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# Laser Marking Machine User Operation Manual



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Product standard code for this product:

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Catalogue

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## 1. Preface

### 1.1 Welcome

Thank you for purchasing HBS products. If you first time using the products, please be sure and read our operation manual carefully before use, be care about the sign 'danger', 'warning', 'notice', to ensure the safety of you and the surrounding personnel and make proper use of the products.

Danger

If you don't follow the correct operation, it will cause serious personal injury or even life-threatening.

Warning

If you don't follow the correct operation, it will cause serious personal injury or even life-threatening.

Notice

If you don't follow the correct operation, it will cause personal injury or damage of equipments.

### 1.2 Company profile

Beijing HBS Science & Technology Development Co., Ltd was founded in 2001, is one of the leading enterprise for producing and supplying marking machine. Over the years, HBS had provided numerous well-known companies with wide-ranging solutions and reliable marking equipment, with a strong and sustainable traceability to the industries' products and supplies.

#### ➤ Products

Beijing HBS Science & Technology Development Co., Ltd provides professional marking processing solutions and related auxiliary equipments to the clients all over the world. Key products ranges include pneumatic marking machines, electromagnetic marking

machines, laser marking machines, electro-chemical marking machines, hand-held marking machines, mobile marking machines, and series of industrial marking equipment and accessories. These are widely used in the electrical equipment, electric power supply, telecommunication, moulds, plastic moldings, automotive, railway, aerospace, military, shipbuilding, casting, machinery, metallurgy, medical, packaging, food products, mobile devices, gifts, jewelry and many other industries.

➤ **Quality**

Beijing HBS Science & Technology Development Co., LTD is strictly comply with quality control under ISO9001 system. The whole process from design to finish product, starting from material sourcing, production to packaging and deliveries are all carried out under strict supervision for perfect quality and performance.

➤ **Services**

HBS's headquarter is established in Beijing to handle it's core business. There are now branch offices in cities like Shanghai, Dongguan, Shenyang, Ningbo to handle the sales, after-sales service, transiting deliveries and technical support. HBS continuously adopts valuable feedback from clients new and old, paying much attention to details and innovation, perfecting our products. HBS hold strong beliefs in "reliable products and excellent after-sales service combination" bringing to our clients unprecedented peace of mind and trust. Our commitment to you, our customers is "Quality first and customer foremost". It is also our long term pursuit and goal.

## **2. Products Profile**

### **2.1 Summary**

Laser marking is one of the most widely used processing method in the processing industry. Our company' laser marking machine consists of DSP chip control(made from Dezhou Instrument Co., Ltd.), Windows user interface control software, high-speed XY galvanometer, long lifetime laser, power supply module, precision alloy aluminum platform etc. The machine is stable and reliable with perfect dynamic performance and strong load

ability, is a high technology products combined with precision machinery, electronic technology, laser technology, has the characteristics of high speed, high precision, high efficiency and economical etc.

Before use of marking machine, the operator should read the operation manual carefully.

During operation, if there are difficulties, please contact us immediately, we will solve the problem and give you a satisfactory answer soonest.

When opening the packing, please check the operation manual, if it's not complete, please feel free to contact us.

## 2.2 Products feature and outlook



Picture 1: Marking machine outlook

Note: all images in the manual are only for reference, except for special explanation. The equipment which provided for user is based on actual products.

- The platform and lifting system are aluminum alloy, with high rigidity, stability and shock resistance.
- The machine head consists of high-speed XY galvanometer that has advantage of overvoltage & over-current protection and can track the motor angular by position sensor to achieve closed-loop control.



- The main chip is imported DSP chip with windows interface control software, much powerful and stable, the program interface is simple and convenient.
- The Z-axis stepper motor is connected with chuck through coupling, ensure the reliability of transmission accuracy.
- The controller is separated with machine head, this design is easy for installation and commissioning.
- Compatible with a variety of graphic formats, it's easy to print out a variety of graphics.
- The controller has one extended axis, easy for marking or controlling round work-piece or another operation platform.
- Equipped with a DC24V power supply, can control the air cylinder, supplying 24V power during marking and switch off while marking completed.
- Equipped with one external pedal switch(), can be connected with mechanical switch or electric switch.
- Is equipped with 1 external pedal switch (can control the marking instruction), can be connected to a mechanical switch or a photoelectric switch.

### **2.3 Main uses and working scope**

Laser marking is the fastest and most widely used marking method in marking industry. Comparing with the traditional marking method, laser marking is more efficient, stable and much faster, with deeper marking depth and operates more flexibly etc. Laser marking is widely used in electronics, electrical equipment, electric power, communications, molding automobile, heavy machines, aerospace, weapons manufacturing, shipbuilding, foundry, machinery, metal materials etc.

### **2.4 Working environment**

- Power supply: two-phase three wire system, AC220V 50Hz;
- The main engine power: 450W

- Power requirement: voltage fluctuation: <5%.
- Ground protection requirement: three electrical plug board with grounding wire, grounding resistance less than4Ω.
- Require good ventilation, dust-free, corrosion-free and pollution-free environment.
- Keep marking machine at least 0.5m away from wall or other objects, the distance between controller and machine shall not more than 1m.
- The core parts, which includes controller, galvanometer, laser source, have a strict requirement for environment. Avoid the machine from interference of electromagnetic wave, such as electric arc welding and electrical discharge machining, to ensure the normal performance of marking machine.

## **2.5 Influence for environment and energy**

- In the process of marking, the laser beam will effect on the metal surface, producing metal powder and debris, please clean immediately as needed.
- The principle for laser marking machine is using laser beam scorch on surface of work-piece speedily to produce the designed characters. During this procedure, for different materials, it will cause different noise or smoke. Generally the noise is not more than 40 dB but some waste smoke is harmful (especially mark on PVC and plastics). So when marking these special materials, it is necessary to purify the exhaust gas before discharging outside.
- The laser source of the marking machine is class 4 laser products. The laser beam or the reflection beam and diffuse reflection is harmful for human body(especially eyes), person at presence should take protection measures. It is important to prevent fire hazard all the time.
- The power consumption for laser marking machine is 220V 50Hz 450W(depends on the different laser source)

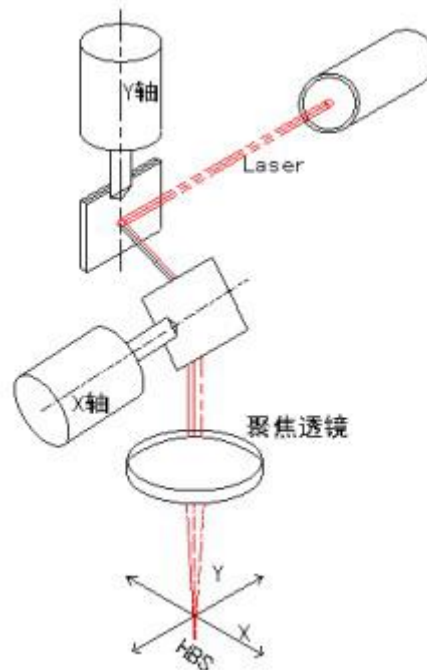
## 2.6 Products structure and working principle

The main components for laser marking machine are: controller and main machine.

The control system consists of power module, marking module card, motor drive, laser source, foot switch and electric cable for signal connection.

The main machine is composed of basic table, a lifting system and a machine head.

The marking work is conducted by scanning. Firstly, the laser beam is incident to the two mirror, and then the scanning motor, which conducted by computer, will drive the mirror rotate along the X and Y axis, when the laser beam focus on the work-piece, the marking will occur. The working principle is as follows:



### 2.6.1 Main structure and working principle, operating characteristics

The machine body is the most important part for main machine, mainly effecting the marking precision, which consist of bedplate, a lifting mechanism and machine head. The machine head is consists of X—Y Two-dimensional galvanometer board, X/Y galvanometer motor, X/Y driver board and focusing lens.

### 2.6.2 Structure, function and working principle for main parts or functional unit

Marking controlling system: as one of the core component of the whole system which run

together with computer software. It controls laser source, XY galvanometer, expansion shaft, IO expansion etc... to realize working.

Laser source: as the lighting source of the whole laser system, the laser source can achieve the different laser frequency and power by inputting different parameters, to realize the marking on a variety of materials.

Power module: provide different power supply for the laser source, marking controlling system, XY galvanometer etc..

Driver: receive the data from marking controlling system, amplify the driving current and transfer to expansion shaft motor.

XY galvanometer system: the galvanometer system is consists of optical scanner and servo control. The design and manufacture of the whole system adopts new technology, new materials, new technology, new working principle.

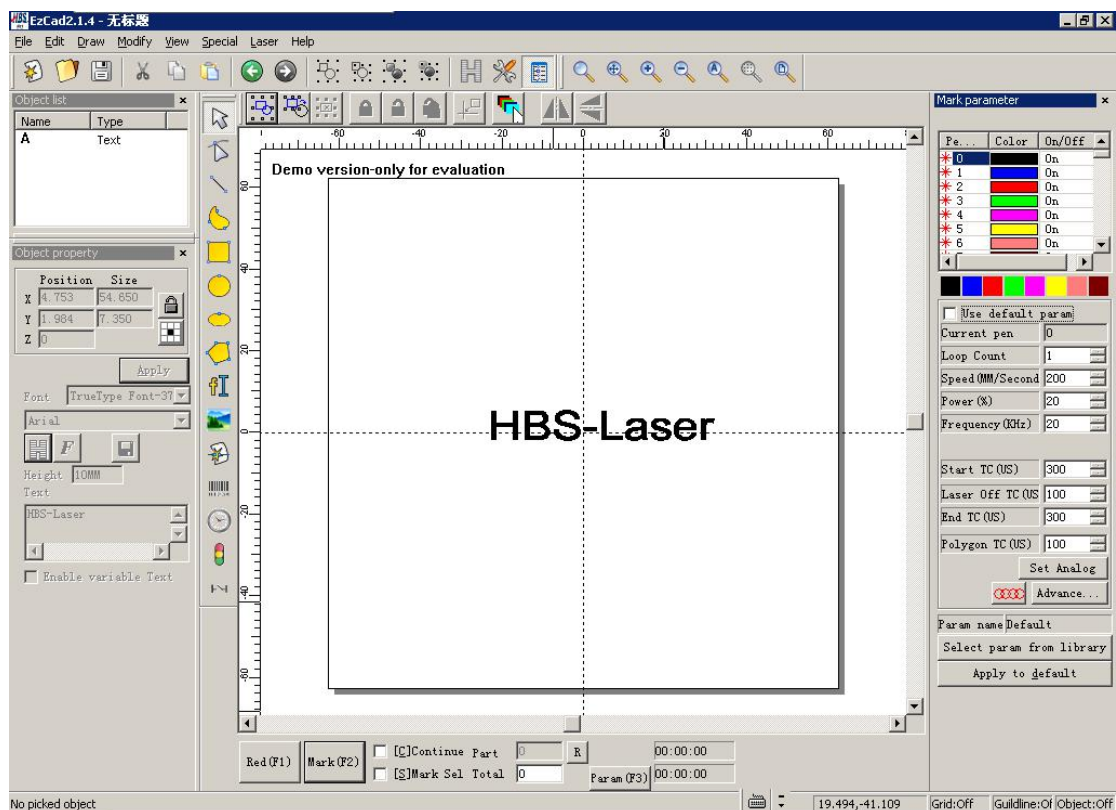
The optical scanner adopts servo motor which is dynamic magnetic deflection system, has advantages of large scanning angle, high peak torque, large load inertia, small electromechanical time constant, fast working speed, stable and reliable. Precise bearing tolerance-elimination mechanism provides the lowest axial and radial jumping error. "electronic torsion bar" replace the traditional elastic torsion bar that greatly improves the service lifetime and reliability. Arbitrary position zero power to keep working principle so as to reduce the use of power and reduce heating effect of components that save the thermostat system. Advanced high stability precision position detection sensor technology provides high linearity, high resolution, high reproducibility and low tolerance.

The optical scanner is divided into the X-axis scanning system and the Y-axis scanning system, and each servo motor shaft is fixed with a laser reflective mirror. Each servo motor is controlled by a computer that controls the scanning process.

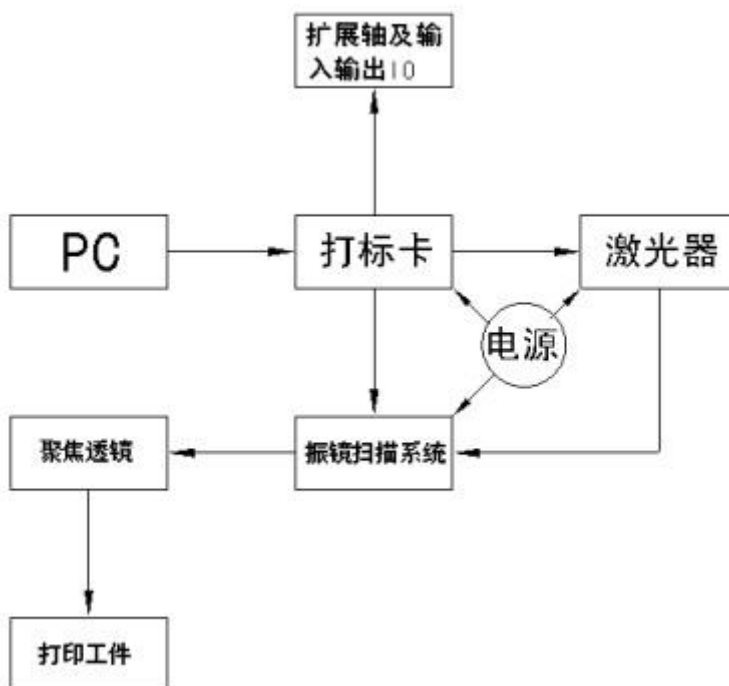
Focusing lens: the laser beam from laser source can not directly meet the requirement of marking, the focusing lens can focus the laser beam into a tiny spot and the laser spot will generate energy which is required energy for marking.

Marking software: the interface of the standard software is used for the standard Windows

style, which is convenient for the operator to master the various editing functions of the standard file.



### 2.6.3 Electromechanical connection between different parts



### **3. Safety instructions and preventive measures**

#### **3.1 Summary**

Before the operation and daily maintenance, operator should read this instruction carefully, acquire the knowledge of safety measures and requirements of equipments, comply with the relevant safety precautions.

#### **3.2 Safety warning signs and instructions**



Caution of high voltage, or will causing death and deadly injury.



Caution of laser beam, don't through the laser beam, or will cause burns and even endanger human life.

#### **3.3 Operator safety protection**

**Metal powder and debris:** in the marking process, the laser beam ablates the metal surface, will produce metal powder and debris. To avoid human inhalation, the operator should wear proper mask during operation.

**Smoke and waste:** when the laser ablates the metal surface, will produce smoke and fumes that is harmful to human(especially print PVC and plastics), during the marking for special materials, it is necessary to add suction device, and discharge the smoke and fumes before purification treatment.

**Laser:** when the laser ablates the metal surface in the marking process, will produce sparks, the strong light will injure the retina of operator if long time stare. The operator should not stare at the laser focus during operation. Due to the high transmittance of YAG laser with long wavelength, the damage is more harmful.

#### **3.4 Electrical safety**

➤ Do not touch any switch with wet hands to avoid the electric shock. The parts, which affixed with lightning signs, have high voltage electric devices or I components. The

operator should avoid any electric shock during operation and maintenance. Such as: protective cover of the motor, the air plug behind the vertical plate, connections behind the controller etc.

- Read the manual and electrical schematics carefully in order to familiar with various functions and corresponding operation method.

- Don't open the controller and change the fixed parameters, potentiometer and switch. If it's necessary to change, must be trained by the manufacturer or changed by professional engineers, be sure to record the parameters before change in order to restore the original state if necessary.

- Don't touch the components in electric cabinet when the power is on, such as: marking controller, all PCB boards, power module and driver etc;

### **3.5 Mechanical Protection**

- Designate safety personnel to determine the scope of responsibility, to proceed safety operation and education for the operator.

- Designate the marking security area and set up warning signs, including marking machine powers, marking types and methods, no entry signs, eyes protection, name of the operator and supervisor etc.

- Turn off the power when the marking machine is free of work. The machine should be protected and supervised by special person to avoid strangers or other person touch the machine and cause injury and malfunction of equipments.

### **3.6 Operator' common sense**

- Before operating of marking machine, the operator must be trained to reach a certain skill and get the permit from the safety supervisor.

- The operator must ware protective goggles in a bright working environment, to ensure smooth operation.

## **4. Installation and commissioning**

### **4.1 Checking before delivery**



#### **4.1.1 Unpacking notice**

- Open the packing according to the instructions to avoid the damage of equipment in boxes. Don't use sharp tools to gash when the equipment wrapped with protective film, otherwise will damage the power cable, connections or scratches the surface of the equipment. Such damages or loss will be at buyer's responsibility.

#### **4.1.2 Checking Item**

- Check the equipments and confirm whether the equipments is your required one.
- Check and confirm if the equipment is damaged during delivery.
- Check the packing list if there is any miss of spare parts or damage.
- If any unconformity of products model, loss of spare parts, damage against delivery, please contact us immediately.

#### **4.2 Environment requirement for installation**

- During installation and fixing of marking machine, please do follow up the hoisting installation diagram, layout, power cable diagram and don't damage the equipments. Contact us immediately if any problem.

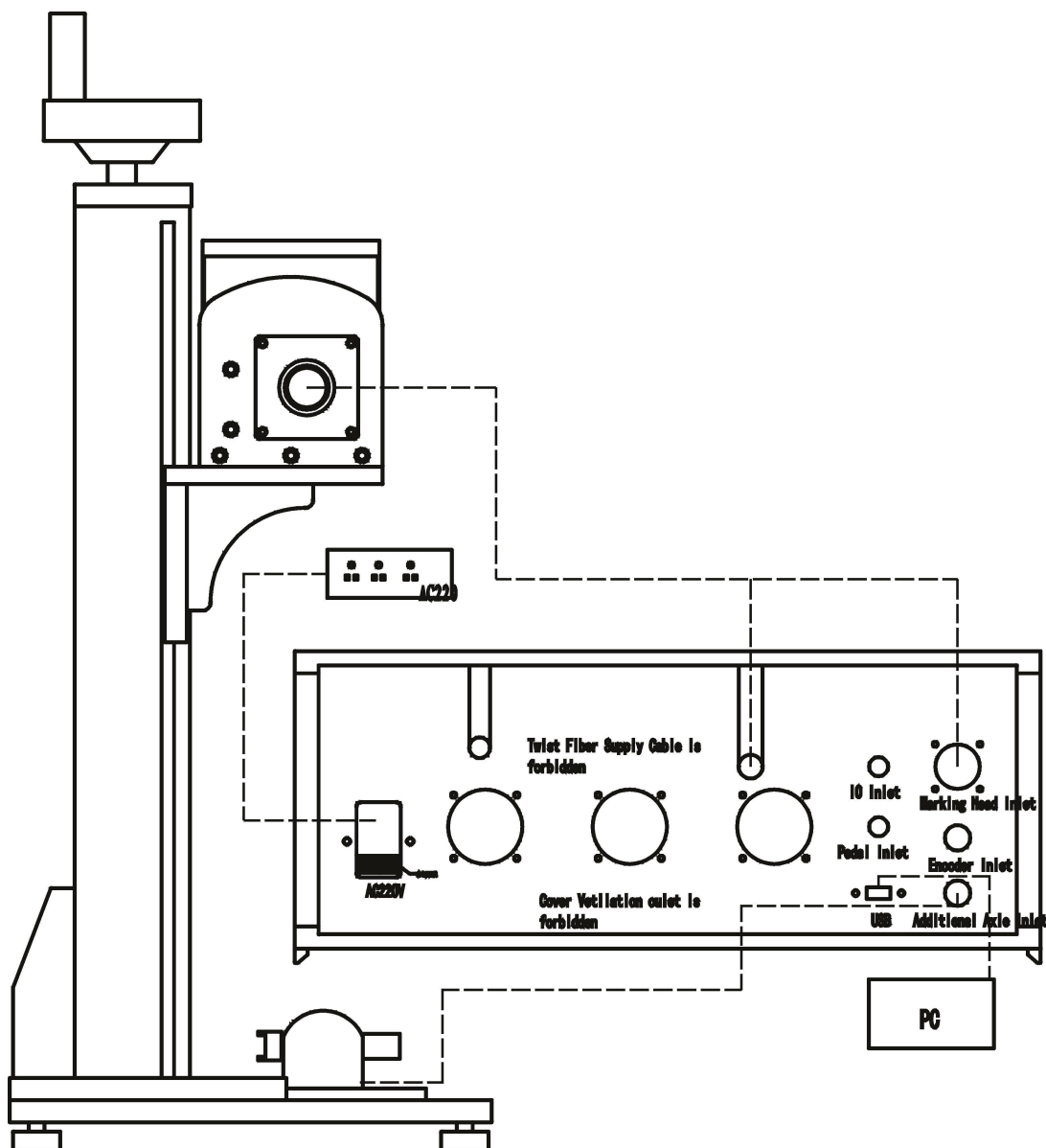
#### **4.3 Installation method and notice**

- During installation and fixing machine body, please do follow up installation diagram, power cable diagram and don't damage the equipments. Contact us immediately if any problem.

#### **4.4 Electromechanical connection**

- The electric connection of marking machine must be carried out in accordance with relevant regulations by professional engineers. Acquire the performance and characteristics as well as technical specifications before commissioning. It's essential to connect cable properly to make sure normal operation. Contact us if any questions.





#### 4.5 Commission method and related notice

- Commission must be carried out in accordance with relevant regulations by professional engineers. Acquire the characteristics and technical specifications before commissioning. The proper commission can ensure the normal operation. Contact us if any questions, we will give you a satisfied answer soonest.

##### 4.5.1 Checking for machine head

- Check the machine head if damaged during delivery. For laser head, red light parallelism, coaxial degree, pulling them and check if there is loose. If so, please adjust the coaxial degree and fix screw properly.

- Check all the cable connections of machine head and confirm if affected or damaged during delivery.
- Check the focusing lens if damaged due to delivery or contaminated by dirt.
- Fix the power plug inside machine head, and fix the marking unit on it's working table.

#### 4.5.2 Checking for controlling system

- Check the integrity of the controller, open the controller and check if any damage or loose due to delivery.
- Check the internal cable of controller if disconnected, loose or broken.
- Turn on the power of controller, check if all indicator light and power voltage are normal.
- After the above mentioned items are checked, fix the cover with screw and place on operating table properly.

#### 4.5.3 Marking Machine electricity adjustment

- Firstly, switch on the power for controller(Switch on three buttons in sequence, firstly marking controlling system, then galvanometer, and then laser source). Secondly, click open the laser marking software 'HBS Laser' in computer and then enter the marking control software. Thirdly, create a rectangular box according to operation manual of marking controlling software, and then press F1(red light), to check if the red light is match with the software interface display. (Before click open the software, please install laser marking controlling system and dongle driver in your computer. See following software inrtoduction)

**[warning] If marking head vibrate or whistling, the red light jump randomly or keep still, immediately switch off power of controller to prevent any damage to marking head and controller. Restart after trouble is released.**

#### 4.6 Method for acceptance test after installation

- Acceptance of equipments according to contract technical provisions.

## 5. Use of software

### 5.1 Summary

- The software is suit for Windows operating system, simple operation, low failure etc.

### 5.2 Preparation and checking before use

- Check if the power supply is normal, if not, re-check the power circuit(check if the emergency stop is off).
- Check if the cover of focusing lens is taken off.
- Check if the marking sample is put in proper marking position.

### 5.3 Software operation guide

- Sequence of starting/booting: turn on 220V power supply --- turn on marking controlling system --- then galvanometer --- then laser source --- then open the software --- then open the file to be marked or create new file.
- Sequence of shutdown: save the file --- laser source --- galvanometer --- marking controlling system --- power supply.

#### 5.3.1 Installation of software driver

##### Installation of software for marking controlling system

- Find the CD disc in computer and choose the proper install version



- Select the installation driver according to computer operating system.



c. Next step



d. Select file, right-click to install.

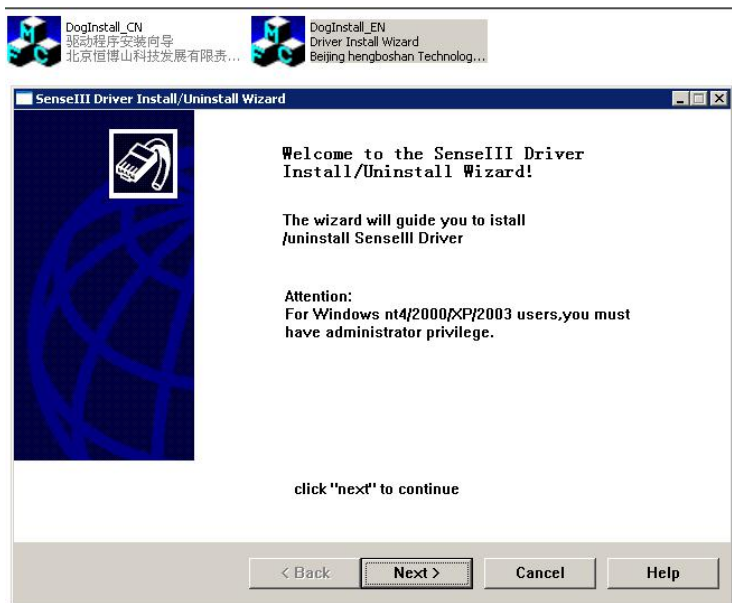


### Installation for soft-dog driver

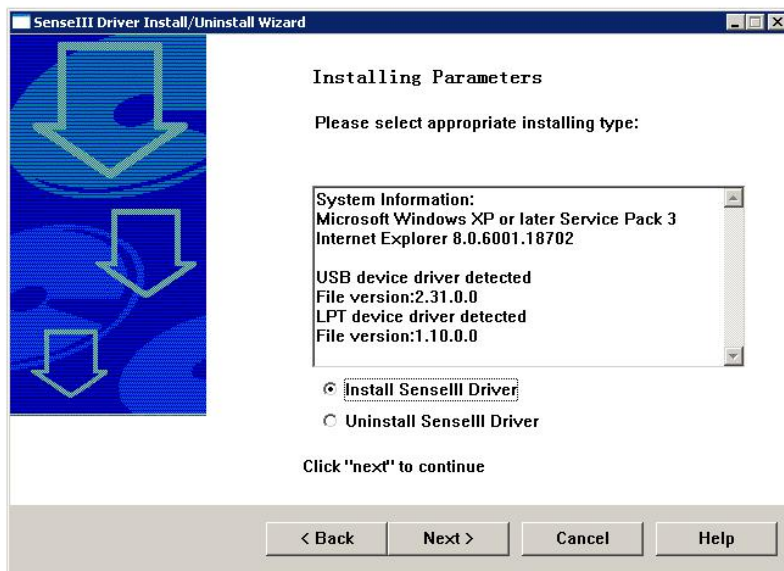
a. Select Chinese/English version and next step



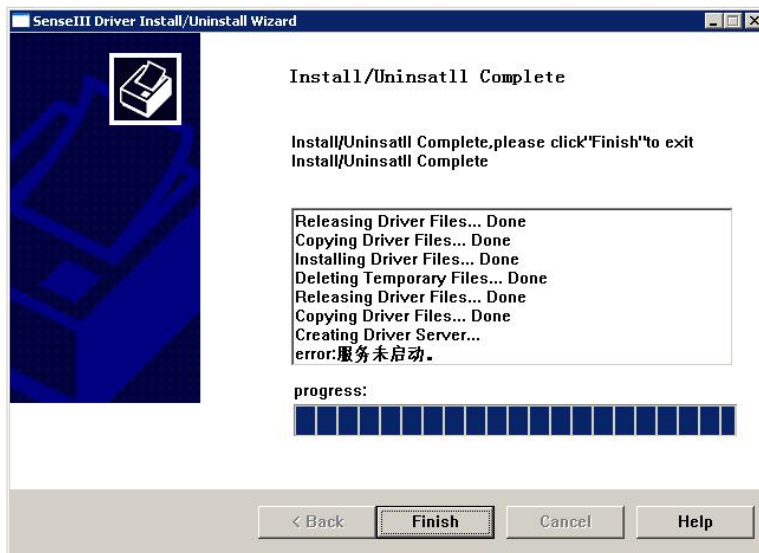
b. Next step



c. Next step

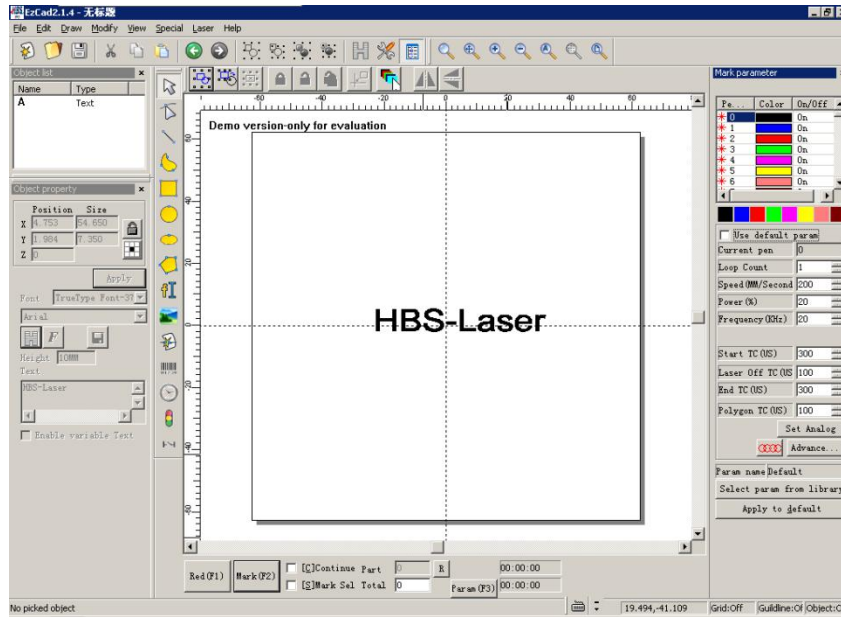


d, Completed

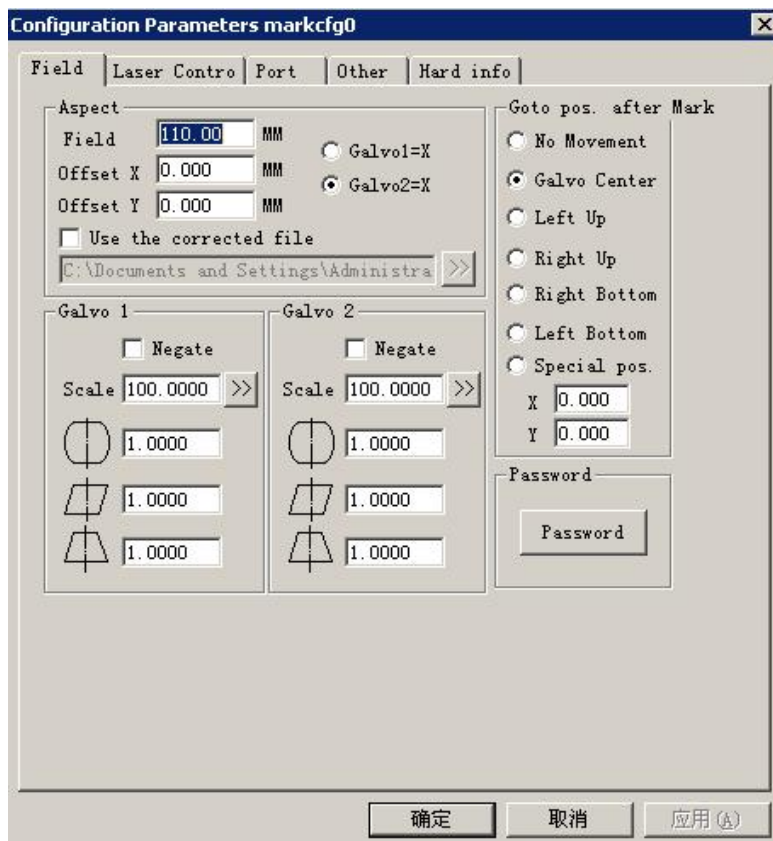


5.3.2 Parameters setting

a. Enter the software in computer

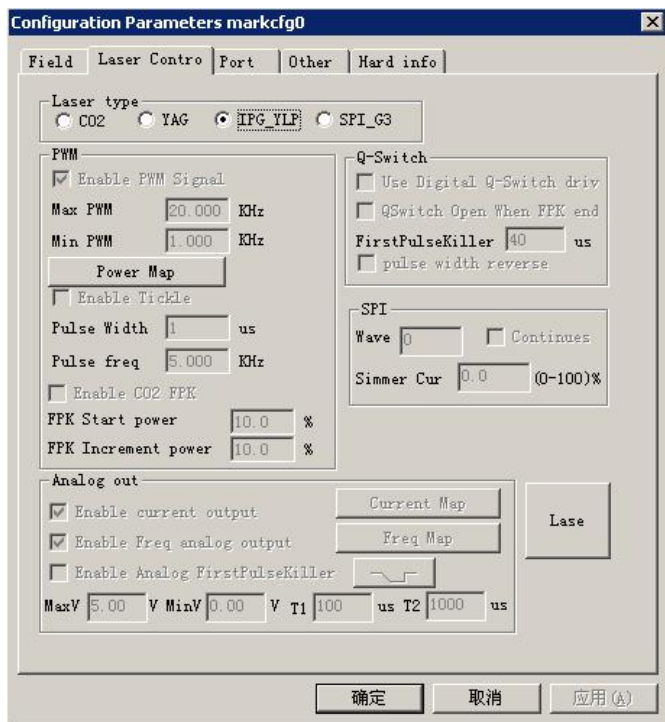


b. Press F3 to set the marking area and Galvo2=X

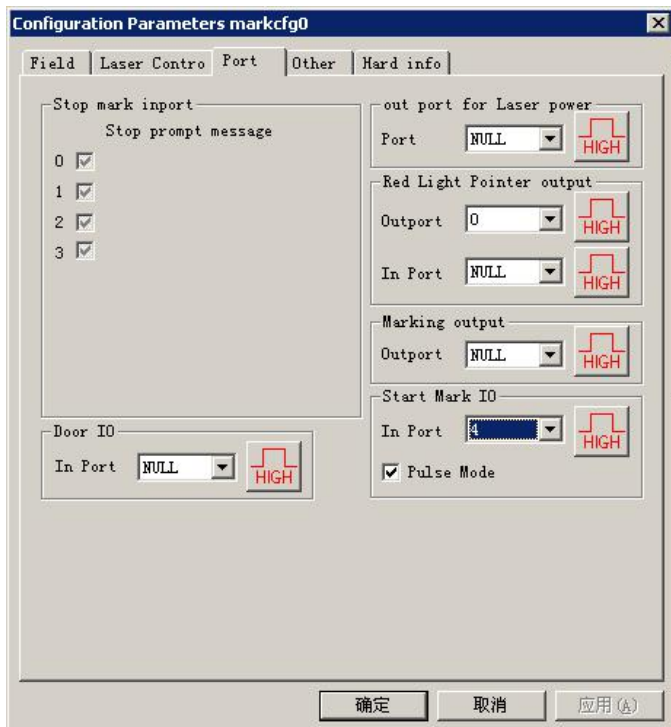




c, Selection of laser source



d, Selection of in port or out port



## **6. Maintenance and troubleshooting**

### **6.1 Summary**

- Daily maintenance is highly required to ensure the normal use of laser marking machine. Due to the high precision of components, the maintenance should be strictly comply with the instructions and maintained by professional engineers. Maloperation are prohibited for avoiding the damage of components.
- The principle of laser marking machine is: The marking work is conducted by scanning. Firstly, the laser beam is incident to the two mirror, and then the scanning motor, which conducted by computer, will drive the mirror rotate along the X and Y axis, when the laser beam focus on the work-piece, the marking will occur. According to this principle, here have the following conclusions:
- The marking depth is influenced by the materials of work-piece, laser focus distance, marking speed. Generally, the more materials absorb the laser light, the deeper it will be marked; The nearer the laser focus to the work-piece, the deeper it will be marked; marking slower, mark deeper.
- The line width of marking is influenced by distance of laser focus. The nearer the laser focus to the work-piece, the slimmer the line of marking.
- The continuity of marking line is influenced by marking speed. The faster the marking, the worse continuity of the line

### **Conventional spare parts**

- a) skim cotton: 1 pcs.
- b) alcohol: 500ml, purity: more than 99.5%.
- c) ball blowing: 1pcs
- d) needle dropper: 1pcs (medical use).
- e) cotton stick: 2pcs
- f) tweezers



## 6.2 Daily maintenance

- Before operation starting, carefully check the external connection or power plugs, clear the trouble if required.
- Check the status button whether damaged or not(indicating light), check the emergency stop works properly or not.
- Check the lubricant for lifting mechanism, fill lubricant if needed.
- After operation, check whether the focusing lens is contaminated with dirt or not.
- After operation, clean the working site, keep everything in order and clean. It's very important to clean every part of the equipment.
- After operation, shutdown the equipments by switch off every button in sequence, and then cut down main power.

### 6.2.1 Inspection/cleaning of the marking head optical system

- In the process of marking, the surface of work-piece will be scorched and fume, producing dust, debris, smoke etc., all of that will influenced the operation. Check and clean the focusing lens every 3-5 working days(**Shutdown the power before clean the optical focusing lens**)

- **Notice**

- a. Don't touch the surface of optical lens (mirror, focusing lens etc.) to avoid any scratch. If there is oil or dust on the lens surface, it will affect the operation, should clean them immediately.
- b. Don't use water and detergent to clean the optical lens, otherwise they will be damaged because all the lens are coated with special film.
- c. Don't put the lens in dark/wet place that cause the surface of lens to be aged.
- d. Keep the surface of lens clean, if the dust, pollutes, moisture absorb the laser, they will damage the surface film of lens and affect the laser beam. What's more, there is no laser beam come out.
- e. when the lens get damaged, send back to factory for repairing immediately. Don't use the damaged lens that can be repaired, otherwise the lens will be damaged even

worse and can't repair any more.

f. During the fixing/replace of the mirror or focusing lens, don't give too much strength on them or it will get distortion of the lens, affecting the quality of the beam.

- Installation or replacement of optical lenses

a. Before fix the optical lens, the operator should wear clean cloths, clean hands with detergents, wear soft gloves, don't touch the lens directly with hands. When take the lens, hold the edge of the lens and don't touch the surface film.

b. Don't blowing the mirror with mouth when assembling, mat a special paper before place the mirror on table. Avoid any carefulness to touch or damage the mirror , don't press the surface of the mirror. Use special clean air spray gun to clean the mirror seat and then place the mirror into the mirror seat.

c. When placing the mirror into the mirror seat, don't apply too much force during fixing in order to avoid the distortion of mirror and affect the quality of laser beam.

d. Notice for replacing optical lens: take out the mirror from packing carefully to prevent any bumps on the mirror; when take out the mirror and focusing lens, the operator should ware clean gloves, hold the edge of the lens and then take out. When remove the wrapping paper of the lens, should avoid dust fallen on the lens. Use a spray gun to remove dust on the mirror and then laid the lens on the special optical lens paper. Clean lens support frame structure and avoid any tiny objects fall on lens during fixing. After fixing, clean the lens and supporting frame again with gas spray gun.

e. How to clean the lens?

For example, the concrete steps of cleaning the focusing lens are as follows:

Clean the lens with cotton swab: firstly, use gas spray gun clean out the dust from lens and then use cotton swab remove the remaining dirt. Wet the cotton swab with high purity alcohol or acetone, and then clean from the center of the lens along with the circular motion, change a new swab once moved one circle and the repeat until the lens get cleaned. Use a clean cloth clean the lens again(avoid scratch the lens).

Take the cleaned lens under light and observe if it's cleaned exactly or not, if the reflection of light is satisfied, it means the lens is well cleaned, or clean the lens again until it get well cleaned. Don't use cotton swab if it's used. After cleaning, fix the lens to the lens seat carefully.

- Storage of optical lens
  - a. Store the optical lens properly can keep the perfect performance.
  - b. the proper storage temperature is 10 °C to 30 °C , if the lens is in the freezing or similar environment, the lens surface will frost and get damage easily. If the temperature is higher than 30 °C , it will affect the surface coating.
  - c. Store the lens in box and placed in a non vibration environment, otherwise it will easily lead to distortion of the lens, affecting the performance.

#### 6.2.2 Inspection/filling of lubricant for lifting system

No need to inspect/refill of lubricant frequently, the lifting system has lubrication systems itself.

#### 6.2.3 Inspection/cleaning for air system

The priority of checking is: check the stability of the power voltage, cleaning and ventilation of the electrical cabinet. Check the integrity and safety of the cable.

During the long term operation of controller, it will produce dirt of oil, grease, the operator should clean it every 5-6 months; at the same time, the cable connection will get loose or aged, so they should be checked every 10-12 months.

#### 6.3 Maintenance against long-term non-operation

If non-operation for a long time, the equipment should be well protected, apply lubricating oil(30 # ) for the lifting mechanism and wrap it with anti-rust paper. Check the equipment timely whether the components are rusted, clear the rust if necessary(if possible, can apply a dust cover on the machine). Regular cleaning and checking are needed during non-operation period.

#### 6.4 Failure checking and troubleshooting

### Common failure and malfunction

Failure or malfunction	Analysis of reason	Troubleshooting Method	Remarks
No red light output	<ol style="list-style-type: none"> <li>1. In software, the red light is off</li> <li>2. Red light plug is loose</li> <li>3. Red light base and machine body are conductive</li> <li>4. Red light base is loose, red light is blocked</li> <li>5. Red light device out of work</li> </ol>	<ol style="list-style-type: none"> <li>1. start red light port in software</li> <li>2. Connect red light plug again</li> <li>3. Insulate the red light and machine body</li> <li>4. Adjust the red light base</li> <li>5. Change the red light system</li> </ol>	
No laser output	<ol style="list-style-type: none"> <li>1. Wrong laser source setting in software</li> <li>2. Bad connection between laser source and marking controlling system</li> <li>3. Laser source base is loose, laser is cut off</li> <li>4. Laser source get damaged;</li> </ol>	<ol style="list-style-type: none"> <li>1. Select the proper laser in software</li> <li>2. Check and reconnect;</li> <li>3. Adjust the position of laser source base</li> <li>4. replace with new laser source</li> </ol>	
Can not open LMC1 driver	<ol style="list-style-type: none"> <li>1. Marking controlling system driver is not proper installed.</li> <li>2. Marking controlling system and computer USD are not proper connected or loose</li> <li>3. Marking controlling system get damaged.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reinstall marking controlling system driver</li> <li>2. Reconnect USB again</li> <li>3. Replace the marking controlling system.</li> </ol>	
Only mark out a vertical or horizontal line	<ol style="list-style-type: none"> <li>1. Connection of galvanometer is loose</li> <li>2. Connection of marking controlling system COM1 port is loose</li> <li>3. Check if the power supply of X/Y galvanometer driver is off</li> <li>4. X/Y galvanometer get damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Reconnect the galvanometer</li> <li>2. Reconnect the marking controlling system COM1 port</li> <li>3. Check the power supply</li> <li>4. Replace the galvanometer</li> </ol>	
Marking and marking angle is different from the design in software	<ol style="list-style-type: none"> <li>1. In the software setting, haven't choose galvanometer 2=X</li> <li>2. The connection for marking controlling system COM1 port is wrong</li> </ol>	<ol style="list-style-type: none"> <li>1. Set the galvanometer 2=X in software</li> <li>2. Weld the COM1 connection again</li> </ol>	
The marking scale/size is different from design in software	The X/Y galvanometer ratio and deformation ratio is wrong	Adjust parameters setting for X/Y galvanometer ratio and deformation ratio	

The scale and position for red light output is different from design	<ol style="list-style-type: none"> <li>1. Red light base loose;</li> <li>2. Red light in software is not well calibrated;</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the red light base in comply with laser out put</li> <li>2. Adjust parameters in F3- other - red light indicator</li> </ol>	
Short of power supply for main equipment or other modules	<ol style="list-style-type: none"> <li>1. The main power supply is off or its fuse is cut.</li> <li>2. The fuse for marking controlling system is cut;</li> <li>power supply is cut;</li> <li>4. The fuse for laser source is cut;</li> </ol>	<ol style="list-style-type: none"> <li>1. Switch on the main power supply or replace the fuse;</li> <li>2. Check the marking controlling system and replace its fuse;</li> <li>3. Check the galvanometer and replace its fuse;</li> <li>4. Check the laser source and replace the fuse;</li> </ol>	

## 7. Packing, delivery and store

### 7.1 Packing

- All of the component for laser marking machine, such as machine body, marking controller, Z axis structure, table and other accessories, are wrapped with polyethylene and protective film, and then packed with paper boxes, protect them from scratch or damage.

### 7.2 Delivery/Loading method and notice

- During delivery, the equipment should be well protected from drench, damp, tilt, rodents, potholes and other hazards, should ensure good ventilation. The delivery environment temperature should be  $-10\text{ }^{\circ}\text{C} \sim +40\text{ }^{\circ}\text{C}$ , and humidity should less than 80%. Avoid long time exposure out of door. If the equipment free from work for a long time, the operator should check it timely to ensure the normal performance.
- Climbing, standing or placing heavy objects on the packing is prohibited,
- Use separate power supply, don't share power supply with other electric equipments.
- Collision, scratching the panel and lens are prohibited.
- The packing box should avoid wet, rain and directly sunshine.
- Pay attention to the equipments when lifting, should avoid any scratching.

### 7.3 Storage condition, period and notice

- Equipment storage should avoid drench, damp, tilt, rodents, potholes and other hazards. Good ventilation are recommended and ensure the storage temperature-10 °C ~ +40 °C , relative humidity is less than 80%. Avoid long time exposure out of door. If the equipment free from work for a long time, the operator should check it timely to ensure the normal performance.

### 8. Technical specification

Main parameters for Laser Marking Machine

Model \ Parameters	HBS-GQ-10	HBS-GQ-20	HBS-DB5	HBS- CO <sub>2</sub> -30
Laser Power W	10	20	5	30
Laser Wavelength nm	1064±4	1064±4	1064±4	1055-1070
Laser Frequency KHz	20-60	20-70	20	20-200
Pulse Energy/mj(20KHz)	0.5-0.6	0.8-1	0.6	1-1.01
Marking Depth/mm	≤1.2mm(depend s on materials)	≤1.2mm(depend s on materials)	≤1.2mm(depends on materials)	≤1.2mm(depends on materials)
Min. Line Width/mm	0.01	0.01	0.02	0.03
Min. Font Size/mm	0.3	0.3	0.3	0.3
Marking Speed	≤12000mm/s	≤12000mm/s	≤7000mm/s	≤7000mm/s
Repetition Accuracy/mm	±0.001mm	±0.001mm	±0.001mm	±0.001mm
Marking Area/mm	110x110	110x110	110x110	110x110
Environment Temperature °C	0-42	0-42	15-40	15-40
Environment Humidity	0-95% Moisture free	0-95% Moisture free	0-95% Moisture free	0-95% Moisture free
Power Supply	AC220V 50Hz	AC220V 50Hz	AC220V 50Hz	AC220V 50Hz
Machine Power/W	≤500	≤500	≤500	≤1200
Cooling	Air cooling	Air cooling	Air cooling	Air cooling



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