



金运激光
GOLDEN LASER

YAG Laser Precise Cutting Machine <Operation Manual>

Please read this manual carefully before installing and operating this product.

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Chapter 1 Introduction

Thanks for using the YAG laser precise cutting machine of Wuhan Golden Laser. Please read this manual carefully before using the machine and keep it for reference. The beam of special properties (wavelength 1um, 10.6um and the like) generated by exciting a specific substance is what we call laser light, while the device that turns electric energy into the optical energy of the foregoing wavelength is a laser, which can be classified by the shape of the excited substances as: a solid (e.g. YAG) laser or a gas (e.g. CO₂) laser. Different lasers are used for processing different materials and different purposes.

Laser light has been widely used in military, electronic, industrial, agricultural, medical and scientific applications ever since it was born and has been developing very quickly. YAG laser light, as a thermal light source of high energy density, provides many ways of processing for both metallic and nonmetallic materials, while the non-touch engraving and cutting provides unique merits: as the conventional mechanical knives are replaced by invisible light and avoids exposure of the workpiece to the mechanical part of the laser knife head, the workpiece surface is free from scratches; as no cutting knife is used, plus the cutting seam is narrow and the cut is smooth, the machine is not subject to the crispness, hardness, softness or elasticity of the materials being processed. It is particularly advantageous for cutting small-angle irregular graphic materials over any ordinary processing technique. Compared with conventional processing techniques, laser processing features high precision, high efficiency, high cost performance and environmentally friendliness.

Wuhan Golden Laser Equipments Manufacturing Co., Ltd is a professional developer and manufacturer of special processing equipment. Ever since it was founded in 1992, the company has regarded technology as the first productivity and followed the human-oriented and market directed guideline, having developed unique products in special processing like laser and electrical erosion, achieved major breakthroughs in laser application software, lasers, laser engraving and cutting technique. The company has been awarded a number of national patents and now owns first-class talents and core expertise in relation to optics and control software. We will continue our efforts for the industrialization of leading technologies in China.

Customers' demands are the power generator for our continuous exploration and development. Customers' problems are the golden key for our continuous studies and innovation. We, the Golden Laser people forged under the corporate culture of "consolidation, innovation, credibility, service", are well convinced that brand comes from quality, credibility is our life, and unremitting efforts has won us gold-precious brand effect. Our extremely cost efficient products have established excellent market image in textile garments and craftworks. We have witnessed rapid growth in the annual sales and ever-rising market share.

It's our sincere wish that Golden Laser will grow hand in hand with you!

Cautions before use

- . Make sure the product is what you ordered after unpacking it.
- . Please read this manual before using the equipment!
- . Please follow the safety preventions, warnings, cautions and safety signs before using the equipment!

Verify the product is not damaged during the transport.

Please contact us or our sale agent for any inconformity in or damage to the product (see details about unpacking and installation described herein).

Special statement: The hardware and software are subject to subsequent changes in connection with customized models or technical escalation without notice. For any question, please contact our customer service at 400-812-9977 or duty handset at 15827233128.

Warning: The equipment should be operated, installed and uninstalled by an operator having received our training only. We assume no responsibility for any damage otherwise caused!

Safety caution: To keep the operator safe and avoid danger to the laser system or environment, please follow all the safety cautions, warnings and signs specified below and in subsequent sections herein whenever you start any of our series products.

Cautions

- * Please read this manual before using the equipment;
- * Only an authorized or trained technician is allowed to come into any place exposed to radiation and to operate this equipment;
- * This equipment contains a laser that produces high power laser as a class IV laser device. Beams outputted are strong enough to penetrate the surface of the skin and injure the hypodermis. More seriously, they may cause irrecoverable injury to the eyes. As a result, please avoid direct exposure or indirect exposure through other reflecting materials to the laser beams;
- * Laser may cause many objects to absorb light energy and burn. Please keep the equipment off any inflammable or explosive object in case of fire accident;
- * Provide protection against shock wave and/or vibration where the laser equipment works to avoid exposure to shock wave or damage.
- * Make sure all the following measures are provided before turning on the machine:
 - The equipment is grounded at all the ground parts to prevent static damage to equipment or injury to people;
 - The equipment contains a sealed-off CO₂ laser. Do not start the equipment if the outer cover of the machine is open in case of personal safety accident as the operator is exposed to laser radiation;
 - Provide all necessary warning lamps, signs, isolation belts and safety interlocks at the work place to prevent other people from coming in by mistake and suffering from laser radiation;
 - All people at the work place should wear laser protection glasses to avoid sight deterioration or damage due to laser radiation;

Do not turn on the machine and work in thunder or lightning.

- * Do not open the outer cover and adjust or repair the laser system without permission. The system should be adjusted and repaired by our professional after service technician or an authorized professional technician only.
- * A key lock is mounted on the electrical cabinet door, the key of which should be kept by the repair management only. No person other than the repairman is allowed to open the electrical cabinet door.

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We will try our best to ensure information provided herein is full and accurate. This manual is a general instruction series and does not intend to cover every function or every type of equipment supplied. Information herein is current at the time and subject to subsequent changes from time to time without notice.

Please contact our after service immediately for any question about the equipment.

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Chapter 2 Features and classification of YAG Laser Precise Cutting Machine

2.1 Hardware

- * Specially designed for fine cutting of large-area metal plate. The follow-up focusing of the laser ensures high cutting quality.
- * Extraordinary processing performances with YAG laser as the thermal source for the laser machine.
- * The specially developed dedicated laser movement control system and fixed path structure guarantees accurate and steady knife operation.
- * The unique water cooling system guarantees continuous work of the laser machine.
- * An industrial control system incorporated provides high disturbance resistance, steady operation and makes it easier to wash or replace the working table.
- * Pleasant appearance, easy installation and small land occupation.

2.2 Generic description of YAG laser precise cutting machine

(The expression of the cutter is specified in the numbering rule)

The product model of this kind of products consists of 6 fields expressed in English capital letters and Arabic numbers as detailed below:

GDB (3D) □□ □□□ (□□) (□)
A B C D E F

Field A means solid marking;

Field B shows whether the product is provided with a dynamic triaxial focusing system and means without a dynamic triaxial focusing system when in default;

Field C means the class of the pump source for the solid laser generator expressed in English capital letters where:

When field C is D, it means the product is a lamp pump laser generator;

When field C is EC, it means the product is a semiconductor side pump laser generator;

When field C is ED, it means the product is a semiconductor end pump laser generator;

When field C is GX, it means the product is a fiber laser generator;

Field D means the power of the laser generator expressed in Arabic numbers in W (the average power);

Field E means the structure form of the working table and refers to a fixed aluminum-board working table when in default;

When field E is SG, it means the working table is a lifting working table.

Field F means the altered sequence number and refers to initial design when in default, and shows the subsequent sequence number in English capital letters, i.e. A means the first alteration; B the second alteration and so on.

E.g. GJMSJG4060 means a solid laser precision cutting machine with the working area of 400×600mm.

Chapter 3 Performance and technical parameters of Yag precise cutting machine

Type of laser	YAG Laser generator wavelength 1064nm low order model per EN.60825-1:07			
Laser generator	Made in china			
Cooling type	Water cooled			
Laser power	250W	450W	500W	650W
The capability of chiller	12. 5KW	18. 5KW	18. 5KW	20KW
Total equipment power	23KW	28KW	30KW	35KW

Laser generator current range (V)	200~500	200~580	200~600	200~640
Laser generator frequency	50-500 Hz			
Movable system	Servo ball screw system. Safety alarm system. Embedded offline control system			
Cooling water temperature	18℃~27℃			
Ambient temperature	10℃ ~ 35℃			
Ambient humidity	40% ~ 85%			
Transport/storage temperature	-25℃~55℃ (24h max when transported or stored where the temperature is no higher than 70℃)			
Power supply	refer to nameplate (ultra-low 24V safety voltage for operation panel, solenoid valve and operation buttons)			
Noise level	40/dB~75/dB			
Environment requirement	Within 1000 above sea level			
Cutting speed range	0-100mm/min(varying from material to material by the content, thickness and laser power)			
Reposition accuracy	≤0.05mm/m			
Environment parameter	To be used in an environment equivalent to at least a class 300000 clean room			
Laser direction	Vertical to the working plane			
External dimensions	1860mm×1480mm×1370mm (GJMSJG4060 as an example)			
Overall weight	550kg (GJMSJG4060 as an example)			
Control software	Golden laser galvanometer scanner cutting software			
Working table type	Crossed slopway			

Table3.1.1 Performance and technical parameters

Special statement:

- 1) Ambient temperature: When the ambient temperature is higher than the max admissible limit, the equipment will not be sufficiently radiated, which will deteriorate the operation stability of the equipment; when the ambient temperature is lower than the min admissible limit, water in the laser module may be frozen, which may damage the components in the laser module.
- 2) Cooling water temperature: When the cooling water temperature is higher than the max admissible limit, the laser energy will drop quickly; when the cooling water temperature is lower than the min admissible limit, water in the laser generator may be frozen, which may damage the components in the laser. (Note: The cooling water temperature should be set as per the ambient temperature and humidity. The max temperature set for the chiller should be less than 10 C from the ambient temperature. Otherwise the equipment might be subject to dewing due to the low temperature setting). Please see the table below for the chiller of an RF laser:
- 3) Power supply: Fluctuation in the power supply voltage will cause unsteady work of the equipment or discontinuous light output; high voltages will cause permanent damage to the equipment power system.

Chapter 4 Composite of YAG laser precise cutting

4.1 System composition

(The following is description of the general composition of our YAG laser precise cutting GJMSJG4060 as an example)

4.1.1 Movable mechanical system

4.1.1.1 Type I of movable mechanical system

(GJMSJG-4060, GJMSJG-13090 and GJMSJG-6080 belong to this type. GJMSJG-4060 as an example below)

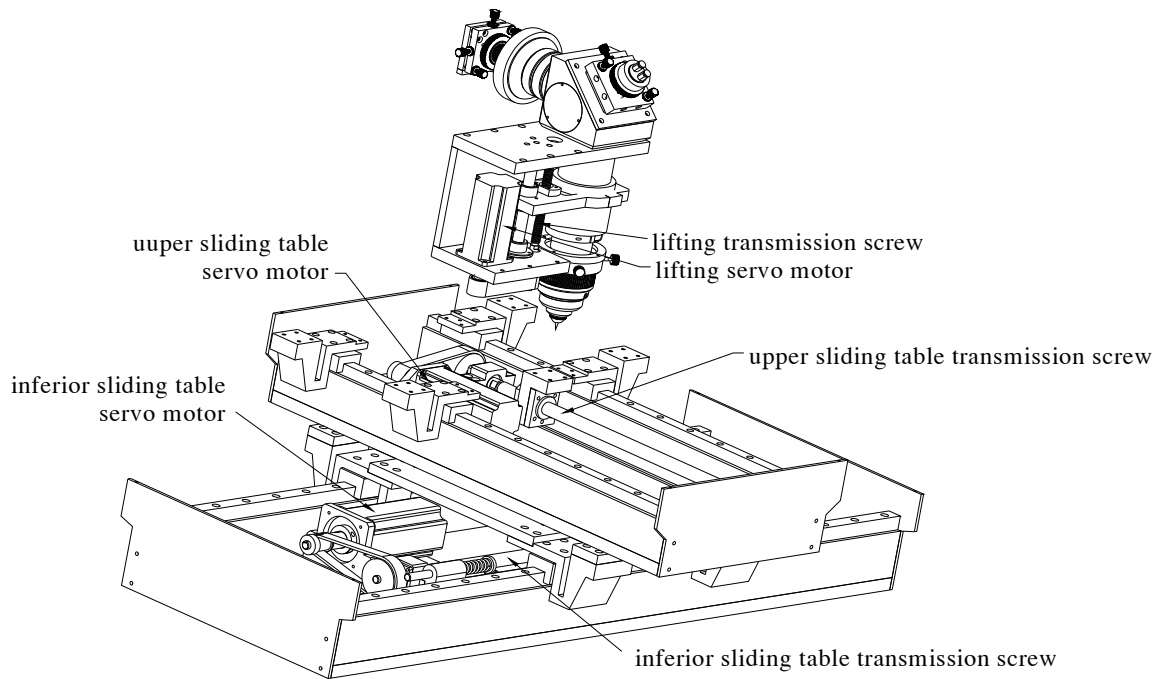


Fig 4.1.1.1 Construction of the machine movable system

Main components and their functions include:

The lower slide frame base is connected to the bracket and stays unmoved. On the lower slide frame is a servomotor, a ball ball screw and two linear guides. The servomotor drives the ball ball screw through the synchronizing wheel, synchronizing belt coupled on the motor shaft and the synchronizing wheel at the end of the ball feeder screw. When the ball feeder screw is rotating, the screw nut and the upper slide frame coupled on the nut move side to side (along X) as guided by the linear guides.

In the same way, the upper slide frame servomotor drives the ball ball screw through the synchronizing wheel, synchronizing belt coupled on the motor shaft and the synchronizing wheel at the end of the upper slide frame ball ball screw. While the ball ball screw is rotating, the screw nut and the working table (for fixing and supporting the workpieces) coupled on the screw nut move back and forth (along Y axis) as guided by the linear guides on the upper slide frame. In this way, the workpiece coupled on the working table will move both back and forth and side to side (X axis, Y axis).

Lifting part of the laser head: As the workpieces to be processed are uneven on the surface, the lifting part of the laser head works mainly to test the distance between the focus of the focus lens to the surface of the workpiece right beneath the laser head with a sensor and adjust the distance between the focus of the focus lens to the surface of the workpiece right beneath the laser head from time to time to keep it within a constant limit. On the lifting part of the laser head is a distance detection sensor, a servomotor, a synchronizing wheel, a synchronizing belt, a ball screw and a guide shaft. The distance detection sensor transmits the detected signal to the servomotor control system. The latter drives the servomotor and rotates the screw through the driving force of the synchronizing belt so that the laser head coupled on the screw nut moves up and down with the screw nut to adjust the distance between the focus of the focus lens to the surface of the workpiece right beneath the laser head and guarantee the cutting quality.

4.1.1.2 Type II of movable mechanical system

(GJMSJG-12595, GJMSJG-150300 and GJMSJG-130250 belong to this type. GJMSJG-12595 as an example below)

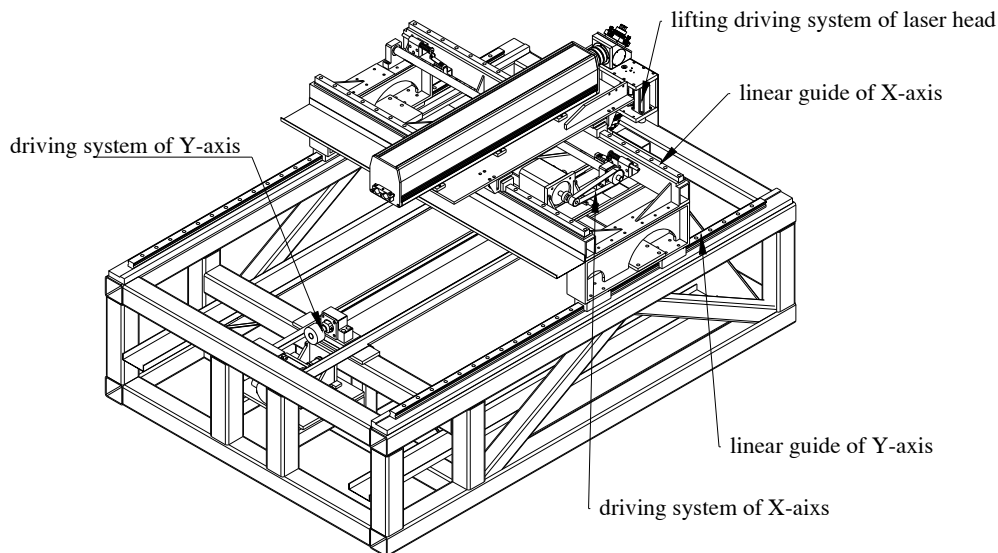


Fig 4.1.1.2.1 KJG-12595 movable mechanical system

Main components and their functions include:

The working table is connected to the bracket and stays unmoved.. On the bracket is a servomotor, ball screw of Y-axis and two linear guides of bracket right side and left aide .The servomotor drives the ball ball screw through the synchronizing wheel, synchronizing belt coupled on the motor shaft and the synchronizing wheel at the end of the ball feeder screw. When the ball feeder screw is rotating, the screw nut and the Y=axis coupled on the nut move side to side (along X) as guided by the linear guides.

In the same way, servomotor on the Y-axis drives the X-axis ball screw through the synchronizing wheel, synchronizing belt coupled on the motor shaft and the synchronizing wheel at the end of the X-axis ball screw. While the ball screw is rotating, the screw nut and the X-axis coupled on the screw nut move back and forth (along Y axis) as guided by the linear guides beside the Y-axis. In this way, the laser cutting head coupled on the X-axis will move both back and forth and side to side (X axis, Y axis) to cutting the working pieces on the working table.

Lifting part of the laser head: As the workpieces to be processed are uneven on the surface, the lifting part of the laser head works mainly to test the distance between the focus of the focus lens to the surface of the workpiece right beneath the laser head with a sensor and adjust the distance between the focus of the focus lens to the surface of the workpiece right beneath the laser head from time to time to keep it within a constant limit. On the lifting part of the laser head is a distance detection sensor, a servomotor, a synchronizing wheel, a synchronizing belt, a ball screw and a guide shaft. The distance detection sensor transmits the detected signal to the servomotor control system. The latter drives the servomotor and rotates the screw through the driving force of the synchronizing belt so that the laser head coupled on the screw nut moves up and down with the screw nut to adjust the distance between the focus of the focus lens to the surface of the workpiece right beneath the laser head and guarantee the cutting quality.

4.1.2 Optical system

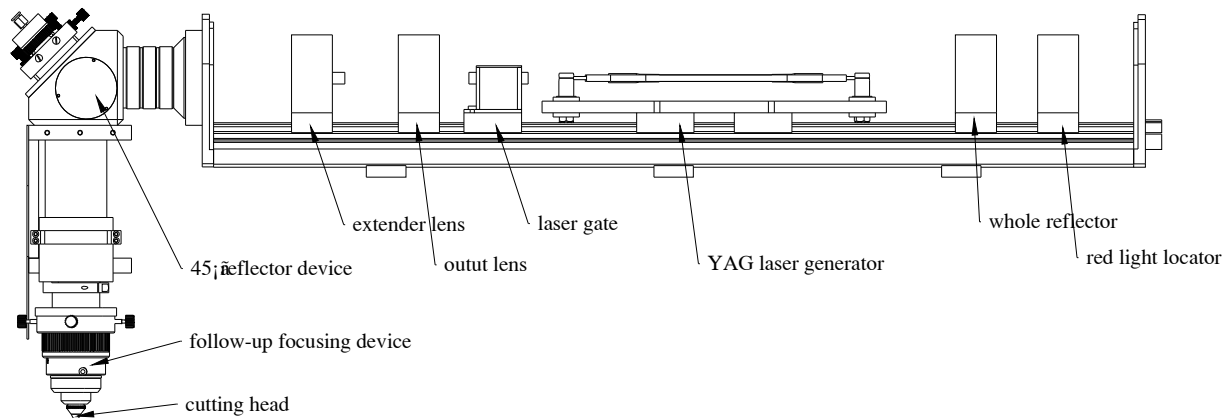


Fig 4.1.2.1 laser path

Main components and their functions include:

Red light indicator: This consists a red light generator that outputs red light visible to the naked eye as the reference for adjusting the laser axis and lens center (whole reflector, laser front and rear ports, optical gate, output mirror, extender lens, reflector, focus lens and cutting head light outlet).

Whole reflector: A laser oscillation cavity made up of a YAG laser generator and an output mirror as the part producing laser sources.

Laser gate is a part that closes or opens the optical passage without stopping the laser pump sources and thereby cuts off the laser sources. It stops laser output when the equipment is under maintenance or in other cases requiring laser protection and opens when the laser is cutting normally.

Extender lens: This expands the diameter of the laser beams and turns less parallel beams into more parallel ones. Besides, as the diameter of the beams are larger, the area reflected on the reflector and focus lens becomes larger too, which reduces the optical energy in the unit area of the lens and protects the lens.

45°reflection device: A 45°reflector is mounted inside to change the transmission direction of the laser so that the laser beams are transmitted more vertically to the workpiece surface.

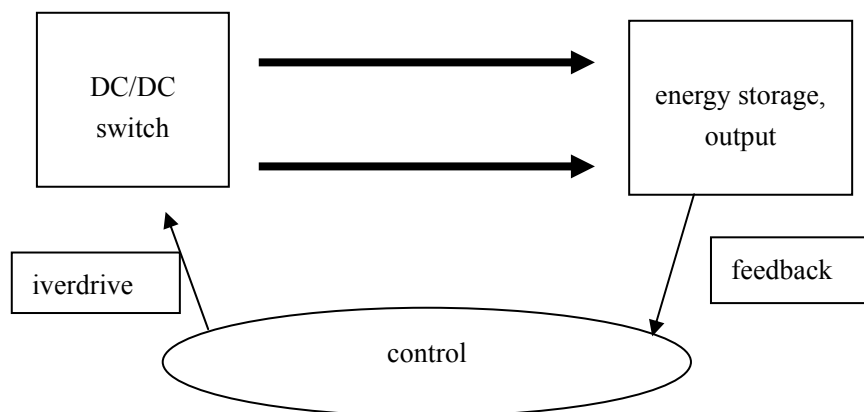
Follow-up focusing device: This moves up and down as driven by the lifting motor and the screw, with an adjusting screw that adjusts the position of the focus lens and center the focus lens to the laser beams. Besides, an adjusting device is also mounted on this follow-up focusing device to adjust the distance between the cutting head and the focus lens.

4.1.3 Laser power

4.1.3.1 Power description

This power is pulse laser power with the voltage adjustable between 200V_650V, suitable for pulse-type large power metal cutting machines. The user may adjust the power output voltage, frequency and pulse width specific to different materials.

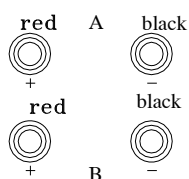
Structure principle:



- 1, The DC/DC switch module first switches between AC/DC and then switches between DC/DC by the single-chip microprocessor control switch tube and the transformer.
- 2, The energy storage and output module completes large capacitance energy storage first and then outputs pulse by the switch tube and diode.
- 3, The control part is performed by the single-chip microprocessor that drives the switch and adjusts the power working state according to the feedback signals.

4.1.3.2 Wire connection

- 1、Output voltage adjusting range: 200V-650V
- 2、pulse width : 0.05-1.5MS
- 3、frequency : 1-150HZ
- 4、Rated output power: 18kW
- 5、Input voltage: AC380V/50HZ (3-phase 5-wire), admissible deviation $\pm 5\%$
- 6、Working conditions: In the ambient temperature is lower than 30℃ dry condition to use, the air dust is smaller than 0.01g/m³



DZ1	3-phase A:1(6mm ² Black) B:2(6mm ² Black) C:3(6mm ² Black) N:4(6mm ² Blue)
G	Earth (2.5mm ² Yellow&Green)
DZ2	Light control: 6,7(0.5mm ² Blue) Water protection: 4,5(0.5mm ² Red)
A,B	+ - Meets the lamp both sides separately

Fig 4.1.3.1 Technical index of laser power and wiring diagram (GJMSJG4060 as an example)

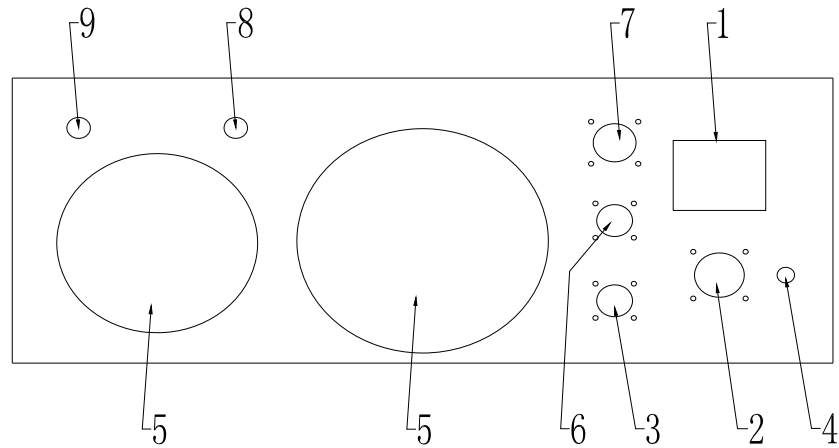


Fig a Block diagram of the front power box tail

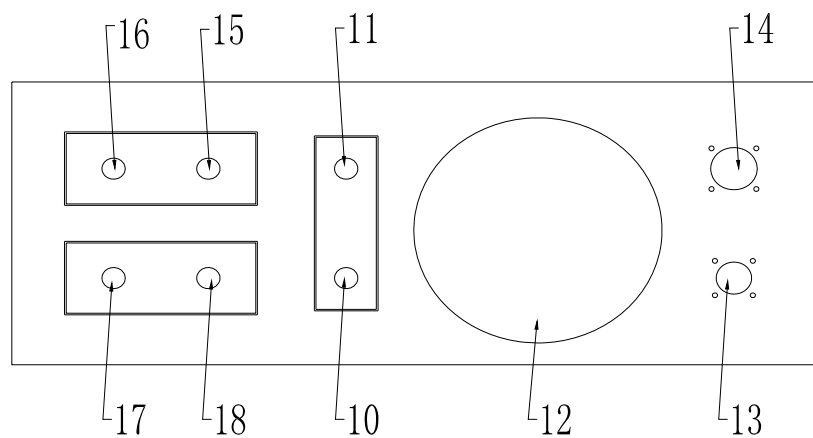


Fig b Block diagram of rear power box tail

- 1) 3P air switch;
 - 2) 4-core aviation socket connector; power: 3-phase input wire pins 1, 2, 3 are L1, L2, L3 while pin 4 is neutral wire N;
 - 3) 7-core water protection aviation socket connector, pins 4, 5 are water protection connectors while pins 6, 7 are light button connectors which should be connected with shielded wire.
 - 4) Ground terminal, the connection between the power case and the ground, which should be connected during work.
 - 5) Fan outlet
 - 6) 7-core aviation socket connector, connected to the 7-core aviation socket connector on the rear box (power fitting);
 - 7) 12-core aviation socket connector, connected to the 12-core aviation socket connector on the rear box (power fitting);
 - 8) Capacitance cathode (black connection pole), connected to the capacitance cathode on the rear box (power fitting);
 - 9) Capacitance anode (red connection pole), connected to the capacitance anode on the rear box (power fitting);
 - 10) Capacitance cathode (black connection pole), connected to the capacitance cathode on the front box;
 - 11) Capacitance anode (red connection pole), connected to the capacitance anode on the front box;
- Note: Make sure that the capacitance cathode/anode wires are correctly connected!
- 12) Air duct outlet;
 - 13) 7-core signal aviation socket connector;
 - 14) 12-core control aviation socket connector;
 - 15) Lamp 1 cathode;
 - 16) Lamp 1 anode;
 - 17) Lamp 2 anode;
 - 18) Lamp 2 cathode;

Requirement:

The charge wires should be 10mm² min in diameter each.

The lamp wires should be 10mm² min in diameter each.

The wire connector should be securely pressed to avoid loose connection that may cause sparking or heating in the conductor.

Avoid binding the charge wire and discharge wire together with the lamp wire in case of serious heating in the conductor.

Avoid binding the signal wire together with the HV wire or strong current wire in case of interference.

4.1.3.3 Operation instructions

The power operation interface provides a key switch, an emergency stop button, a digital potentiometer and a display screen.

To start the machine:

After connecting all the wires and making sure they are correctly connected, turn on the chiller first, and then the power key switch. The display screen will be on after a sound of AC contactor absorption and shows: frequency**, pulse ** . voltage**, preburn OFF.

To set parameters:

Now the preburn is in white letters against blue background, i.e. the cursor has selected preburn. Press the digital potentiometer, which will be followed by another sound of AC contactor absorption together with “hiss”. The capacitance is charged, the lamp is successfully ignited and the power is normal (to turn off the preburn, press the digital potentiometer and release it right away. Otherwise the lamp will be ignited once again).

The preburn is to ignite the lamp by HV breakdown so that the 10000V high voltage will break down the lamp in a twinkling of the eye. The ignition is completed within 1~2sec. A successful ignition will be followed by two sounds of AC contactor absorption and the preburn ON on the display will turn to preburn OFF. The lamp is successfully ignited and now it is in microvias. An unsuccessful ignition, on the other hand, will be followed by only one sound of AC contactor absorption (no none at all) and the preburn OFF on the display will stay unchanged. Upon three consecutive ignition failures, turn off the power key switch and contact the technician.

When the lamp is successfully ignited, the user may turn the digital potentiometer and select between voltage, frequency and pulse width. The Chinese characters displayed in white against blue background are what you have chosen. Point down the digital potentiometer to confirm your choice and the cursor will move to the figure of this option. In the same way, you may modify the parameter of this option by turning the digital potentiometer. Point the digital potentiometer after the modification to confirm and exit.

To stop the machine:

First turn off the preburn and then turn off the key switch after 5min delay (for the internal discharge of the power).

Turn off the cutting machine directly upon any abnormality in the machine during the work like high noise or unusual smell (turn off the key switch or the emergency stop button).

4.1.3.4 Rated parameters

- 1、Input voltage: AC380V/50HZ (3-phase 5-wire), admissible deviation $\pm 5\%$
- 2、Rated output power: 18kW
- 3、Applicable load: double-pulse xenon lamp
- 4、Max frequency-pulse width product: 225 (frequency 1-150HZ adjustable; pulse width 0.05-1.5MS adjustable)
- 5、Output voltage adjusting range: 200V~650V

Notice: Ensure good ventilation and sufficient radiation space are provided when installing the power to keep the air duct well ventilated.

Caution: Make sure the capacitance cathodes and anodes in the power box are correctly connected; keep people away from the lamp pole wire as there is HV output from the pole when is being ignited.

Please contact our after service department if all these solutions fail your problem with the power use.

4.1.4 Structural diagram of offline card

1) Structural block diagram of the offline card

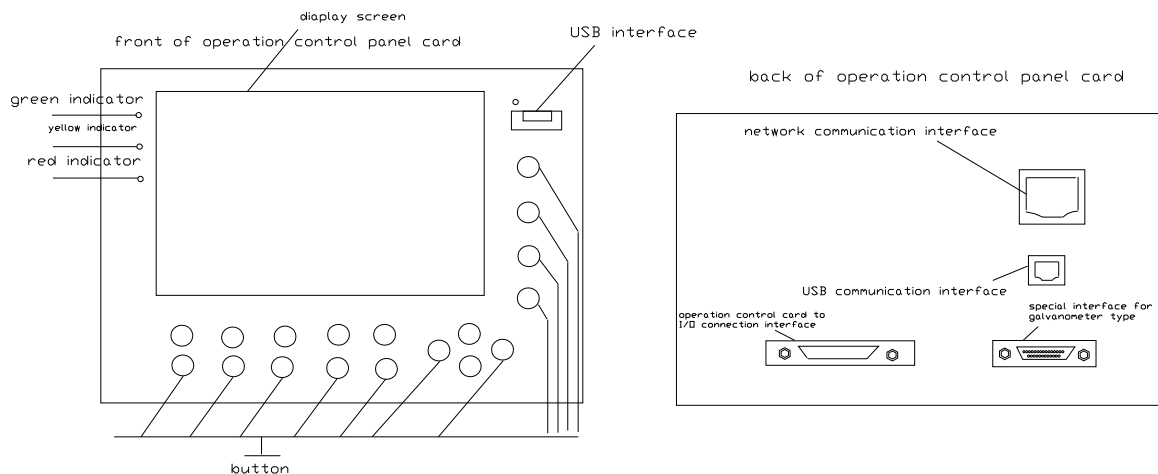


Fig 4.1.4.1 External structure of the operation control card

An operation control card is like the commander of a machine that gives instructions on what to do for nearly every part of the machine. As shown in the front sketch of the operation control card, the operator may select the parameter setting and the control of the machine movement he wants by pressing the buttons; The USB interface provides escalation of the processed documents and the control card identifiable for the USB entry control card; in the back sketch of the operation control card, two communication interfaces are provided, one for the network and the other for the USB which, with the help of the upper-level software, connect inareaion between the machine and the pc; the interface at the lower left is used to communicate with the I/O board card shown in Fig 4.1.4.3, the combination of which enables inareaion communication between the control card and the machine to control the machine movement and the laser power; the figure at the lower right shows the interfaces related to the galvanometer scanner machine.

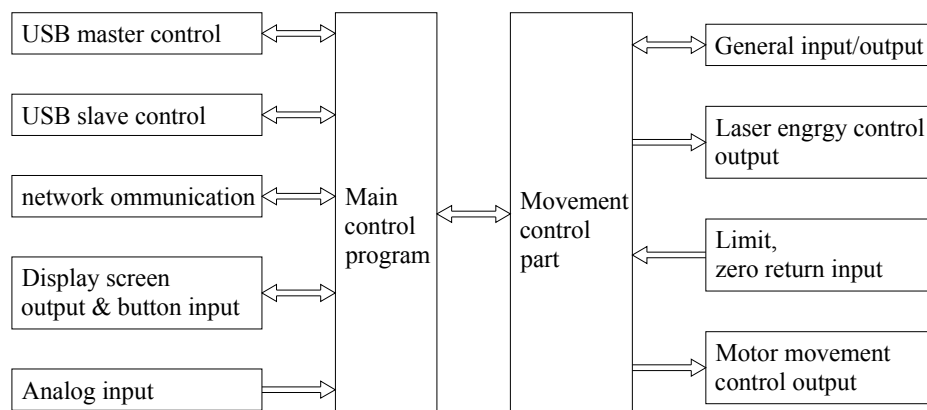


Fig 4.1.4.2 Structural block diagram of the offline card

The pinboard interface of the offline card communicates with the mainboard and provides 4 ports to connect to the equipment:

1. Motor output port, motor pulse on X, Y, Z, W axis, direction instruction signals;
2. Laser energy control port, to control 4 laser generators separately, 4 groups of PWM differential signals;
3. General input port, motor on X, Y, Z, W axis reset/limit signals, door switch, foot switch signals;
4. General output port, light output blow signal, axis switch signal, painter signal, analog input signal;
5. External feedback interface SN, including servo feedback, encoder and magnetic grating ruler feedback.

2) External structural diagram of the control card

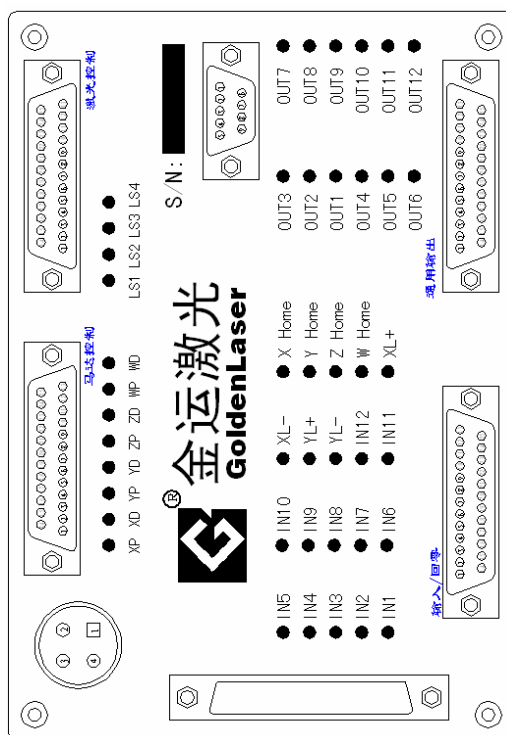


Fig 4.1.4.3 External structural diagram of the control card

Please refer to the instructions for the control panel for specific control of the board card.

4.1.5 Cooling system

(For water cooled laser tube): See the chiller manual for the chiller suitable for the laser tube.

4.2 Overall structural diagram

4.2.1 Overall structural diagram of GJMSJG-12595

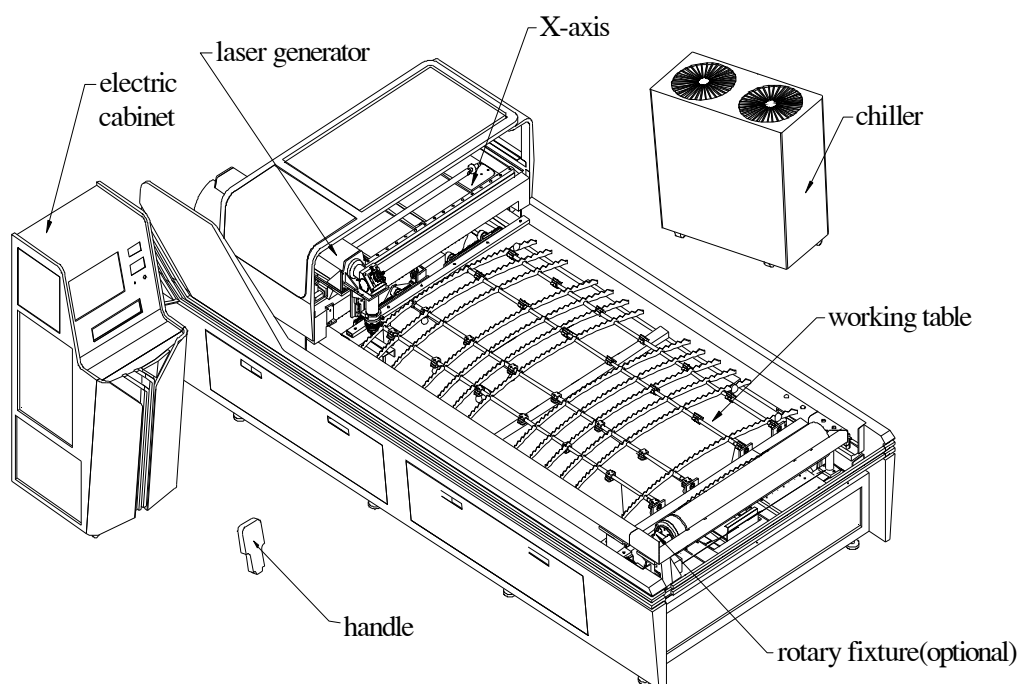


Fig4.2.1 Overall structural diagram

4.2.2 Overall structural diagram of GJMSJG -4060

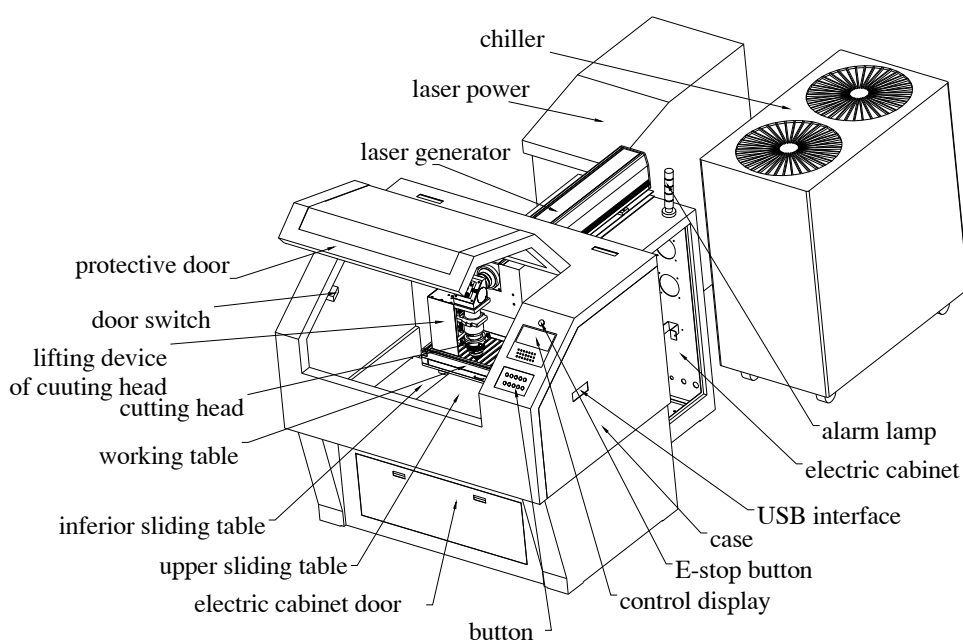


Fig4.2.1 Overall structural diagram

4.2.1 Available parts for mechanical hardware

NO	Name	Material /Spec	Qty	Function	Manufacturer	Remark
1	Cutting head	\	1	Class 1 part	Self-made	
2	Working table	Profile/Plate	1	bearing part	Self-made	
3	Laser generator	\	1	Class 1 part	Self-made	
4	Inferior sliding table	\	1	movable part	Self-made	
5	Upper sliding table	\	1	movable part	Self-made	
6	Working table	\	1	Working table	Self-made	
7	Control display	\	1	Operating part		
8	Button	\	1	Operating part		
9	Protective door	Profile/Plate	2	Safety protection	Self-made	
10	Electric cabinet door		1	Safety protection	Self-made	
11	E-stop button	\	1	Safety protection		
12	Alarm lamp	\	1	Safety protection		
13	Chiller	\	1	Class 1 part		
14	Door switch			Class 1 part		
15	Laser power	\	1	Class 1 part		

Table 4.2.1.1 Available parts for mechanical hardware

4.2.2 Replacement guide for mechanical hardware

Note: Any removal of the parts for inspection or repair purpose should be by our company (our sales agent) only.

Part	Standard replacement interval	Service condition	Remark
Xenon lamp	About 300-800h	·Ambient temperature: 30 ⁰ C (annual average) ·Load factor: 80%max	The replacement interval provided herein is for reference only and subject to the specific
Reflector	About 4000h		
Focus lens	About 4000h		

Speed-change-device of X axis	2~3y	·Operation time: 20hmax	service conditions and equipment operation. Any nonfunctional part should be replaced or repaired immediately.
Speed-change-device of Y axis	3~4y		
Bumper mechanism	2~3y		
Belt-tightening -device of Y axis	2~3y		
Belt-tighten-device of X axis	2~3y		

Table 4.2.2.1 Replacement of mechanical hardware

Chapter5 Installation and position of YAG laser precise cutting machine

5.1 Packing, handling, placement and position

- 1) The equipment has been derusted, washed and greased before it is packed as per GB/T 4879-1999 Dustproof Package;
- 2) When the equipment is loaded, the gravity height of the heavy truck should be no more than 2m from the track top. The equipment should be well balanced and not be heavier either side or end. Pay attention to the parts small in size and large in weight in contact with the truck body, e.g. the anvil block is likely subject to weight concentration. Please take measures to increase the contact area between the loaded object and the truck body for any weight-concentrated part.
- 3) The equipment is contained in a wooden case, which should be transported horizontal as marked on the case;
- 4) The transport and storage temperature should be -25°C -55°C. The equipment should be transported and stored for no more than 24h when the temperature is 70°C max;
- 5) When unpacking the equipment, first remove the top cover and the sideboard of the wooden case. Then move the laser machine to the ground horizontally from the wooden base bracket;
- 6) 500mm; The laser machine should be placed in a dry and ventilated place with its back, left and right sides 500mm from the wall;
- 7) The laser machine should be placed secure without flexibility to avoid trembling or resonance. Avoid using the machine where it is exposed to high temperature, heavy dust or dampness.

5.1.1 Unpacking

Your CO₂ laser precision marker/cutter is transported in a wooden packing case. Please check that the packing case is free of any damage when you receive it and keep all the transport documents and packing material. Absence of any of these documents or packing material may suffice the carrier to disclaim any losses in connection with the transport.

Please find all the following in the packing case:

a software CD; a USB connecting cable; a product operation manual.; a GeniusDog; chillers/a chiller ;a set of fan and common tools and so on.

Please contact us immediately for any shortage!

5.1.2 Installation environment inspection

● Verify the warnings/signs

Your CO₂ laser precision marker/cutter is a class IV laser device with warnings/signs at specific places of the equipment. Please check your equipment and notice the position and detail given in the warnings/signs.

● Verify the installation environment

- 1) The installation environment should be well ventilated, free of pollution, strong current or strong magnetic disturbance and allow for normal access to the equipment.
- 2) Where a chiller is required for the equipment, to guarantee the safety of the operator, please make sure the ground of the working area is skid-proof.
- 3) The admissible noise level in the environment is 40~75/dB and 115/dB max, subject to the specific service conditions of the equipment, e.g. work hours, continuous/intermittent, daytime/nighttime and local conditions (the admissible limit is provided for reference only).
- 4) The work environment of the equipment ranges approximately between 500~2000/lx. As the luminance level decides the labor productivity related to the eye, improving the luminance in the working area means increasing the labor productivity.
- 5) Verify that the power supply is acceptable. Please provide a regulated power supply if the power supply is not acceptable.
- 6) Verify that the equipment power supply is normally and reliably grounded.

5.2 Equipment installation flow

- Place the laser machine and remove the anti-move tape fixing Y axis and X axis.
- Check the equipment carefully (outside and internal security).
 - * The soundness of the outside, including the glass door and paint);
 - * Noticeable deareaion or loosed screw in the mechanical part;
 - * Soundness of the optical elements, including the lens, holder and laser generator;
 - * Damage or looseness of the electrical elements or wire;
 - * Completion of the connectors or crack in the tubes in the water circuit part;
 - * Try to solve any abnormality on site. Contact us for any problem you cannot solve and record the unpacking inspection details.
- Connect the chiller, water tube, exhaust system, assist gas tube and power;
- Open the chiller and check if it is at the right level against the operation manual of the chiller. If it is at the right level. Start the chiller and check if there is any leakage after running for 20~30 minutes. Remove the problem before starting work. Missionary should not leave from the working area when chiller is running, in case it can be found as soon as the leaking happen.
- For equipments of cross shaped sliding platform: Place the cross shaped sliding platform to appointed position (located by block). Next, bring the cutting head down to the working position, then adjust level of cross shaped sliding platform and the distance to the light outlet by machine-used level gauge (by anchor screw). Then adjust the X-axis and Y-axis of cross shaped sliding platform respectively in accordance with the vertical direction and horizontal direction of cutting head by cutting head. Make sure the cutting area is in the area of working area.
- If the above steps are normal, connect to the power supply. Check if the driver alarm, or the zero switch and are normal. Start the work if every step is normal, if not contact us for any error.
- Input the parameters, then beginning debugging
 - * Start the laser power and input the debugging parameters, then check whether the components are normal ;
 - * check whether the equipment, chiller, laser power and exhaust system are normal;

Safety cautions:

- Make sure the main power is disconnected before accessing the equipment for inspection or maintenance purpose. Do not uncover or access the equipment when it is working.
- To avoid exposure to laser light, it is advisable that the path be adjusted by two persons together: one to adjust the

light, the other to keep watch to avoid mis-operation and keep any irrelevant people off the debugging spot.

- Protection glasses should be available for light adjustment to avoid eye injury by the laser light.
- Do not touch the strong current part with the hand when accessing the electric circuit.

(As the laser equipment is subject to subsequent improvement and renewal, the function allocation herein may be different from the real product and is subject to the product delivered to the destination.)

Note: The socket connecting the machine to the 220V power supply should be reliably ground!

Chapter 6 System debugging of YAG laser precise cutting machine

Notice

- 1, While the optical path of all the models of machines is already adjusted at shop, it is subject to error during the handling. Please check again.
- 2, Laser is invisible and may burn the skin and eyes. Keep the laser path closed under any condition including path debugging. Any adjustment of the optical path should be by a technician having received our training.
- 3, As your CO₂ laser precision marker/cutter is a class IV laser device that produces high power laser, the path adjustment part should be installed and debugged either by our professional technician or a technician having received our training. No other people are allowed to adjust the optical path in case of personal injury.
- 4, The equipment should be adjusted only by competent professionals. Please advice us (or our sales agent) immediately of any problem you cannot solve and record the site details to facilitate our repair.

6.1 Replacement of YAG laser generator and path debugging

6.1.1 Replacement of YAG laser xenon

- Disconnect the laser generator cooling water tube, screw off the exhaust screw and drain all the water in the laser generator.
- Release the electrode bracket and remove the press blocks at both ends of the focusing cavity Then remove the upper board of the focusing cavity and take out the glass tube and xenon lamp.
- Install the new xenon lamp into the glass tube in the way the old one was installed and secure it in the focusing cavity Note the cathode and anode of the xenon. The one with the red mark is the anode.
- Reinstall the upper board of the focusing cavity and the press blocks at both ends. Tighten the electrode bracket.
- Tighten the exhaust screw and connect the cooling water tube.
- Debug the laser path as detailed in the figure below.

6.1.2 Laser path debugging

● Laser operation path (laser path)

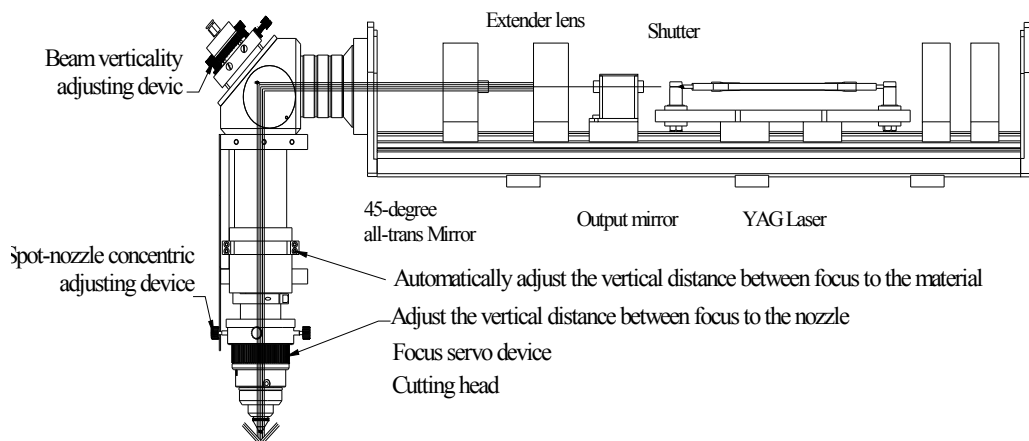


Fig 6.1.2.1 laser path (GJMSJG4060as an example)

The laser beams are outputted from the YAG laser generator from point a, transmitted from the output mirror, expanded from the extender lens and then emitted onto the 45° reflection device on point b. After reflected by the reflection device, the beams are focused on point c (1-2mm from the workpiece surface) after adjusted before it is ready for the cutting job, (**Note: Structures and laser paths vary slightly from product to product due to the different specifications and sizes.**)

● Laser path protection structure:

The laser path of the equipment is an enclosed path with all the optical components like the laser, optical gate, output mirror, extender lens and reflector device installed inside the laser cover. The whole operation of the laser path is protected by the laser cover to guarantee both personal and property safety when the machine is working.

● Path adjustment

Before adjusting the laser path, first take off the plug-in terminal on motors on X, Y axis, turn off the computer and switch on the laser generator power supply to adjust the laser intensity adjustment button so that the laser intensity is kept at a small output state.

Adjust red light: Check whether the red light parallels with the top surface of optical benches rail, and check whether the red light is in the center of the outlet of baffle. If there is any deviation, adjust the screw in the red light locating device.

Adjust the position of focusing cavity: Put diaphragms to both ends of the thimble rods of YAG bar, and check whether the red light spot is in the center of thimble rods. If not, adjust the position of focusing cavity. Then, observe the reflected light position of YAG bar which generally coinciding with outlet hole of red light.

Adjust the output lens: Make red light in the center of the output lens, and make sure the red light outlet is in direct line with output lens. If not, adjust the two screws of output lens.

Adjust the all trans-mirror: Make red light in the center of the all trans-mirror, and make sure the red light outlet is in direct line with all trans-mirror. If there is any deviation, adjust the two screws of all trans-mirror, then power on the laser generator, at the same time, adjust the voltage to about 400V, pulse width to about 1ms and repetition frequency to 90Hz or so. Long pressing the pre-set button, when xenon lamp flashing, put a conversion filter in front of output lens and observe the laser out. Then adjust the two screws of all trans-mirror until the light spot become even and roundest. After that reducing voltage and frequency of pulse width, adjust knob slightly, making the light in the center is strongest. Fix the conversion filter in front of output lens and far away from output lens, then press the "pre-set" button and observe whether the center of red light and the light spot in conversion filter are coincident. If not, adjust the output lens and the all trans-mirror making them coincident. Finally fix a conversion filter 900mm before output lens, checking whether coincidence, if not adjust till it is.

Adjust the position of extender lens: Place a light proof baffle 900mm before output lens after the red light and the laser become coaxial, in addition mark the position of red light in baffle (Don't move the baffle during the course. That's need to mark again if the baffle moved.). Adjust the four screws after extender lens fixed making marked red light in baffle and the red light through extender lens form concentric circles. The distance between the center of two circles must be no more than 0.5mm.

Adjust the position of 45° all-trans mirror: Adjust the two screws until the red light is at the central part of lens.

Adjust the position of follow-up cutting head focusing: Let the red light reflected from 45° all-trans mirror is at the central part of focusing lens and is sent from the central part of cutting nozzle, making sure laser path vertical to the workpieces, by adjust the two screws of all-trans mirror. Keep the protective lens clean to avoid protective lens rupture during usage.

Chapter 7 Operation flow of YAG laser precise cutting machine

7.1 Operation flow of hardware

- Turn on the power switch on the laser machine
 - * **Normal start:** Make sure that all the laser marking machine doors (electrical control box door, hand door and so on) are closed first. Switch on the external power. Close the main power air switch. Turn the “key switch” to “ON” and turn the “NORMAL/MAINTENANCE” switch to Normal. Point the reset button once. The equipment will be energized and the display will be on. When the control card is started and standby, press the MIRROR START button and the galvanometer scanner will be energized before you are able select the document for laser processing.
 - * **Normal stop:** Stop processing and exit the program. Press the MIRROR STOP and then the POWER STOP. Turn the “key switch” to “OFF”. Pull out the key, switch off the external power and finish work.
 - * **Emergency treatment:** For any unusual sound or flame, press the emergency stop button (red) to cut the power to the equipment. Reset the emergency stop button after the failure is removed. Press “RESET” and then “POWER ON” before the equipment can be powered.
 - Note: Do not use the emergency stop button unless for any abnormality. Please follow “Normal stop” for normal stop.**
- Verify that the return water isnormal in the chiller
- Launch the special software in the computer
- Place the workpiece
- Adjust the focus
- Test the laser power
- Try process

Chapter 8 Protection and Maintenance

8.1 Safety protection and cautions

- 1) Do not use the equipment where it is exposed to any flame or explosion. Keep the equipment off any inflammable or explosive object in case of fire. Use the equipment in dim light as far as possible.
- 2) The equipment should be kept away from any inflammable, explosive or corrosive gas, liquid or other corrosive substance or strong electromagnetic disturbance, and should be used in a well ventilated context free of any contamination, strong current or strong magnet disturbance or impact.
- 3) Keep any irrelevant full-trans or pan-reversible object way from the inside equipment in case direct laser exposure for people or inflammables.
- 4) Turn off the computer power and equipment power when plugging in or out the connection wire. Avoid live operation in case the equipment is prevented from normal service.
- 5) All the equipment parts and the user pc should be reliably grounded to avoid equipment damage or personal injury by static current. **Any poor grounding will decrease the service life of the laser generator, operate the control circuit during HV discharge and even threaten people’s life.**
- 6) The equipment contains a metal RF laser generator. **Please make sure the path cover is closed before working or debugging any part of the laser path. Please keep off this part in case of personal injury!!!**






- 7) Do not look in the direction of the laser anytime in any way when the laser is being outputted. Do not open the protection cover when the laser is being outputted.
- 8) Laser produces heat. To prevent burns or flame, do not expose the body or any material can reflecting to any laser beam.
- 9) The equipment contains laser and HV parts. No person other than a professional technician should open the machine.
- 10) Do not open the laser generator part by yourself. Make sure the laser part is repaired by the manufacturer only.
- 11) A key lock is mounted on the electrical cabinet door, the key of which should be kept by the repair management only.
No person other than the repairman is allowed to open the electrical cabinet door.
- 12) Do not leave the equipment when it is working in case of accident.
- 13) Keep watch of the equipment when it is working (e.g. if the workpiece is over the light outlet of the focus lens, any unusual sound in the equipment and the temperature of the circulating cooling water).
- 14) Excessive humidity will cause the laser to HV discharge that may endanger people and cause damage to the laser power supply.
- 15) Do not turn on the machine and work when the voltage is not stable. We recommend using a 3000W or above power regulator.
- 16) Do not turn on the machine and work in thunder or lightning.
- 17) Press the buttons with uniform force instead of hitting them forcibly in case the buttons are damaged.
- 18) Cut off the power immediately upon any failure or any fire to the equipment.
- 19) Clean the slide way and X axis regularly. Check the tightness of the transmission parts and secure them if they become loose.
- 20) Check the warnings or signs at least once a week. Secure them if they become loose before turning on the machine to start work.



Please abide by all the rules above. We assume no responsibility for any personal injury or machine damage caused by any operation against the rules above.

8.2 Warnings or signs

Please read the warnings or signs below to prevent injury to the operator or other people and damage to the machine or parts.

警 示 语	说 明
CAUTION! Live parts inside when main switch is OFF! Read Instructions before opening!	警告！即使主开关断开，电器箱内部仍然有电。在打开电器箱前，请仔细阅读说明书。
 LASER RADIATION DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 1M LASER PRODUCT!	1M 类激光机辐射时不能用光学仪器观看。
 LASER RADIATION DO NOT STARE INTO BEAM CLASS 2 LASER PRODUCT!	2 类激光机辐射时，禁止注视激光束。
 LASER RADIATION DO NOT STARE INTO THE BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 2M LASER PRODUCT!	2M 类激光机辐射时，禁止注视光束或借助光学仪器观看。
 LASER RADIATION AVOID DIRECT EYE EXPOSURE CLASS 3R LASER PRODUCT!	3R 级激光辐射避免直接接触眼睛。
 LASER RADIATION AVOID EXPOSURE TO BEAM CLASS 3B LASER PRODUCT!	3B 级激光辐射避免接触。

<p>⚠ LASER RADIATION AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION CLASS 4 LASER PRODUCT</p>  <p>Typical Product Safety Signs</p>	<p>4 级激光机工作时，避免眼睛或皮肤被光束照射。</p>
<p>SAFETY INSTRUCTION</p> <p>White letters with green background is used to convey information relative to safe work practices and procedures.</p>	<p>安全说明： 采用绿底白字的标注是安全操作信息。</p>
<p>NOTICE</p> <p>White letters with blue background is used to convey information that may be indirectly related to the safety of personnel or the protection of property.</p>	<p>警告： 用蓝底白字的标注是指有可能会间接危及到生命和财产的信息。</p>
<p>WARNING</p>  <p>Eye Protection</p>	<p>警告</p>  <p>注意保护眼睛, 以免激光伤害!</p>
<p>WARNING</p>  <p>Toxic fumes/particles may be generated by this machine.</p>	<p>警告</p>  <p>机器可能会产生有毒的气体或物质!</p>
<p>⚠ NOTICE!</p> <ul style="list-style-type: none"> * Please read the instructions carefully before using. * This machine is operated and maintained by eligible man only. 	<p>⚠ 注意!</p> <ul style="list-style-type: none"> * 使用设备前请仔细阅读说明书; * 只有经过培训合格的人员才能操作和维护此设备。
<p>Maintenance Information</p> <ul style="list-style-type: none"> * Do not use Inferior water for colling water (there is no warranty ,If the laser tube damaged because of inferior water,).We suggest to use purify Water or distilled water for cooling. * The water should not less than 3/4 of the water tank ,and the water level should cover the top of the water pump. * When machine is working , check the water temperature at any moment,if the temperature more than 27℃ , stop working at once,till the temperature of water being 18℃ to 24 ℃,restart the laser-module Drain the laser generator after work if the working ambient temperature is or is below 0℃ in case the components in the laser generator are 	<p>保养须知</p> <ul style="list-style-type: none"> * 严禁使用劣质循环水（因用户使用劣质水导致的激光器损坏不在保修范围之内）。建议采用纯净水或蒸馏水。 * 冷却水液面不能低于水箱进水口。 * 设备工作过程中，必须随时检测水温，一旦水温超过 27℃，就应当立即停止使用，待水温降至小于等于 24℃、大于 18℃ 时才能重新启动激光器。设备不工作时的环境温度小于等于 0℃ 时，应在停止工作后，及时排出聚光腔内的水以免结冰，导致聚光腔内元件损坏，严禁在冷却水箱中加入防

<p>damaged due to the frozen water.It is prohibited to add antifreeze and other chemicals into the cooling water tank,our company shall not be liable for any loss resulting from improper use(automotive antifreeze can be applied as coolant provided the working temperature of equipment with glass laser tubes is not higher than 0 ℃)</p> <ul style="list-style-type: none"> * Every half month,clean the water tank,water pump (especially the filter cotton inside the water pump)include inlet water and outlet water pipe.Note It is prohibited to add antirust and other chemicals into the water tank. * Every time before turn on the machine ,take out the nozzle , then, put a mirror under the focusing at a 45-degree angle.Check the focus lense is dirty or not .If it is dirty,clean it immediately. * Please tread lightly when you clean reflect mirror A and B ,or else should adjust the laser route again.C mirror should take out and clean .All the reflect mirrors and lenses should be cleaned immediately if it's dirty,(Should use dedicated lense cleaner). * Keep the machine clean,especially two guide.Clean the guide everyday after work .Before work oil on the guide ,using a piece of cloth with sewing machine oil (Oil should be not too much.) * Clean the machinery auxiliary equipments (air pump,exhaust fan) every other week. 	<p>冻液等化学物质，由此造成的设备损失本公司概不负责（使用玻璃激光管的设备允许在工作环境小于等于零度时使用汽车防冻液作为冷却液）。</p> <ul style="list-style-type: none"> * 每隔半个月，必须清洗一次水箱、水泵（特别是水泵内过滤海绵）及进出水胶管；注：不得向水箱中添加水箱防锈保护剂及任何其他化学物质。 * 每日第一次开机工作时先将气嘴取下，拿面镜子放在聚焦镜下呈 45°，观察聚焦镜片是否受污染，如有应及时清洗。 * 清洁 A、B 反射镜片不得过于用力，否则需重新调整光路。C 镜片须拆下清洁。各反射镜片、聚焦镜片的保养遵循有污染就及时清洗的原则。 * 床体要保护清洁，特别是两条直线导轨，要经常擦净。要求每天下班前清洁导轨、上班工作前必须给直线导轨添加润滑油，用沾满缝纫机油的布擦拭即可，切不可加多。 * 每隔一周，对机械外设（风机、气泵等）进行一次清理。
<p> NOTICE!</p> <ul style="list-style-type: none"> * When the equipment is installed ,please first open the side cover of the equipment before switching on ,then insert the water pump plug for cooling into the outlet inside the machine case ,at the same time fill the water tank with enough clean water ,After that ,close the cover of water tank and the cover of machine .Then switch on the equipment,otherwise the equipment won't produce light normally. 	<p> 注意!</p> <ul style="list-style-type: none"> * 设备安装完毕后，在启动前请打开冷水机机盖及水箱盖将水箱内注满纯净水或去离子蒸馏水，然后装好水箱盖及冷水机机盖方可启动设备，否则设备将无法正常出光！
<p>Caution</p> <ul style="list-style-type: none"> * When switching on the power ,please close the cover to protect your skin and eyes away from being burnt by the laser . * Do not alter reflectors at will.It may cause accident. * When starting machine .fill water in the water tank and examine the work condition of circulation pump of chiller. * When laser machine is in working status .It's forbidden to leave the machine alone ,and be cautious to the fire! 	<p>注意</p> <ul style="list-style-type: none"> * 通电时请关盖操作，以防激光照射灼伤皮肤和眼睛。 * 切勿任意调动反射镜片防止发生意外。 * 开机时请在水箱中注满水并检查冷水机循环泵工作状态。 * 激光机工作时，旁边请勿离人，以防发生火灾。

<p>* The master switch must be turned off before opening the cover board.</p> <p>* This machine is maintained by professional man only.</p>		<p>* 打开此盖板之前要关闭总电源。</p> <p>* 非专业人员不得维修设备。</p>	
<p>Warning</p> <p>* High-voltage in the case,do not take the outer cover down at your will if you are not professional..</p> <p>* There should be 80mm space around the laser power supply with venting measures so as to cool it down.</p> <p>* The outer cover should connect to the ground well.</p> <p>* Open the outer cover may cause the machine burnt.</p>		<p>注 意 事 项</p> <p>* 机箱内有高压电，非专业人员请勿自行拆卸外罩维修。</p> <p>* 激光电源周围应留有 80mm 以上的空间，并有通风措施，以利散热。</p> <p>* 外壳必须可靠接地。</p> <p>* 拆下外罩敞开使用会导致整机烧毁。</p>	
标识符号	说明	标识符号	说明
	有电危险！ High Voltage, Dangerous!		勿将手卷入传输带或滚子内！ Do not put your hand into Conveyor belt or roller!
	当心触电！ Beware of electric shock!		小心身体侧撞！ Beware of Side-impacc!
	小心手触电！ Be careful of electric shock		小心腿被输送带卷入 Don't let conveyor belt hurt your leg
	注意电动锁定 Notice electronic locks		不允许移动操作 Strictly prohibit to move machine.
	咨询专业人员正确操作程序 Inquire professional technician for correct operation flow		请勿触摸 Do not touch
	阅读操作说明 Read the operation manual		非专业人员请勿靠近 Non-professionals stay away from machine.
	表示接地标识并且接地线截面应与相线相同 Grounding		非请勿入 Authorized persons only!
	当心激光 Watch out laser Radiation		移动时请勿开动传动装置 Do not move machine when gearing is running.



	<p>本机内有传动装置，避免机械伤人！ Gearings are inside this machine , please avoid mechanical injury.</p>		<p>不要将手放在开口处，当心受伤！ Physical damage may be caused by crevice. Don't put your hand in gap on the table.</p>
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Table 8.2.1 Warnings or signs

8.3 Everyday maintenance

- 1) Do not use inferior water since it may substantially prevent the laser power and greatly reduce the service life of the laser module. We do not warrant any damage to the laser caused by inferior water used. It is advisable to use purified or distilled water.
- 2) The cooling water should be no less than 3/4 of the water tank and cover the top of the water pump.
- 3) Drain the laser module after work if the ambient temperature is or is below 0℃ in case the components in the laser generator are damaged due to the frozen water. It is prohibited to add antifreeze and other chemicals into the cooling water tank, our company shall not be liable for any loss resulting from improper use (automotive antifreeze can be applied as coolant provided the working temperature of equipment with glass laser tubes is not higher than 0℃).
- 4) Unless otherwise necessary, the laser intensity should not be in excess of 80% in case the laser module ages more quickly.
- 5) Note that if the equipment will not be fully diffused when the ambient temperature is higher than the max admissible limit, which will deteriorate the operation stability of the equipment and reduce the service life of the laser generator. Improve the ambient temperature if the equipment works long hours, especially the diffusion and cooling of the control part. Remove the dust on the radiator from time to time.
- 6) Before turning on the machine the first time of the day, take off the nozzle, put a mirror under the focus lens at 45° and see if the lens is contaminated. Wash it immediately if it is.
- 7) Do not wash the reflector lens too forcibly, or you will have to readjust the laser path. The reflector and focus lenses should be washed once they are contaminated, and should be washed with special detergent for lenses. (Note: See the steps below for washing lenses);
- 8) Please adjust the focus every time before the equipment starts work, since incorrect focus may heavily prevent the work effect.
- 9) Clean the working table briefly every time after the equipment finishes work and avoid dust when doing so. In the event of power failure, it is acceptable to push X axis guide or Y axis guide slowly instead of violent pushing or pulling.
- 10) Keep the bed clean and in particular, the two linear guides. Clean the guides every day after work and lubricate the linear guides before work the next day with cloth of sewing machine oil. Avoid using too much oil. (Note: Please read the instructions on “lubrication of the moving system” next section when lubricating the guides!)
- 11) Clean the external mechanical equipment (fans and air pumps) every week.
- 12) Check the warning signs every week and make up any that is incomplete before turning on the machine to start work.
- 13) Check the protection cover and test the interlock function every 8 hours.
- 14) The laser generator should be repaired by the manufacturer only. No other person than the manufacturer's technician is allowed to repair the laser.
- 15) For any question, please contact our after service at 400-812-9977.

For final after-sales technical support, please access our registered website at www.goldenlaser.cc.

8.3.1 Instructions on lubrication of movable system

To guarantee normal service and long service life of your equipment, please carry out everyday maintenance as described herein (some of the details below may not be included in your equipment).

- parts of the movable system to be lubricated (please remove the dirt from the surface of the part before lubricating it)

The bearing parts below are to be maintained by lubrication:

The guide slide blocks and screw nuts are the lubrication maintenance points:

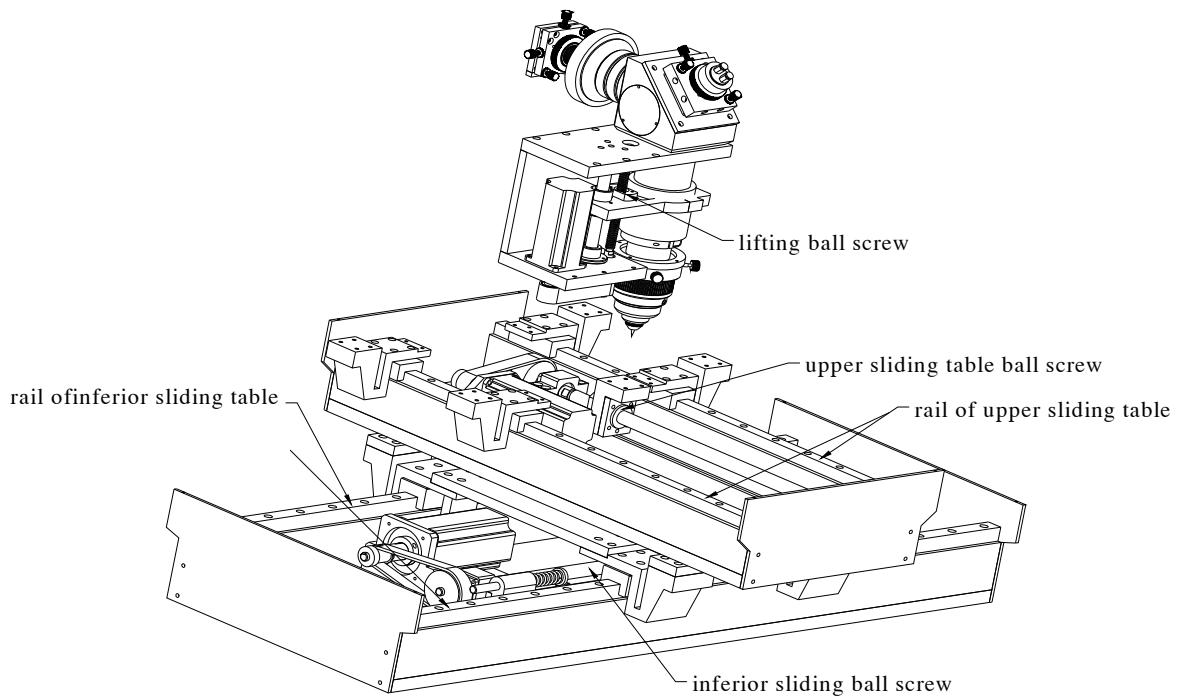


Fig 8.3.1.1 Instructions on lubrication of movable system (GJMSJG4060 as an example)

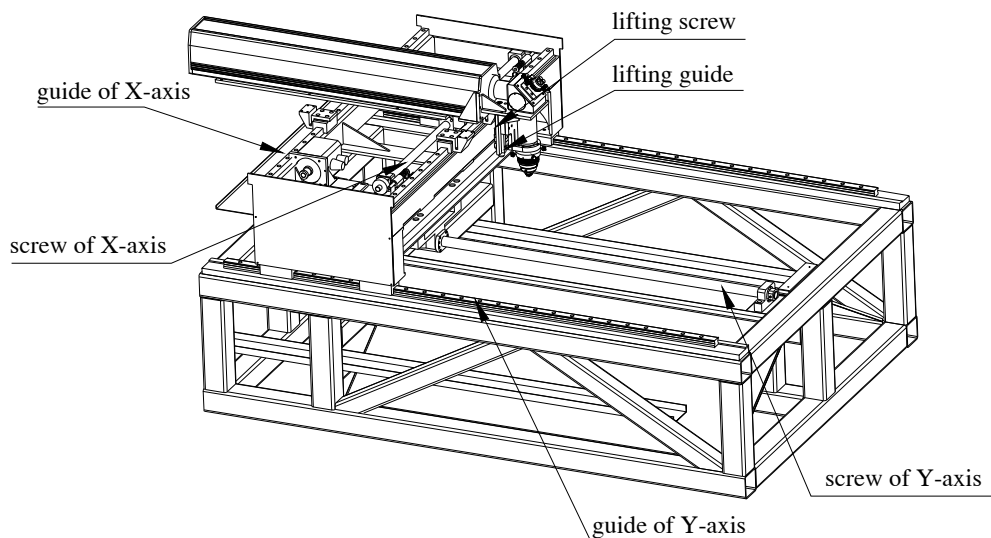


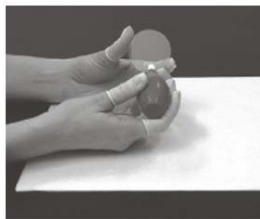
Fig 8.3.1.2 Instructions on lubrication of movable system (GJMSJG -12595 as an example)

8.3.2 Lens washing

Please read the cautions below before washing the lens:

1. Do not take out the lens with any tool, e.g. pliers.
2. Do not put the lens on any hard or rough surface. Infrared lenses are vulnerable to damage and should be put on lens

paper.



步骤一

Step 1: Clean light contaminants (dust, floc) gently; Blow off the float on the lens surface with a blow bag. Go to Step 2 if this fails.

Note: Do not use compressed air for factory applications since it contains much oil and water which will form hazardous absorbing film on the surface of the film course (for lenses with a lens holder, simply Step 1 is enough).



步骤二

Step 2: Clean light contaminants (soot, fingerprint) gently

Rub the surface gently with a cotton swab or a cotton ball dipped with acetone or propanol and avoid rubbing it too forcefully. Rub over the surface as quickly as possible which is good for liquid evaporation without any strips. Go on to Step if this fails.

Note: We recommend reagent-class acetone or propanol.



步骤三

Step 3: Clean medium contaminants moderately (saliva oil drops)

Rub the surface with a cotton swab or cotton ball dipped with white vinegar with small strength and then remove the surplus white vinegar with a dry cotton swab. Immediately rub the surface gently with a cotton ball or a cotton swab dipped with acetone and remove the residual acetic acid.



步骤四

Step 4: Clean heavily contaminated lenses (splashes) forcefully

Note: Do not apply the cleaning operation of Step 4 or Step 5 to any new lenses. The step below applies to very dirty lenses or lenses having failed any of the cleaning operation above. The lens will be disabled if the film course is rubbed off. Noticeable color change indicates the film course has come off.



步骤五

Shake up the polishing paste. Pour 4-5 drops onto a cotton ball and then move in circles on the lens. Do not press down the cotton ball as the dead weight of the ball itself is enough. Turn over the lens frequently to avoid excessive polish in the same direction. Keep the polish process within 30sec and stop the operation upon any color change at any time as this indicates the outside of the film course is being corroded. Damp a new cotton ball with distilled water and rub over the whole lens surface gently to remove as much of the residual polishing paste as possible.

Note: Use a cotton wall instead of a cotton swab for this step if the lens diameter is equal to or over 2 inches.

8.3.3 Instructions and cautions on loading and unloading

1. Before loading/unloading, switch the operation mode to SERVICE on the console and pull off the mode switch key (NORMAL/ SERVICE switch). Now the laser generator is off and you may do all the loading operations.
2. Apply the object to be processed over the working table surface from the right front of the equipment. Arrange the object properly as required for the processing to achieve the flatness of the object, make sure there is no significant unevenness and ensure the uniformity of the processing. Refer to the operation rules in the Specifications for detailed operation and debugging.
3. After finishing loading, make sure any irrelevant object in the processing area is removed before starting processing the workpiece.

4. After completing the work, switch the operation mode back to MAINTENANCE. Pull off the mode key and unload the workpiece.
5. Please wear work overalls during operation in case the clothes are rolled into the feeder.

Chapter 9 Common problems and their solutions

9.1 Common problems with cutting and their solutions

Phenomenon	Cause	Solution
Misalignment or unclosedness in engraving	1、 Overspeed engraving	Adjust
	2、 Overhigh definition	Adjust
	3、 Error in computer system	Reinstall system
	4、 Small driver current	Adjust current as per driver instruction
	5、 Loosed synchronizing belt on motor on Y Axis	Adjust synchronizing belt
	6、 Static disturbance	Secure ground wire
Indent edge of engraved graphics	1、 Focus lens not tightened	Tighten
	2、 Wrong parameter	Reset angle, initial speed, acceleration parameters in software.
Sudden drop of the engraving power	1、 Working long hours	Stop and rest
	2、 Reflector lens unwashed or carcked	Wash and replace
	3、 Focus lens unwashed or cracked	Wash and replace
Unusual to-and-fro movement of X axis during engraving Irregular misalignment in graphic	1、 Wrong parameter setting on software	Adjust to optimum value
	2、 Motor bush loosed	Tighten bush screw
Uneven laser strength in the engraving process or failure to output light or multi-point laser output	1、 Reflector lens cracked	Replace reflector
	2、 Path altered	Readjust path
Unclosedness when cutting enclosed graphics	Synchronizing belt too loose	Adjust synchronizing belt
Non-vertical edge when cutting thick fabric	1、 Laser head not put vertical on working table	Adjust working table so that laser head stands vertical
	2、 Overhigh focus for thick plate cutting	Adjust focus distance to focus it on the middle of thick plate.
Laser head does moves less smoothly trembles on the way when cutting and engraving vector graphics	1、 Overspeed	Adjust speed
	2、 Incorrect acceleration, starting speed, automatic gear shifting angle settings	Adjust acceleration parameter

Table 9.1.1 Common problems with cutting and their solutions

9.2 Equipment failures and trouble shooting

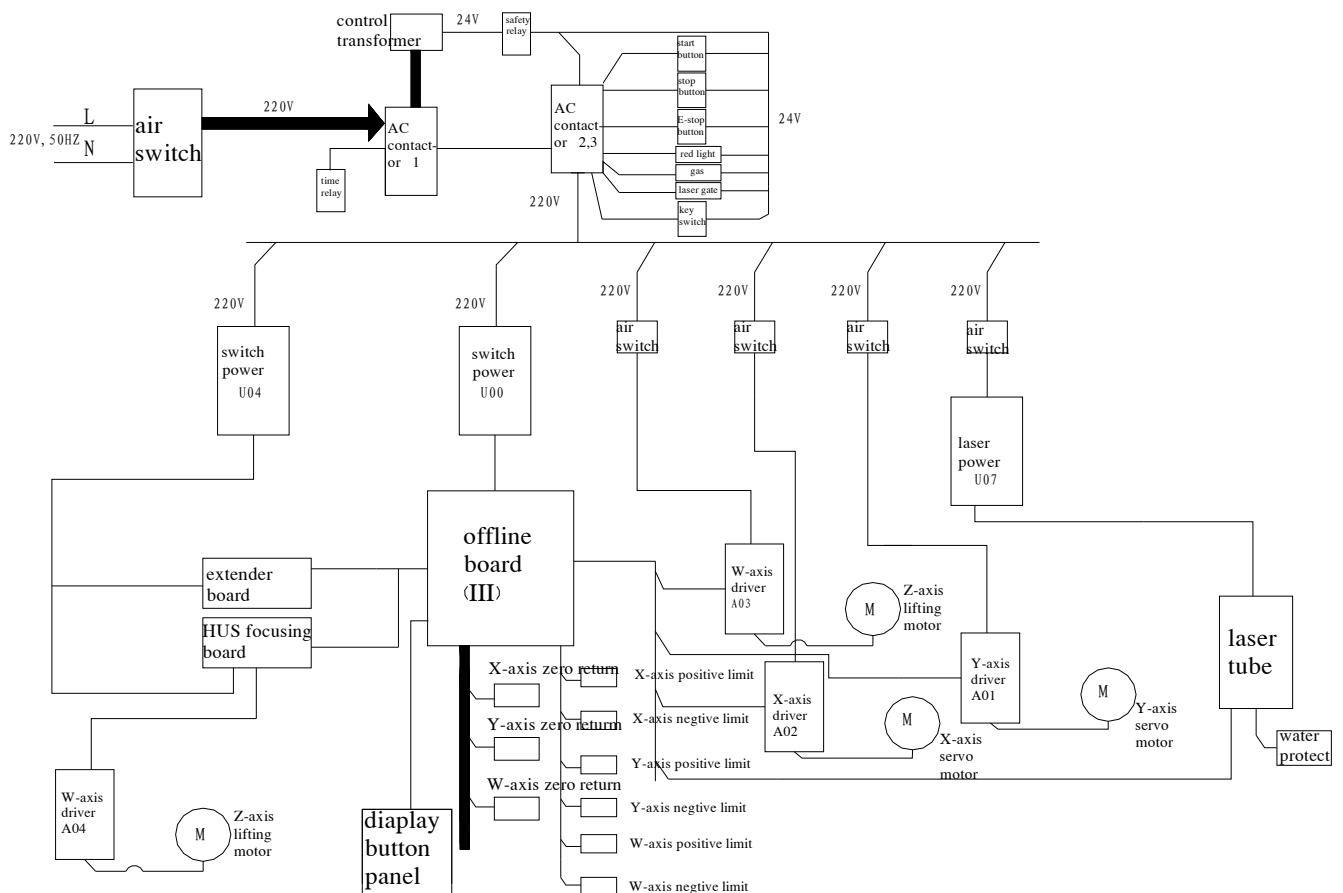
Phenomenon	Trouble shooting
Alarm sounds continuously	1、 Check if there is water flowing from point A to point B in the return hose of

when the machine is started or working	the chiller and if the water flows freely; 2、 Check if the chiller working normally (if the quantity of waster is enough or the temperature is too high).
Y axis/X axis does not respond when X+, X-, Y+, Y- is pointed	Check if the fuse inside the laser machine is all right. Check the tightness of the synchronizing belt. Restart the laser machine. Check the limit switch is all right. Check the motor driver indicator. Check the DC power supply indicator.
High noise produced from movement of X axis and Y axis	Check the synchronizing belts of the lift platform and push plate and see if the belts are of the same tightness; apply top-grade lube to the lift platform ball screw, guide bar and the linear guide of the push plate on regular basis (not too much) and check if the ball screw of the push plate turns freely.

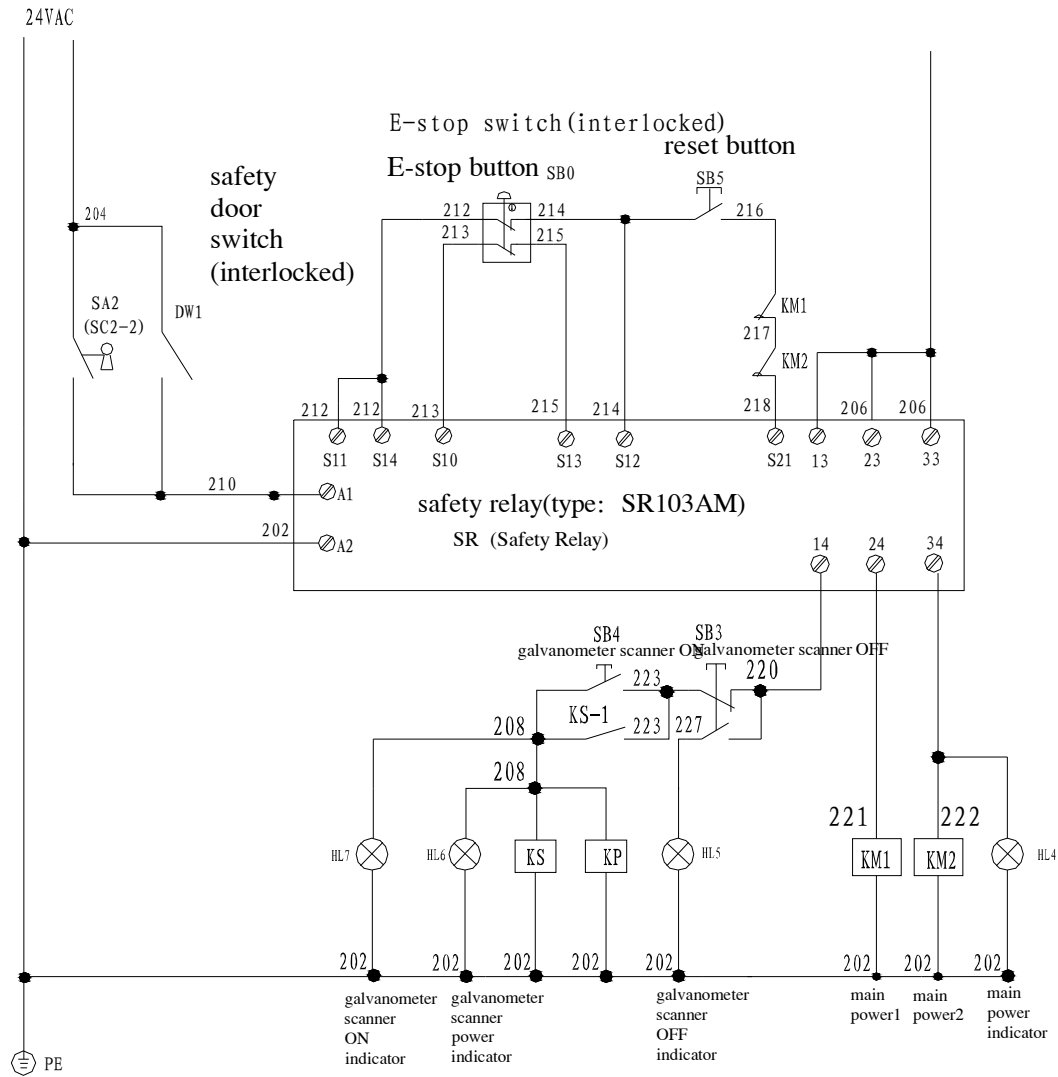
Table 9.2.1 Equipment failure and trouble shooting

Attachment: Electronic circuit of the equipment

Combination and connection of the circuit system



Attached fig 1.1 Schematic block diagram (GJMSJG4060 as an example)



Attached fig 1.2 Safety door sketch state indicators

Safety facilities for the equipment include a door switch and safety inspection control. The equipment will process and output light normally when the door switch SP1, SP2 contact is closed and NORMAL/SERVICE switch SC is turned to the normal position, and will stop processing and outputting light when the door switch SP1 or SP2 contact is open to protect people from being injured by the equipment when the door is open. To maintain and tune the equipment, just turn NORMAL/SERVICE switch SC to SERVICE and then point laser preset button SB before the equipment is able to output light. But when door switch SP1, SP2 or NORMAL/SERVICE switch SC doesn't work or is removed, the equipment won't be able to process and output light normally. Besides, the equipment also provides a limit protection switch along both the positive and negative X/Y/W axis so that when the working table or laser head hits the limit protection switch, all the motors in the related direction will stop running to ensure the equipment works safely. In addition, the equipment also provides a light output alarm so that a tricolor alarm indicator will flash and an alarm buzzer HB will produce sound prompt when the equipment is outputting light and working.

Wire connection

- * Use black wires for AC, DC power lines;
- * Use red wires for AC control lines and blue wires for DC control lines;
- * Use light blue wires for neutral lines;
- * Use yellow-green wires for ground lines;

* Ground wires should be grounded with a separate terminal for each wire and may be transferred by on a ground bus bar.

* The main equipment power incoming line should be connected from an externally locked disconnecter.

* A fixed contracting hole guard should be used for cable coming into and out of the equipment.

Available parts list

No.	Name	Code	Type	Specification	Qty	Use	Manufacture	Remark
1	Break	QFI	DZ47-63-63A	3P	1	Main power	ZHEJIANG CHINT	
2	fuse	FU1.FU2.FU3	RT14-20 3X18	1A1 个, 3A, 8A	3	Control circuit protect	ZHEJIANG CHINT	
3	Fuse holder		RT28-32	400V	3	Control circuit protect	ZHEJIANG CHINT	
4	AC contactor		LC1-D2510	AC24V 50/60HZ	2	Main circuit control	ZHEJIANG CHINT	
5	contactor	TC	220V-24VAC BK50VA	50HZ	1	Main circuit control	ZHEJIANG CHINT	
6	relay	KA0.KA1.KA9 .KA2	JQX-13F	24VAC	4	circuit control	ZHEJIANG CHINT	
7	relay	KA8	JQX-13F	24VDC	1	blow	ZHEJIANG CHINT	
8	Electro-magnet				1	gate	Home-made	
9	servodriver	A02	EDB-04APA	200V 3phases	1	X-axis driver	Estun Industrial	
10	servodriver	A01	EDB-10AAP	200V three phases	1	Y-axis drive	Estun Industrial	
11	Switch power	U00		DC24V,12V,5V,2A	1	DC power	Home-made	
12	Tamper switch			D4MC-2000	6	Limit	OMRON	
13	proximity switch			ZYJA12-4NA/R1	3	Return to zero	上海卓一	
14	Offline board		The third generation board		1		Home-made	
15	Convertor board		For the third generation board		1		Home-made	
14	E-stop switch	SB1	LAS0-K-02TSA/R	Normal close	1	Circuit control	ZheJIANG HONGBO	
15	Key switch	SA\SA1	LAS1AGQ -22Y21	Two-position	2	Circuit control	ZheJIANG HONGBO	1067081
16	button		LAS1AGQ-22E/B AC24V	w/blue light AC24V	1	Circuit control	ZheJIANG HONGBO	
17	button		LAS1AGQ-22ZE/B AC24V	w/blue light AC24V	2	Circuit control	ZheJIANG HONGBO	1068025
18	button	SB2\SB4	LAS1AGQ-22E/R AC24V	w/red light AC24V	1	Circuit protect	ZheJIANG HONGBO	1068023
19	button	SBT\SB3\SB12 \SB5	LAS1AGQ-22E/G AC24V	w/green light AC24V	4	Circuit control	ZheJIANG HONGBO	
20	Terminal blocks		UK4.0		5	Connect		
21	Terminal blocks		UK2.5		50	Connect		

22	Red locator				1	Red light locator		
23	Electromagnetism valve		24VDC		2	Blow		
24	panel				1	Control panel		
25	Safety relay		SR103AM		1	Safety protect	SG	
26	cable			4X6。0MM2		Power cable	上海卡迪夫	
27	break	QF4	DZ47-63-10A	1P	1	Servo power	ZHEJIANG CHINT	
28	Plug-in unit		4pins		3	Connect		
29	Plug-in unit		7 pins		2	Connect		
30	Plug-in unit		35 pins		2	Connect		
31	Accessory of offline board		The third generation board		1			
32	Grounding copper bar				1			
33	diode		4007		5			
34	resistors		500 欧,1/4W		5			
35	Constant current source				2		Home-made	
36	Relay holder		CZT08A		1			
37	timer	JS	SPC-B	AC 220V 50HZ	1	Time relay control	1064007	
38	Servo driver	A03	EDB-04MA	200V single phase	1	Focusing drive	Estun Industrial	
39	breaker	QF2.QF3	DZ47-63-20A	1P	2		ZHEJIANG CHINT	
40	Laser head				1		HUS	
41	Focusing board				1		HUS	
42	Switch power		±15V/12V,5A		1	Focusing board power	Home-made	
43	AC contactor		LCJX2-1810	AC24V 50/60HZ	2	Main circuit start	ZHEJIANG CHINT	
44	Key switch			Two-position	1	Normal/Service	ZHEJIANG HONGBO	1067081

Table1.1 Available parts list (GJMSJG4060 as an example)

Installation and connection

● Location

- * Indoor where it is not exposed to rain or direct sunshine;
- * Where it is not exposed to corrosive gases, inflammable gases, grinding liquid, iron powder or particulates;
- * Well ventilated and damp and dust proof;
- * Easily accessible for maintenance, inspection and washing.

● Ambient conditions

Item	Requirement
Ambient temperature	0 to 40℃ (freezing free)

Ambient humidity	90%RH max (dew free)
Storage temperature	-20 to 80°C (dew free)
Storage humidity	90%RH max (dew free)
Vibration	49 m/s ² (5G)max when at work, 24.5 m/s ² (2.5G) when at rest

Attached table 1.2 Environment conditions

● How to install

The motor may be installed either horizontally or vertically with the cautions below:

- * Horizontally: Place the motor with the cable outlet downward to keep oil and water off.
- * Vertically: For a motor connected to a reduction gear, make sure the reduction gear oil is kept away from the motor.

● Oil and water protection

- * The motor should not be placed or used in a water- or oil-flooded environment;
- * Use an oil seal for a motor connected to a reduction gear to keep the reduction gear oil away from the motor;
- * The motor cable should not be flooded in oil or water.

● Cable: Stress relieving

- * Make sure the cable is not subject to any moment or vertical load caused by external bend or its dead weight, in particular, at the cable outlet or connection.
- * To the extent that the motor travels freely, fix the cable (the one provided with the motor) to a static part (e.g. the floor) and extend it with an additional cable mounted in the cable support such that the bending stress is minimized.
- * The cable elbow should be made to the largest radius practically possible.

● Admissible shaft-side load

- * Make sure the radial and axial loads on the shaft end during the installation and operation are kept within the admissible limit for the respective types of machines.
- * Take special care when installing a rigid coupling. An excessive bending load may cause damage and/wear to the shaft end and bearing.
- * It is advisable to use a flexible coupling to keep the radial load below the admissible limit.
- * Try to align the shaft end to the best extent (any misalignment may cause vibration and/or damage to the bearing).

● Wiring step and safety protection details

- * Connection of power plug and connection of ground wire:
 - 1、Do not connect the equipment to the power supply before installing the equipment completely.
 - 2、Select a power source that outputs power of a capacity larger than the rated power according to the nameplate with two power lines reliably connected to the disconnecter. A ground wire should also be provided connected to the yellow/green wire of the power cable or securely connected to the ground copper screw on the machine tool.)
- * Fixing of towline
 - 1、The cable in the towline should not be subject to any tension. The cable should be lightly longer than the towline so that the cable remains relaxed. The cable outside the towline should be fixed.
 - 2、Do not damage the insulation course of the cable when installing the towline and keep any oil/water/crap iron away from the towline.
- * Inspection and installation of electrical equipment

- 1、Check that the limit switch and reset switch of each of the motors on X/Y/Z/W axis are not damaged.
 - 2、E-stop switch must be unimpeded during operate.
 - 3、Notice the type of the socket connector and the direction/sign of the socket connection (as per the signs on the drawing) when installing it.
 - 4、Make sure the connector is free of any rubbish or metal sheet inside when connecting the connector.
- * Arrangement and connection of cable wires
- 1、Select and identify the wire as per the wire number/diameter shown in the drawing when connecting the wire.
 - 2、Select the right screwdriver to press the wire specific to the press screw, and use the right wrench tightness necessary for a screw with a nut.
 - 3、The connected cable wire should be fixed instead of being left suspended.
 - 4、Do not hit the shaft end directly with a hammer when installing/uninstalling parts coupled to the motor shaft end (or the encoder at the other end of the motor shaft will be damaged).
 - 5、Do not connect the machine to the main power before completing all the wiring operations in case of electric shocks (please refer to the respective connection diagrams when wiring the machine).
 - 6、Make sure the connector is connected to the servomotor from the servomotor cable side first. If it is connected to the encoder cable side first, the encoder may break down as a result of the potential difference between FG.
 - 7、Make sure the pins are arranged correctly when connecting the wire.
 - 8、The connector is made from resin. Do not impose any impact on it in case the connector is damaged.

Inspection before test run

- Inspection before powering the equipment
- * Verify that the external power conforms to the required voltage parameter.
- * The ground wire is reliably connected.
- * The emergency stop switches on the machine tool and the console work normally. Set the switches to RESET after the verification.
- * Reliability of the limit switch and reset switch
 - 1) Check the transmission part of the bracket and see if the bumping block is loose or the limit switch is damaged.
 - 2) The upmost end of the reset switch is 1~2mm from the inductive metal plate, and all the limit switch and reset switch installation screws are tightened.
- * The motor on X/Y axis power lines are correctly connected to the X/Y axis servomotors. Any wrong connection will cause flying accident (ultra-speed).
- * Water circuit: Check if there is any impurity in the water tank of chiller. Put 80% distilled water into the tank and see if the inlet or return hose is squeezed or bended and keep the water circuit thorough. Finally start the chiller and verify that the inlet and return are both all right.
- * Finally start the chiller and verify that the inlet and return are both all right.
- * Run the data cable through the machine tool, lug it into the 25-core aviation socket mounted on the control card on the console and tighten up the screw.
- * Plug the 32-core aviation plug on the console into the corresponding 32-core socket on the machine tool.

- Inspection after powering the equipment

Note: The control card will be automatically started when the equipment is power on. Motors on X/Y/W axis will be automatically reset, i.e. move toward the original point when the control card is set to return to the original point upon power on.

* The contactor and relay should function without noise.

* Verify the following when the equipment X, Y axis is reset:

1) Water circuit: Verify that the water in the return hose of the laser tube runs in the right flow.

2) Laser path: Place an organic plate under the laser head. Press the preset button of the control card and see if there is laser light through the organic plate. See instructions for debugging the laser path above for specific adjustment.

Circuit protection

● What is protection?

As the YASKAWA servo system incorporated provides all protections itself, the motor will cut the current as shown in the main circuit diagram and the servo alarm output (ALM) will be off when any of the protections is activated.

● Actions to take after an emergency

Upon any triggered incident, the LED panel will display an alarm code and identify with the servo ON.

When A-CLR (alarm clearing input) is disconnected, reconnect it and maintain A-CLR at 120ms before the trigger state is cleared.

Overload protection will not be cleared by A-CLR until at least 10sec after the incident. This delayed operation will be cleared if the control power between r and t is disconnected.

● Alarm indications, causes and solutions

For any adversity in the servo driver, the panel controller will provide an alarm indication A.□□ or CPF□□ in addition to A.9□ as a warning indication though A.--is not an alarm. The alarm indications, warning indications and their solutions are detailed in the table below.

If the adverse situations still can not be resolved after the treatment, please contact our service department.

Alarm	Alarm detail	Case of alarm	Cause	Solution
A. 33	Wrong connection of main circuit power	When control power is connected	Excessive servo energy	Replace servo unit
	Tested when main circuit power is connected	When main circuit power is connected	Supply AC power from L1 & L2 (or L1, L2 & L3) under DC power output	Set to pn001.2=0 for AC power input Set to pn001.2=1 for DC power input
			Supply DC power from ⊕1 & ⊖ terminals under AC power input	
			pn600As is not 0 since no regenerate resistance is connected	Set to pn600=0
A. 40	Overvoltage (tested when the main circuit AC voltage inside the	When control power is connected	Failure in servo unit circuit board	Replace servo unit
		When main	Excessive AC power voltage	Adjust AC power voltage to normal

	servo unit is over DC420V) * Tested when main circuit power is connected	circuit power is connected		value
			Failure in servo unit	Replace servo unit
		During usual movement	Check AC power voltage (for any excessive voltage fluctuation)	Adjust AC power voltage to normal value
			High speed used, excessive load moment of inertia (insufficient regenerability)	Reconsider load condition, movement condition (check load rotation inertia, negative load parameter)
			Failure in servo unit	Replace servo unit
		When servomotor is decelerating	High rpm, excessive load moment of inertia	Reconsider load condition & service condition
A. 41	(tested when the main circuit AC voltage inside the servo unit is about over DC170V) * Tested when main circuit power is connected	When control power is connected	Servo unit circuit board	Replace servo unit
		When main circuit power is connected	Low AC power voltage	Adjust AC power voltage to normal value
			Broken fuse of servo unit	Replace servo unit
			Broken impact current limiting resistor (if power voltage is abnormal, or impact current limiting resistor is overloaded)	Replace servo unit (verify power voltage, reduce main circuit ON/OFF frequency)
			Failure in servo unit	Replace servo unit
		During usual movement	Lower AC power voltage (check for any excessive voltage drop)	Adjust AC power voltage to normal value
			Transient power failure	Reset alarm & restart movement
			Short circuit cable for motor main circuit	Correct or replace cable for motor main circuit
			Short circuit servomotor	Replace servomotor
			Failure in servo unit	Replace servomotor
A. 82	Encoder & sum check alarm * Tested at encoder side	When control power is connected or during movement	Failure in encoder (self diagnosed by encoder)	Set encoder; replace servomotor if this happens frequently
			Failure in servo unit	Replace servo unit
		When SEN signal is ON	Failure in encoder (self diagnosed by encoder)	Set encoder; replace servomotor if this happens frequently
A. 84	Encoder data alarm *Tested at encoder side	When control power is connected	Malfunction of encoder	Restart PG power; replace servomotor if this happens frequently
			Failure in servo unit circuit board	Replace servo unit
		During movement	Malfunction of encoder caused by disturbance	Connect wires outside encoder in the right way (e.g. encoder conductor separated from power line, grounding)
			Failure in encoder	Replace servomotor if this happens frequently
			Failure in servo unit circuit board	Replace servo unit

A. C9	Abnormal encoder communication	When control power is connected or during movement	Wrong wiring, poor contact of encoder	Correct encoder wiring
			Disturbance caused by different encoder cable sizes	Change cable spec to shielded multi-strand cable with individual conductor over 0.12 mm ² , multi-strand tin-plated soft copper wire
			Disturbance caused by overlong encoder cable	Wiring distance 20m max
			Disturbance to signal line caused by mesh-in or damaged sheath of encoder cable	Correct installation of encoder cable
			Encoder cable bound together with or too close to large current wire	Install encoder cable at a point it won't be exposed to voltage surge
			Change in FG potential as exposed to motor-side equipment (e.g. a welding machine)	Connect equipment ground to avoid shunting to PG-side FG
			Disturbance to encoder signal line	Provide anti-disturbance measures for encoder wiring
			Excessive vibration impact on encoder	Reduce machine vibration or install servomotor correctly
			Failure in encoder	Replace servomotor
			Failure in servo unit circuit board	Replace servo unit
A. F5	Motor wire broken (Servomotor is not powered whether servo unit receives servo ON instruction)	When control power is inputted	Failure in servo unit circuit board	Replace servo unit
A. F6		When servo is ON	Failure in servo unit circuit board	Replace servo unit
			Motor power line broken	Rewire motor

Attached table 1.3 Alarm indication

Maintenance and inspection

Regular maintenance and inspection of the circuit is critical for the normal and satisfactory service of the drivers and motors.

Note to maintainers/inspectors

- * Power should be connected/disconnected by the operator himself.
- * The circuit will remain under HV charging within a certain time after the power is disconnected. Do not start any inspection until the LED light on the panel is out about 10min after the power is disconnected.
- * Do not measure the insulation resistance as this will damage the driver.
- * Please discharge the casing with a copper binding post when removing the HV connector to avoid accident from the surplus current.

Inspection items and cycle

* Inspection of servomotor

As the AC servomotor does not have an electric brush with it, everyday brief inspection is enough. The inspection interval is provided for reference only. Please decide the right interval specific to the service conditions and service

environment.

Notice: Don't uninstall the servomotor for maintenance or inspection purpose. To uninstall the servomotor, please contact our agent or operation office.

Item	Frequency	Inspection/Maintenance essential	Remark
Vibration & sound verification	Every day	By sense & listening.	No increase from usual.
Visual inspection	As per contamination/damage	Clean with rag or sweep with air gun.	—
Insulation resistance measurement	At least every year	Disconnect from servo unit, measure insulation resistance with a 5000V megohm meter. Resistance is normal if it's over 100MΩ.	Please contact our agent or business office if it is below 10MΩ.
Oil seal replacement	At least every 5000h	Please contact our agent or business office.	For servomotor with oil seal only.
Overall inspection	At least every 20000h or 5y	Please contact our agent or business office.	—

Attached table 1.4 Inspection of servomotor

* Inspection of servo unit

While everyday inspection is not necessary, please inspect at least every year.

Item	Interval	Inspection essential	Abnormality solution
Cleaning of mainframe & circuit board	At least every year	Please contact our agent or business office.	—
Bolt flexibility		No flexibility is permitted for patch board or connector fixing screws	Please tighten it again.

Attached table 1.5 Inspection of servo unit

Replacement of circuit electrical part

The electrical and electronics parts are subject to mechanical wear and ageing. To guarantee safety, please check them on regular basis.

To replace any part, please contact our agent or business office.

For a servo unit repaired by us, the user parameters are set back to the defaulted values. Please make sure that they are set back to user parameters for service before the unit starts any movement.

Note: Any removal of the parts for inspection or repair purpose should be by our company (our sales agent) only.

Name	Standard replacement interval	Service condition	Remark
Cooling fan	4~5y	Ambient temperature: annual average 30℃ Load rate: under 80% Service rate: 20h/day	The replacement interval provided herein is for reference only and subject to the specific service conditions and equipment operation. Any nonfunctional part should be replaced or repaired immediately.
Contacting	5y		
Breaker	5y		
Transformer	5y		
Relay	5y		

Attached table 1.6 Replacement of circuit electrical part

Debugging and maintenance of eclectic system

- **As your JMSJG4060 vibration mirror marker/cutter is a class IV laser device that produces high power laser, the electrical part should be installed and debugged either by our professional technician or a technician having received our training only. No other people are allowed to adjust the optical path in case of personal injury.**
- **The equipment should be repaired only by competent professionals. Please advice us (or our sales agent) immediately of any problem you cannot solve and record the site details to facilitate our repair.**

Attachment: Hazardous substances

As the laser cutting machine will produce some hazardous substances (e.g. cyanide, carbon monoxide and benzene derivatives; allergy/ stimulating: isocyanates, acrylates; carcinogen: benzene, PAHS) which will be treated by the exhaust system of the equipment, please take necessary protection when working on the equipment, remove the surplus materials from the processing from time to time and keep them away from the equipment! Please refer to EN ISO 11553-1:2005 for details of hazardous substances.

Attachment: Discarding

Any discarding of the equipment should be as per the local law and regulations!

Conclusion

Laser machines involve a number of technologies of which we do not intend to cover every detail. From our experience, however, 90% of laser machine failures are derived from human operation since the laser machine is subject to computer and the latter is subject to human being. As a result, we have to know well how to operate the graphic production software, set the right parameters and prevent malfunction of the laser machine, which is especially important. Secondly, please make sure your operators attend our training programs or, if they are not able to receive our training at our company for any reason, read the instructions on software operation carefully before starting any operation and contact us by telephone to avoid mal-operation. Please contact us immediately for any failure in your unskillful operation instead of trying to handle it by yourself in case of any negative result.