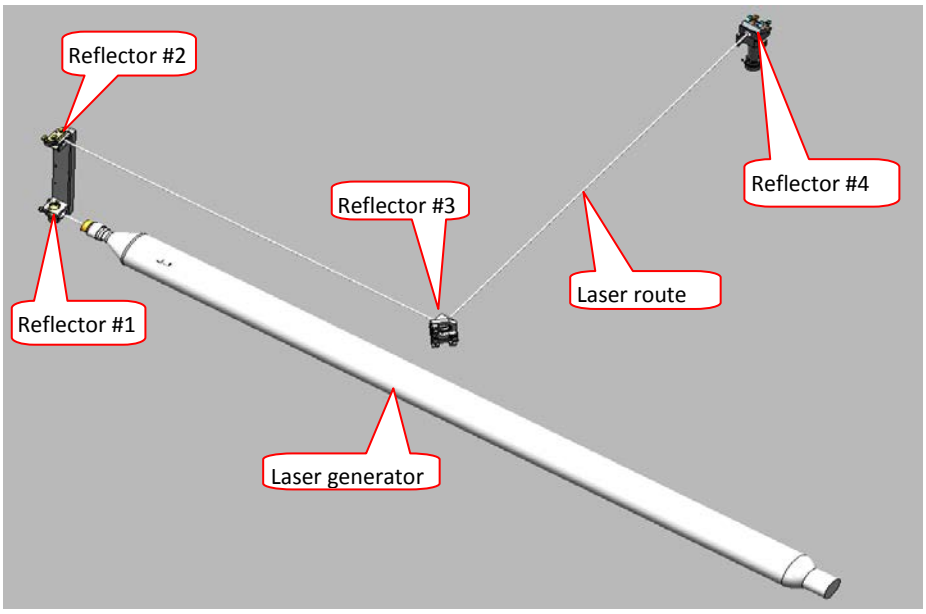


Fig.3-14 Illustration of laser route

After being emitted from the laser generator, laser successively passes through reflector #1, #2 and #3, and finally emitted to working table after be focused by the focus. Transmission of the laser is actually a course of multiple reflection and focusing. During this course, in case of loosen reflector, laser route deviation will be caused make the laser fail in finally output through the jet cup.

The laser path is adjusted in the following steps:

- Stick a layer of adhesive paper on the inlet of 1# reflector holder, press surrounding of the inlet to make the contour of the inlet appear on the adhesive paper, adjust the laser position to make the laser beam output from the laser irradiate to the center of the 1# reflector;

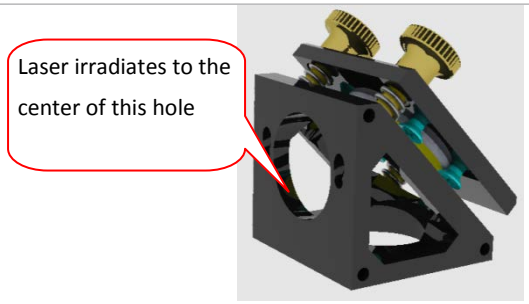


Fig.3-15 1# reflector

- Stick a layer of adhesive paper on the inlet of 2# reflector holder, press surrounding of the inlet to make the contour of the inlet appear on the adhesive paper, adjust the screws of 1# reflector holder, and irradiate the laser beam of 1# reflector to the center of 2# reflector; if needed, adjust three adjustment screws to make the laser beam focus on the center of 2# reflector, as shown below:

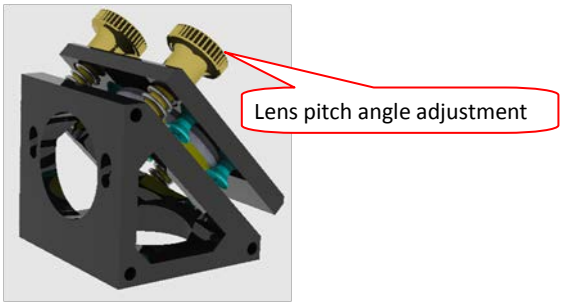


Fig.3-16 Light route adjustment

- Stick a layer of adhesive paper on the inlet of 3# reflector holder, press surrounding of the inlet to make the contour of the inlet appear on the adhesive paper, adjust the screws of 1# reflector holder, and irradiate the laser beam of 1# reflector to the center of3# reflector; if needed, adjust three adjustment screws to make the laser beam focus on the center of 3# reflector, as shown below:

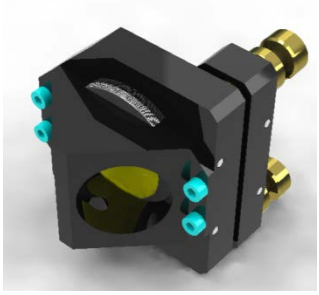


Fig.3-17 3# reflector

Attention	The positions of the light spots above are recommended to emit at the center of lens, but not the edge. In case of being at the edge, further adjustment is needed till being at the center.

- When adjusting the third and fifth reflector, move the cutting head assembly to the leftmost and rightmost of the beam. Affix a layer of tape on the incident light port of the cutting head, burst laser at the burst leftmost and rightmost of the beam, to make the laser beam on the tape affixed on the incident light port of the cutting head and ablate traces of light spot, adjust the screws of the front reflector holder so that the spots superpose in the center of the incident light port;

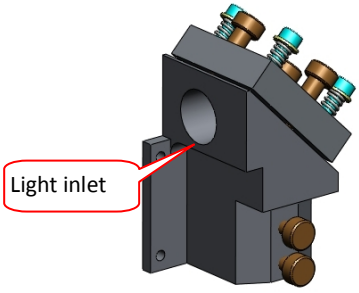


Fig.3-18 Cutting Head

- Check if the light spots are superposed when the beam is in a different position after adjusting; if not, please re-adjust the optical path in above method until superposed.
- After adjusting superposition, check if the light spot is in the center of the focusing lens, and if the laser beam is perpendicular to the focusing lens. The method is as follows: rotate the jet cup to separate it from the cutting head, adjust the focusing lens barrel to the highest position and the lowest position, stick a layer of adhesive paper on the outlet of the focusing lens, press surrounding of the outlet to make the contour of the outlet appear on the adhesive paper, shoot laser to make the laser beam burn spot on the adhesive paper, adjust the screws of 3# reflector holder to make the two spots overlap in the center of the outlet, as shown below:

Fig.3-19 Focusing Lens Laser Outlet

Attention	Laser is invisible light and with direct harm to human body. While adjusting the light route, the operator is required to pay great care. The operator is not permitted to make adjustment until having received professional training. During adjustment, pay attention to the lens to have them free of pollution by smoke and dust.

3.3.4 Processing commissioning

After the above steps, the motion and laser commissioning are finished, and commissioning can now begin.

- First start the equipment in power-up sequence;
- Then, prepare the materials to be processed, and place the materials on the work surface horizontally;
- Import or draw graphics to be processed;
- Set the processing parameters (layer parameters) and related data processing technology (such as path optimization);
- Adjust the distance of cutting head (non-metal processing) to make the laser focus fall on the surface of the processing materials;
- Move the laser head to the processing start (find the starting point);
- Start processing.

Chapter4 System Maintenance and Care

To ensure normal use of laser cutting machine, it is necessary to perform routine care and maintenance on equipment. Since the whole machine tool is assembled with high-precision parts, be careful in the routine maintenance process, operate in strict accordance with the rules of each part, and perform maintenance by dedicated personnel to avoid damage to components.

4.1 Users should prepare the following accessories

- Cotton swab: 2 bags.
- Degreasing cotton: 5 bags.
- Alcohol: 500ml, purity > 99.5%.
- Acetone: purity > 99.5 %, water < 0.3%, capacity: 500ml.
- Lens cleaning wipes: 5pcs.
- Disposable latex gloves: 1 pair.
- Multimeter: 1pcs.

4.2 Mechanical maintenance

Mechanical maintenance mainly includes the maintenance of: guide rail, lead screw, synchronous belt, synchronous belt wheel, screw and coupling. It is a must to the followings well done for maintenance:

- After completing use every day, cleaning all parts of the equipment.
- Oil sliding mechanism such as guide rail and lead screw with lubricant.
- Make irregular check on the equipment to mainly check if there is poor contact of the joints. In case of abnormality, timely treatment is needed to avoid causing serious problems.

The followings are detailed information concerning maintenance of each mechanical part.

4.2.1 Guide rail, Lead screw

Guide pulley and lead screw are core parts of the equipment. Their function is for direction leading and transmission. To ensure a higher processing accuracy of the machine, higher direction leading accuracy and stable movement of the guide pulley and lead screw are required. During operation, plenty of corrosive powder and smoke are generated from the processed work piece. In case of long-term stay of the smoke and dust in the surface of the guide pulley and linear shaft, the accuracy of the equipment will be greatly lowered, and corrosive points will be formed on the surface of the linear shaft causing lifespan of the equipment shortened. To keep normal operation of the machine and ensure processing quality, daily maintenance shall be well done.

Cleaning and maintenance of lead screw and guide rail:

Turn off the equipment, move the laser head to the right-most (or left-most), and wipe along the axis repeatedly with cotton cloth until the axis is clean; then, move the laser head to the left-most (or right-most), and wipe along the repeatedly with cotton cloth until the axis is clean. Finally, apply a little lubricant on the surface of the axis (guide rail lubricant); push the laser head slowly in lateral direction for several times until the lubricant is evenly distributed on the surface of the linear axis. Clean the guide rail in the same method.

According to the frequency of equipment use, periodically (once every 15 days to two months) check if the lubricant of the linear guide rail is sufficient; lubricate the linear guide rail with lubricant of 32-150cst viscosity.

Procedures:

- Stop the equipment and disconnect the power supply;
- Open the corresponding guard to expose the nozzle of the linear guide slider;
- Aim the filler of the grease gun at the nozzle of the slider as shown on the manual of the grease gun, and apply oil;
- Put back the guard;
- Connect the power, and start the equipment.

Grease linear guide rail slider

Grease the linear guide rail slider every 70km or within three months, or else it will cause abnormal wear of the slider and affect the precision and life of the equipment; turn off the equipment before greasing, open the hood, and grease the slider oil nozzle with oiling gun. The recommended grease viscous force is 40~120cst.

4.2.2 Synchronous belt, synchronous belt wheel

Synchronous belt and synchronous pulley are important movement parts of the equipment. It controls the precision of motion components. The synchronous belt may be loose due to slight stretch and impact the movement precision and sensitivity of the laser head, and thus the synchronous belt should be adjusted in time.

Adjustment method: Use a hex wrench to loosen the mounting parts of the synchronous belt, adjust the mounting parts of the loosened synchronous belt to tension the belt, adjust to an appropriate degree of tension, and lock these parts. The synchronous belt should be tensioned properly; adjustment of drive motor synchronous belt is to achieve that when pressing middle part of the synchronous belt, the sinking level is 3% to 5% of the central distance between the belt wheel at the two ends.

Attention	➢ If to adjust the transmission belt too tight, the belt is not only easily made distortion but also cause more severe abrasion of the bearing; if too loose, transmission accuracy and sensibility will be lowered. Therefore, you should adjust the synchronous belt at a proper tension. While adjust Y direction synchronous belt, it is to achieve a proper ten for the synchronous belt and make the left and right synchronous belts at the same tension. Only by this way, a stable transmission synchronous belt can be achieved to ensure a good carving and cutting effect of the product. ➢ Keep the synchronous belt away from oil, pr chemicals. Contact with acid, alkali, oil and organic solvent is prohibited. Keep the synchronous belt dry and clean. ➢ There is problem of aging with rubber of the synchronous belt. In case of serous aging (or abrasion), timely replacing with a new one is required. Please note that synchronous belt wheel should also be replaced if to replace the synchronous belt. ➢ After using the synchronous belt for a certain period, loose belt and abrasion will also be caused, and then timely replacement and lockup are needed. Please note that the new synchronous belt should match with the synchronous belt wheel.

4.2.3 Fasten screws and coupling

After working for a certain period, the screws at movement joints and the coupling of the movement system may be loosen causing low stability of mechanical movement. Therefore, during movement of the machine, you should observe if there is abnormal sound or other abnormality with the movement parts. In case of problems found, timely fastening and maintenance are needed. Meanwhile, the screws of the machine should be tightened one by one with tool after a certain period of use. The first fixation should be performed roughly one month later after using.

4.3 Electrical maintenance

Mainly check the stability of routine supply voltage, and keep the electrical cabinet of the machine tool clean and well-ventilated. Check the integrity and safety of the lines, check if the emergency stop button functions

normally, test the function of the limit switch and home switch of each axis, and check if the sensor and the drive work normally. Check if the state of button switches, indicators and warning lights is normal, diagnose and eliminate the failures of the servo system.

4.3.1 Limit switch

Minimum once a month to make check on the effectiveness of limit switch of the X-axis and Y-axis. The limit switch plays the role of restraining the limit position of the movement to avoid machine impact (overreaching) causing damage to the machine. It is a must to make regular check on working state following the steps below:

- Start up the machine to have the laser head reset;
- Operate the machine to make the movement shaft move to the limit positions. If the movement shaft stops at the limit position, it means a normal operation of the limit switc

Tips	In case of hard impact occurs, please immediately press the emergency stop button to stop the machine, and find a solution for it.

4.3.2 Emergency stop button

Emergency stop button is a safety emergency component of the laser cutting machine relating to the safety of personnel, property and equipment. The functions must be tested in the following steps within the maintenance intervals specified on this manual.

- Turn on the laser cutting machine and perform the cutting operation;
- Press the emergency stop button. If all of the power supplies to the electrical load of the equipment are cut off, the emergency stop safety circuit is working properly. If one machine has two or more emergency stop switches, check one by one this way;
- Reset the emergency stop button and restart the device;
- The emergency stop button is optional, depending on the configuration;

4.4 Light route maintenance

The light route system of the laser cutting machine consists of the reflection of the reflector and focusing of the focus lens. The focus lens doesn't have offset problem in the light route. However, the light route may offset after a long period of work or due to mechanical vibration. Although the reflector will not offset when the machine is under normal use, it is recommended that the user shall check whether the light route is normal each time before the machine is working each time.

The optical lenses of the equipment have specular reflection and focusing effect on the laser beam. Although we have taken adequate protective measures, the material surfaces may release large amounts of corrosive gases and dust during laser cutting of the materials easy to produce dust, and the lenses can't completely avoid these dust pollution. In addition, the lenses are precious and easily damaged under improper use, which isn't covered by the manufacturer's warranty. Therefore, the lenses require regular cleaning and maintenance. If there is any damage or serious pollution, please replace the lenses in time. It is recommended to check and clean the lenses before starting the equipment every day.

The polluted lens may cause the following consequences:

1. Effective power of the laser beam is reduced, and power loss is increased; output power is unstable;
2. Excursion of laser beam focus;
3. In case of serous pollution, the focusing lens may be broken down or burn damage to plating layer causing absolute malfunction.

Any bonding material will increase the absorption rate of the lens and reduce the service life. Therefore, please take the following preventive measures to prevent damage and contamination to the lens in the process of placing, installing and cleaning the lens:

1. Do not use suction equipment or inflatable devices to avoid scratching the lens surface;
2. Do not contact with the film directly with tools or human body when take the lens; use lens cleaning paper to isolate the tool or human body and grip the edge of the lens;
3. Do not clean the optical lenses with water or detergent. The surface of the lens is coated with a special membrane, and these materials will damage the surface of the lens
4. When installing or replacing the reflector or focusing lens, do not apply too much pressure, or else it will cause lens deformation, thus affecting the quality of the beam;
5. The lens should be tested and cleaned in dry and clean places. The surface of a good console should have several layers of clean non-woven fabric or lens cleaning paper;
6. The operator should avoid sweat or breathing gas contacting reflective surface of the lens, and keep other potential contaminants away from the work environment.

4.4.1 Correct cleaning method

During cleaning the lens, the only objective is to remove pollution on the lens, but not cause further pollution and damage to the lens. To achieve this goal, people usually take the method with less risk. The followings are just for this purpose:

Firstly, use air balloon to blow off particles on surface of the lens, especially the micro particles and floccules on the lens. This is a necessary step. Yet, compressed air of the production line is strictly prohibited. This is because the air from it contains oil and moister, and that will cause further pollution to the lens.

Secondly, gently clean the lens with acetone or absolute alcohol (Absolute alcohol is necessary. It may lower the possibility of pollution to the lens.

After soaking acetone, use the lens paper to clean the lens under sunshine and move in a circle. When the paper gets dirty, it is ma must to replace it. Cleaning must be done in a one-off way to avoid scratch caused.

Certainly, some pollution and lens damage can not be removed by cleaning, e.g. film burn by dirt, film peeling off by dew or condensate water. To recover its good performance, the only way is to replace the lens.

The focusing lens is vulnerable and valuable. Follow the steps shown in the figure below during the cleaning process:

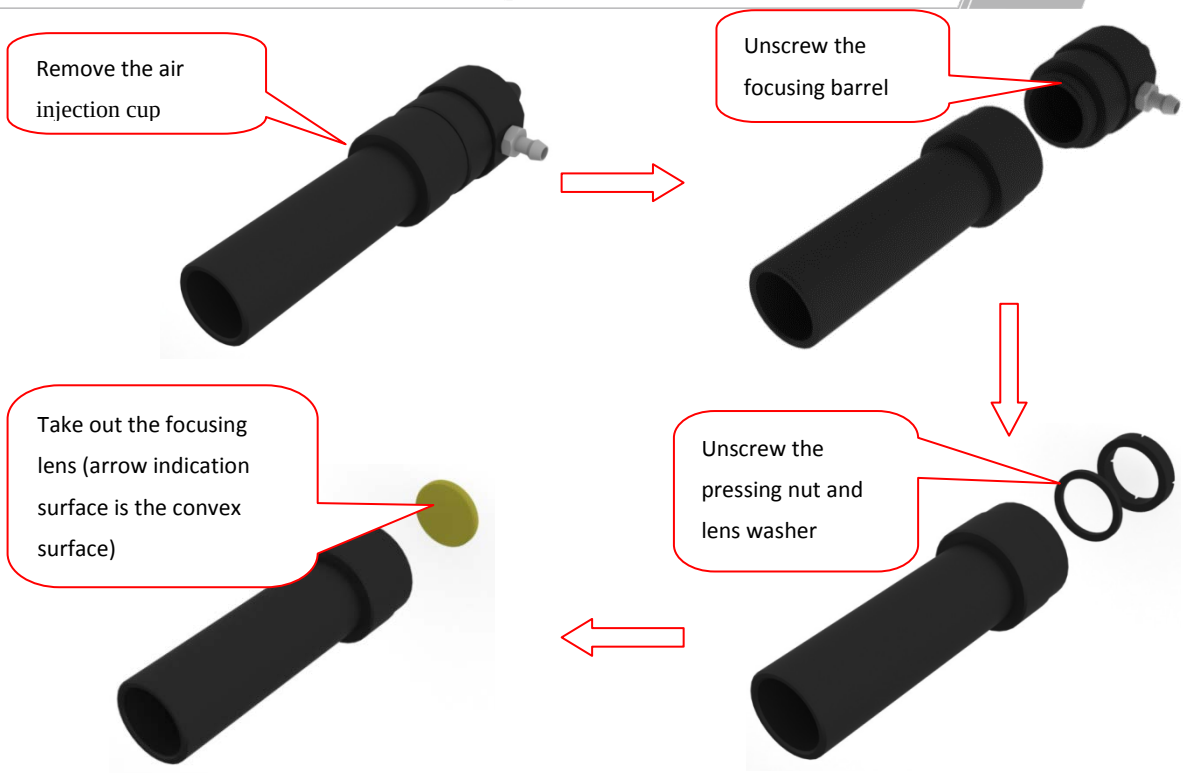


Fig.5-1 Focus Lens Removal Process

Storage of optical lens:

- Proper storage can maintain intact quality of the optical lens.
- Storage temperature: 10 ~ 30 °C; do not place the lens in the freezer compartment or a similar environment, or else it is easy to damage the lens when it is taken out; the storage temperature shouldn't be greater than 30 °C, or else it will affect the surface coating of the lens.

Store the lenses in a box and put it in an environment without vibration, or else it causes lens deformation easily and affects the lens performance.

4.5 Auxiliary parts maintenance

4.5.1 Blower cleaning

For every 15 days, it is to clean the air pipe, and blower to prevent foreign matters accumulated from lowering effect of air out. Check if there is leakage, foreign matter, perform repair or maintenance. Long-term use of blower will cause plenty of solid dust accumulated inside the it causing large noise and lower effect of air exhaustion ventilation and smell elimination. In case of insufficient suck force causing unsmooth smoke expelled, firstly power it off, remove the air-in pipe and air-out pipe from the blower, remove dust inside them, and then turn the blower upside down, and push the blade of it till it getting clean, and then assembly the blower ready for use:

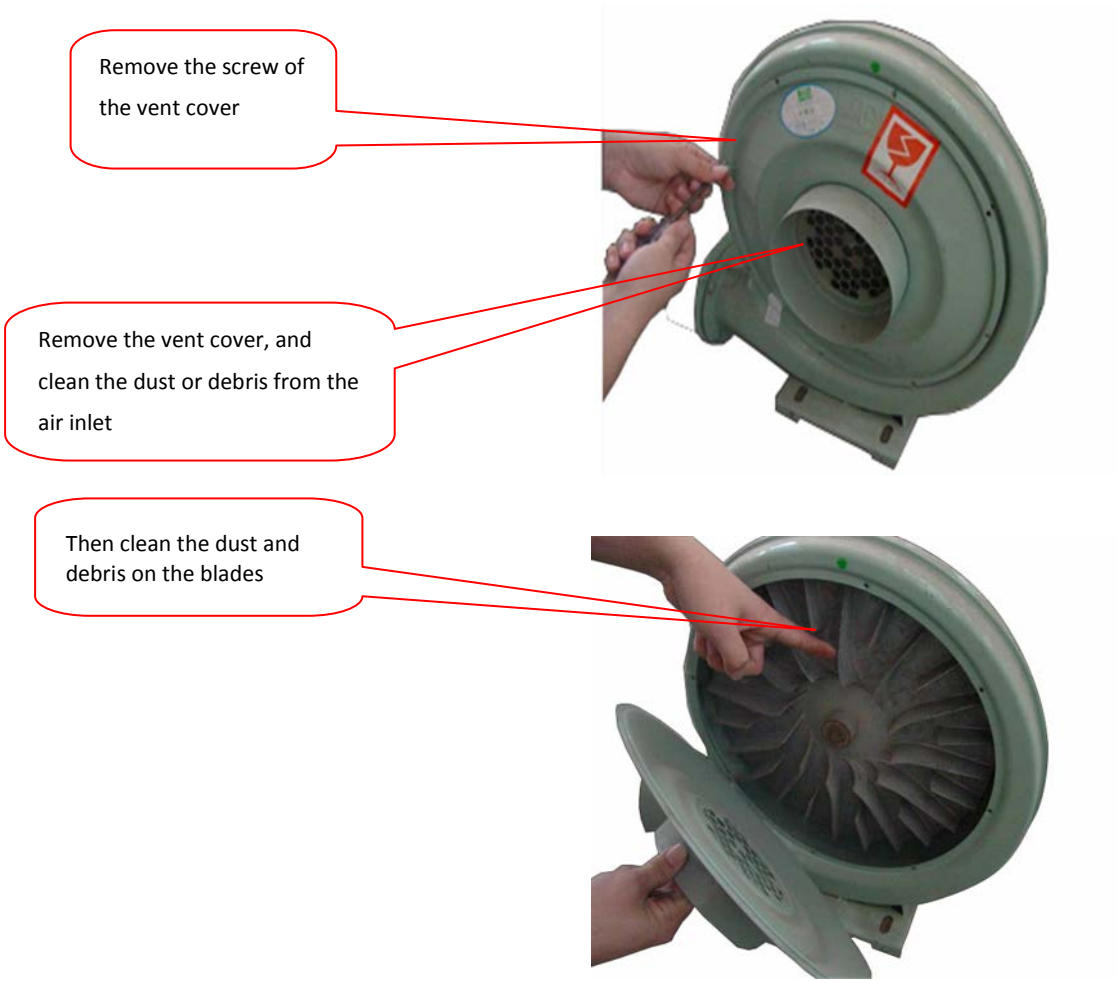


Fig.5-2 Blower Cleaning

4.5.2 Water chiller maintenance

Water quality and temperature of the cooling water will directly relate to lifespan of the laser tube or radio frequency tube. Cooling water must the purified water at temperature below 35℃; the cooling water must be kept clean and regularly replaced (minimum once a month). Check if the cooing water gets muddy, with deposit, at over high temperature, or water replacement required; during processing, frequently check water level to ensure sufficient water or if the water temperature is over high (higher than 35℃).。

Fig.5-3 Water chiller

Steps of replacing cooling water:

- Power off the machine and stop the laser device;
- Unscrew valve of water outfall of the water chiller for a thorough drainage of water from the water chiller;
- Open protective cover of the water chiller and pour purified water into the water chiller;
- Start up the machine, it will start work when the laser tube is filled up with water and formed to circulation.

4.5.3 Platform maintenance

The conveyor device is the Epsilon-type cutter conveyor mechanism, of which Han's Yueming is in possession of the independent intellectual property right. Each cutter is mounted on the worktable separately. The following aspects should be noted during operating:

- During daily work, do not touch the cutter with hard object or scratch the surface of the cutter directly;
- Due to materials being processed are flexible, it is necessary to clean the scraps on the surface of the cutter with a brush after processing, or else it will affect the suction effect of the worktable and thus affect the processing effect;
- The cutter should avoid contact with corrosive liquids or gases;
- If the cutter is damaged or deformed, remove it directly and replace.
- Do not put heavy objects on the cutter belt, or else it will cause cutter broken or deformation
- The plastic covers on both sides of the cutter protect the operator from being scratched or protect the materials being processed and the sealed worktable from being damaged by the cutter edge in the process of movement. If damaged or lost, replace in time.
- Before delivery of each machine, we have lubricated the sprockets and chains. In order to extend the life of the chains and sprockets, it is recommended to lubricate the machine every other year (with high quality mineral oil). The user only needs to disassemble part of the cutters, clean stains on the sprockets and then re-lubricate.

4.6 Maintenance cycle

The maintenance period of laser, chiller and air compressor in accordance with the maintenance cycle stated on the manual.

The machine tool requires initial inspection after 24 hours of the first use, re-inspection after 100 hours, one inspection after six months, and then one after every six months or a year (depending on the customer).

4.7 Runtime maintenance

Before running the machine tool, check machine tool every day as required. If there is abnormal sound when the machine tool is running, shut down and check immediately. After the machine is running, shut down in required sequence, clean the work table of the machine tool and around machine, and do not place unrelated items on the work table or console of the machine.

- Regularly check the lubrication of the moving parts of the machine tool, ensure sufficient lubrication of X-axis rail, Y-axis rail, Z-axis rail and screw seat, ensure the accuracy of the machine tool, keep lubrication of all moving parts and extend the life of X-axis, Y-axis and Z-axis rails;
- Check the air pipe and water pipe for damage weekly; if damaged, inform Han's Yueming Laser for maintenance;

- Clean the debris and dust from the air inlet and outlet, and filter screen of the machine tool weekly;
- Check the level of the cooling water weekly, and fill up in time if insufficient;
- Check the pollution of the reflector and focusing lens surface every two weeks, and clean the optical lens in time to ensure its service life;
- Check the outer optical path once every month; the optical path directly affects the cutting results;
- Check the filter in the gas path once every month, and remove the water and debris from the filter;
- Regularly check if external cables are scratched, and if the interfaces in the power distribution cabinet loose;
- After the machine tool is installed and used for six months, readjust the level of the machine tool to ensure the cutting precision.

4.8 Maintenance of long-term shutdown

If the machine tool will be shut down for long time, please lubricate the moving parts of the machine and wrap in rust-proof paper. For other parts, regularly check for rusting, process the rusting parts (add dust cover if possible), regularly clean and check the machine.

Chapter5 Troubleshooting

No	Failure	Analysis Method	Solution
1	The equipment can't be turned on	Check if the emergency stop button is pressed down	Release the emergency stop button
		Main contactor in electrical b ox trips	Reset the main contactor
2	Laser tube can't work	Water-cooling system isn't turned on normally	Turn on the water circulation system
		Water protection is not triggered	Check if the chiller is working properly
		Laser system isn't turned on	Press the laser power button
		Laser power supply is damaged	Replace the switching power supply of the same specifications
		Laser is damaged	Replace the laser
3	Equipment alarm	If motherboard parameters are correct	Correct motherboard parameters
		Device alarm signal triggered	Check the alarm signal source of the equipment
4	Laser pause during working	Check if water circulation is smooth	Clean water tank, dredge water hose
		If power voltage is table	Install a stabilizer to input power supply
5	Wrong figure size	User adopts PLT output in CorelDraw software. In HGPL dialogue box, if unit of plotter in page option is set correct	PLT plotter unit out from CorelDraw software should match with resolution of SmartCarve software lead-in PLT option
		User adopts PLT output in CorelDraw software. In HGPL dialogue box, if zooming in page option is 100%	Change to 100%
		If resolution of the mainboard parameters are correct	Set to the correct resolution or equivalent
		Fail to connect earthing for the mainboard or other interferences	Connect earthing, eliminate the interference
		Over high temperature causes crash to the mainboard	Add more measures for lowering temperature
6	Reverse direction of motor shaft movement	If lines from the drive to the motor are connected improperly, and drive parameter settings are correct	Check electric earthing and drive parameter settings
7	Fail in movement of motor shaft or twittering of it during movement	Improper setting of motor parameters	Set to the correct movement parameters
		Damaged drive or motor	Change the drive or motor
		Change the drive or motor	Reconnect the motor and drive line
8	Cutting graphics and drawing size do not match	Program input error	Check the procedures according to the figure
		Synchronous belt is loose	Tension the synchronous belt
		Control system is damaged	Check the stepper motor and drive, and replace if damaged

Chapter6 Transportation, Shipment and Storage

6.1 Packaging

The chiller, laser and accessories of laser cutting machine are packed in wooden cases. Other parts are wrapped with PE foam and protective film to protect external objects damaging any part of the laser cutting machine.

6.2 Transport and shipment method and precautions

Pay attention to the following matters during transport:

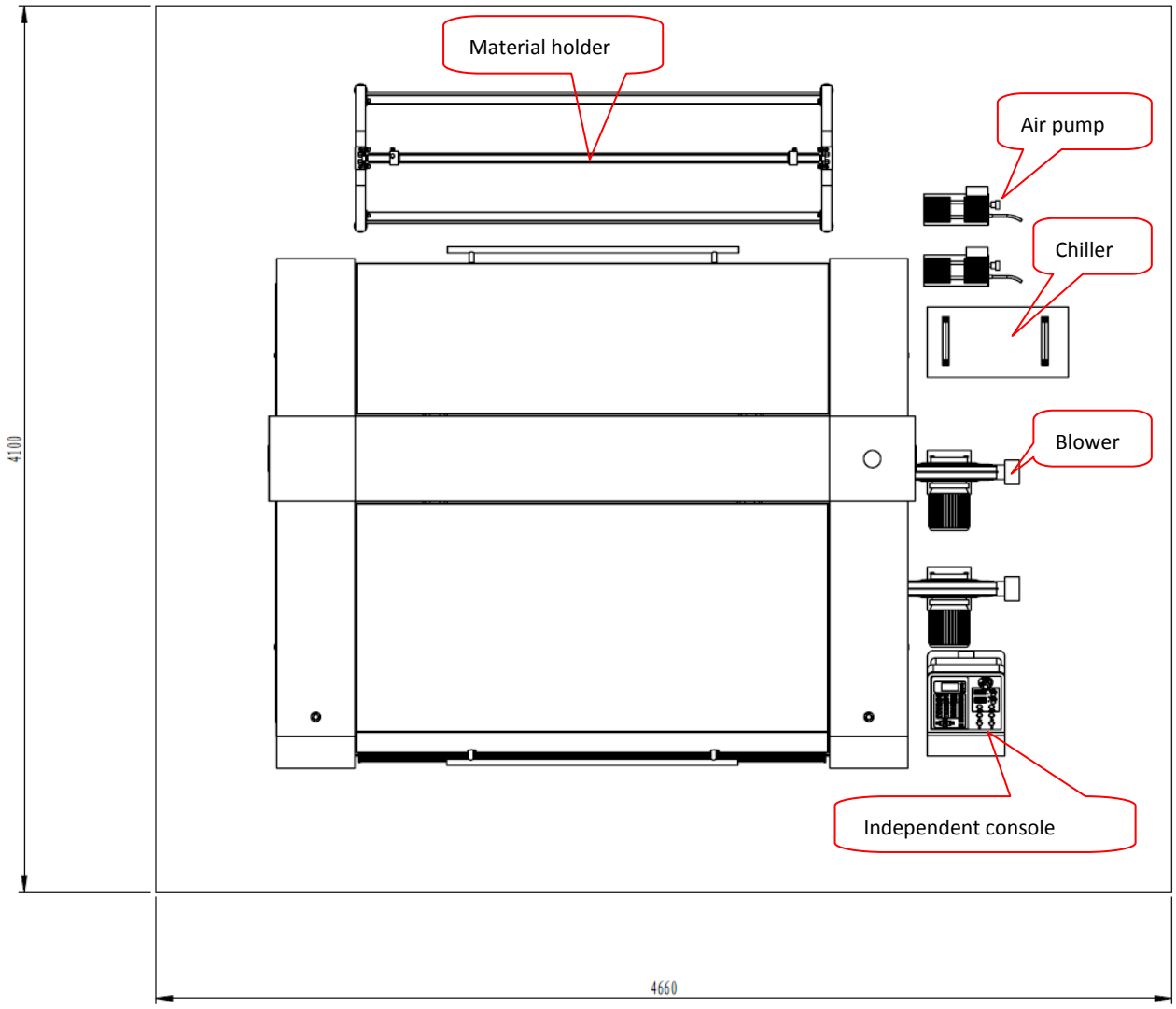
- The equipment must be placed in a secure position of the vehicle load;
- Do not place other parts in the equipment to prevent secondary damage to other equipment in long-distance transport;
- Tighten the equipment with wire rope after loading, and the equipment must be fixed to the plate firmly to prevent movement of the equipment in transit;
- control panel, monitors and other wearing parts must be protected properly (disassemble and package separately if possible);
- If the transport equipment is pallet truck, it must be wholly wrapped in ponchos at least two layers to prevent being exposed to moisture and rain due to water seepage;
- Do not climb or stand on the crate, or place any heavy objects on the crate.
- Do not drag or carry the product with cables connected to the product.
- Do not impact or scratch the panel and the display.
- The crate should be protected from moisture, exposure in the sun and rain.
- When lifting the machine, handle gently to avoid collision. The wire rope shouldn't scratch the machine while lifting; if unavoidable, isolate with soft objects.

6.3 Storage conditions, period and precautions

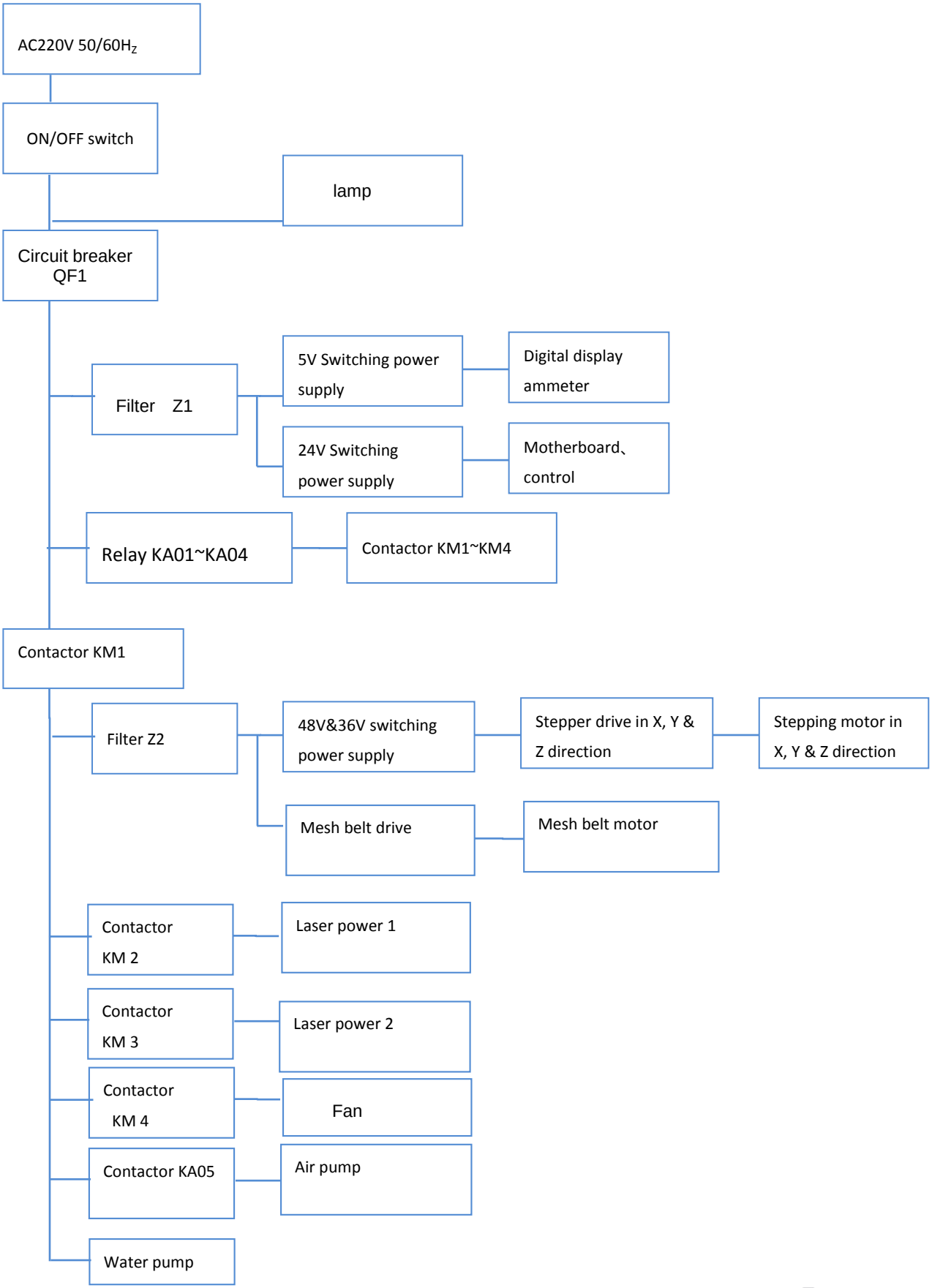
The storage environment of the machine should avoid the rain, moisture, inclining, rodents, potholes and other hazards and ensure good ventilation. The storage ambient temperature should be -10°C ~ +40°C, and relative humidity is not higher than 85%. For the transport and storage less than 24 hours, the ambient temperature shouldn't exceed 60°C. It is prohibited to store in open air for a long time. If temporary storage is required, in addition to the above requirements, check the storage conditions and packaging state to ensure the machine from damage.

Chapter7 Appendix

7.1 Flat Machine Installation Diagram



7.2 Electrical diagram



Postscript

All final right of interpretation of this manual belongs to GD HAN'S YUEMIGN LASER GROUP CO., LTD; we will do our utmost efforts to ensure the accuracy of the contents of this manual. We do not assume any responsibility caused by misspellings and typing errors. Your comments will be highly appreciated.

大族粤铭激光 YUEMING HAN'S YUEMING LASER

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