

# Fiber Laser Marking Machine Operational Manual

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Before installation and use the product, please read the instructions



We specialized in Fiber Laser Marking Machine, CO2 Laser Marking Machine, End pumped Laser Marking Machine, Pneumatic Marking Machine, Laser Engraving Cutting Machine, Plasma Cutting Machine, CNC Router etc.

**Dear laser users:**

**Before using this product, please take time to read this operational manual, please be familiar with the information provided in this manual, it will provide you a variety of important operational information, security and other aspects.**

**The information provided in this manual is subject to change without notice.**

**The company shall not bear any responsibility for the loss caused by the operation of the operation in accordance with this manual.**

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# Contents

Chapter 1 overview.....	4
Chapter 2 equipment operation safety protection.....	5
Chapter 3 equipment technical parameters and application environment.....	6
3.1 equipment technical parameters.....	6
3.2 equipment.....	7
Chapter 4 the introduction of laser marking principle.....	7
4.1 laser theory overview.....	7
4.2 laser profile.....	8
4.3 laser marking machine.....	8
Chapter 5 equipment system description.....	9
5.1 Equipment System.....	9
5.2 Laser Power Supply.....	11
5.3 Fiber Laser.....	11
5.4 Mirror Scanning System.....	11
5.5 Focusing System.....	11
5.6 Computer Control System.....	11
Chapter 6 equipment installation and commissioning.....	12
6.1 equipment installation and positioning requirements.....	12
6.2 out of the box and check.....	12
6.3 equipment.....	12
6.4 equipment operation procedure.....	13
Chapter 7 maintenance and maintenance.....	17
1. points for attention during the maintenance of the machine.....	17
2. common failures and troubleshooting methods.....	17

## Chapter 1 Overview

### 1.1 Laser Marking Mechanism

Laser with high brightness, high directivity, high monochromatic and high coherence, is the ordinary light source can not match. Laser beam come through the focus, the focus

can be generated at the moment thousands of degrees is the highest level of high temperature, so that it may process almost all of the materials.

Laser marking is the marking of permanent marks on the surface of various materials by laser beam. Marking effect is through the evaporation of surface material to reveal the deep material, or through the light energy to chemical physical changes in the surface of the material, and the "engraved" out of the picture, showing the required etching graphics, text.

## **1.2 Laser Marking Features**

- 1) it can be used to process a variety of metals, non-metallic (effect depending on laser type) material, especially for high hardness, high melting point, brittle materials, more obvious advantages.
- 2) It is a non contact processing, does not damage the product, no tool wear, with high marking quality.
- 3) Laser beam is very small, and the material consumption is very small, and the processing thermal influence area is small.
- 4) The processing efficiency is high, the use of computer control, easy to realize automation.

## **1.3 Product Overview**

Optical fiber laser marking machine is a high-tech product, which integrates laser, computer, automatic control, precision machinery and technology. The marking machine adopts high performance imported digital mirror scanning system, which is fast, high precision and can work long time. In most metallic materials and non metallic materials such as silicone, rubber, epoxy, ceramics, marble and other materials are hard to be imitated by carving or make permanent anti fake mark (effect of laser type).

Fiber laser marking machine laser optical mode is good ( $M2 < 2$ ), equipment volume is small, the work is stable and reliable, maintenance free, no need to water cooling system, the device has high efficiency, low energy consumption, good marking quality, laser power and frequency of computer control, easy to achieve calibration automation.

The company provides Windows based platform for the purpose of special software. Real time control of laser power and pulse frequency. The tag content can be text, graphics, pictures, serial number, bar code and its combination, and can be directly input, edit, or CorelDRAW or Auto CAD and other graphics software, through computer control input and output.

Fiber laser marking machine design, in line with international safety and operating standards.

# **Chapter 2 Equipment Operation Safety Protection**

## **2.1 General Safety Instructions**

Fiber laser marking machine, the accident was specifically designed to reduce the risk of radiation exposure.

In order to ensure the safety of the operation and the optical performance of the product,

please follow the following tips and warnings.

**Warning** When using the laser equipment, be sure to ensure that the connection of the ground wire.

**Carefully** before the laser equipment on the power, please be sure to enter the 220V AC, the wrong voltage input may cause damage to the device.

**Warning** to prevent electric shock, please do not open the machine cover, otherwise if the problem, the company will refuse to provide quality assurance commitment.

**Warning** if the equipment is not in accordance with the instructions in this manual, the protection measures of the equipment will not be able to play its due role. In addition, the instrument can only be used in ordinary work environment.

## **2. Laser Type**

optical fiber laser marking machine, the use of laser belonging to 4 types of lasers, such as the use of improper will damage to the human body, the user should be in accordance with the requirements of this manual to take protective measures.

The laser marking machine with the laser wavelength of 1064nm laser, Fiber Laser power have 20W 30W 50W etc. Avoid eyes or skin directly exposed to laser radiation.

Do not attempt to open the device, any maintenance and service can only be accomplished by the technical staff authorized by the company.

## **3. Laser Hazards**

Laser output of the laser is not visible light, even in the case of a deviation from the focal length of the case may also cause a three degree burn.

The output of the device contains a beam of visible and invisible radiation. Harmful to the human eye. Open laser beam. In order to avoid human exposure, accidental in the output beam and the reflected beam and equipment around all personnel must use special safety glasses. Even wearing protective glasses to prohibit open laser beam.

## **4. Explosion and Fire**

optical fiber laser marking machine is not suitable for use in flammable and explosive situations. Also do not have volatile solvents such as alcohol, gasoline, etc..

## **5. Electrical Safety**

optical fiber laser marking machine not free to open, there are high pressure, easy to cause damage to the human body. In case of failure, only professional and technical personnel to open the machine.

## **6. Working room and Label**

fiber laser marking machine installation and use of the work of the prominent position should be

marked "careful laser" word.



## Chapter 3 Equipment Technical Parameters and Application Environment

### 3.1 Equipment Technical Parameters

optical fiber laser marking machine is fully enclosed, maintenance free, imported high performance vibrating mirror scanning system and focusing system, fan cooling mode, with red light indicating positioning function.

Type specification	F20 F30 F50
Wave length of laser	1064nm
Laser repetition frequency	20kHz~100kHz
Laser power	20W 30W 50W
Marking scope	70*70 110*110 150*150 175*175 200*200 300*300mm optional
Laser sources	Fiber module
Laser Head	Scanning head
The minimum focus facula diameter	20 μ m
Minimal character	0.01mm
Marking speed	≤7000mm/s
Repeated accuracy	0.0025mm
Cooling ways	Force-air Cooling
Power supply	220V/ 50Hz/2kVA
Process Material	All kinds of metal and part of Non-metal Materials
Support format	PLT, BMP, DXF, JPG, TIF, AI etc
Package	Standard Crate for export
Applications	Mobile phone keypads, nonopaque-plastic keypads, electronic components, integrated circuits (IC), electrical appliances, communication products, sanitary wares, tool accessories, cutters, watches, glasses, jewelry, auto parts, boxes, bags, clasps, cookers, stainless steel products, etc

### 3.2 Equipment Application Environment

optical fiber laser marking machine should be installed in the work room, no dust, no smoke, no corrosive gas, the environment temperature 42 ~ 0, humidity 45 ~ 85%.

## Chapter 4 The Introduction of Laser Marking Principle

### 4.1 Laser Theory

When is inspired by some of the material and its atomic (or molecular) in the distribution of high level more than low level, the material can with the difference of the corresponding frequency radiation amplification. English "laser" - amplification by Light radiation Dstimulated of (stimulated emission optical amplification) of the abbreviation. The working medium and the pump source of the laser are closed in the pump cavity. The pumping source is pumped from the ground state to the excited state. If the "particle number inversion" is realized in the two excitation levels, the stimulated emission (i.e., the photon) can be produced by the amplification of the resonance (back and forth) in the optical cavity, and the output of the electromagnetic radiation is amplified. Compared with other light sources, the laser has the characteristics of good color, good coherence, good direction and high brightness.

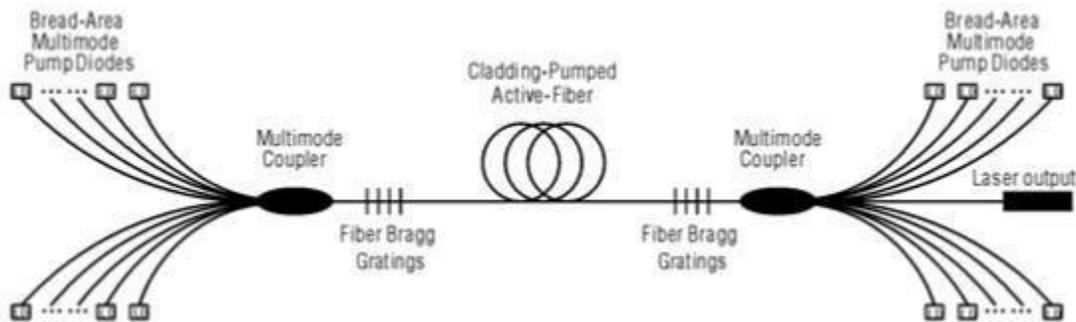
- 1) monochrome. The light emitted by ordinary light source includes a wide range of wavelength, that is, the width of the spectral line, such as the sun light contains all visible wavelengths, and the laser is a single wavelength, spectral line width is very narrow, usually in the hundreds of nanometers to a few microns, compared with ordinary light source, the spectral width of a few orders of magnitude.
- 2) good coherence. Laser beams are superimposed together, and the amplitude is stable, in a long period of time, can keep the phase of the wave of light wave, this is any other light source can not reach.
- 3) good direction. Ordinary light emitted from the light source at four, beam divergence degree; laser divergence angle is small, usually a few mrad.
- 4) high brightness. Laser beam can be focused on a very small area with an optical system (such as a lens), which has a high brightness.

### 4.2 Laser Profile

The working medium of the laser can be gas, liquid or solid. The working medium of most gas lasers is composed of atoms, molecules, or both. The working medium of the solid state laser is made of atoms or ions in some crystals. The working medium of the liquid laser is composed of a large molecular weight dissolved in the liquid. Under the condition of a specific pump, all of these work can realize the "particle number inversion", and produce a wavelength of laser output.

fiber laser marking machine adopts the most advanced pulsed fiber laser in the world. Fiber laser is developed on the basis of fiber amplifier. Fiber amplifier is the use of doped rare earth elements of fiber, plus a proper feedback mechanism to form a fiber laser. The optical fiber with rare earth element acts as the gain medium of fiber laser. A piece of very fine light slender core in fiber laser, due to the role of external pump, within the fiber will be very easy to form high power density, causing the population inversion of laser material level. Fiber grating as the cavity of fiber laser. Made by special technology fork type clad fiber, multimode pump is introduced from the fork of the fiber, the fork type optical fiber of a small doped with rare earth elements (for example) ytterbium single-mode fiber core pumped. When the pump each cross

through a single mode fiber core, rare earth elements atomic pumping to upper level, then the transitions of spontaneous radiation, through is arranged on the inner surface of the fiber grating frequency, the spontaneous radiation of a specific wavelength of light is amplified oscillation and finally produce the laser output. If in the package layer fiber materials doped with different rare earth elements, such as different REE doped erbium, thulium, PR, Yb and will the fiber laser with different laser wavelengths. With the package layer and the parallel pumping technology, the high power laser output can be obtained simultaneously with the multi laser diode coupled to the cladding fiber. The basic principle is shown:



### 4.3 Laser Marking Machine

Laser marking is the use of high energy laser beam irradiation in the work piece surface, light energy into heat energy, so that the work piece surface quickly evaporate, so that the work piece surface to carve out any necessary text and graphics, as a permanent Security signs.

Laser marking is characterized by non-contact processing, can be in any shape of the surface of the work piece, the work piece will not deform and produce internal stress, suitable for metal, plastic, glass, ceramics, wood, leather and other materials.

Laser can be almost all parts (such as piston, piston ring, valve, valve seat, metal tools, sanitary ware, electronic components, etc.) for marking, and the marking of wear, production process is easy to achieve automation, marking parts deformation.

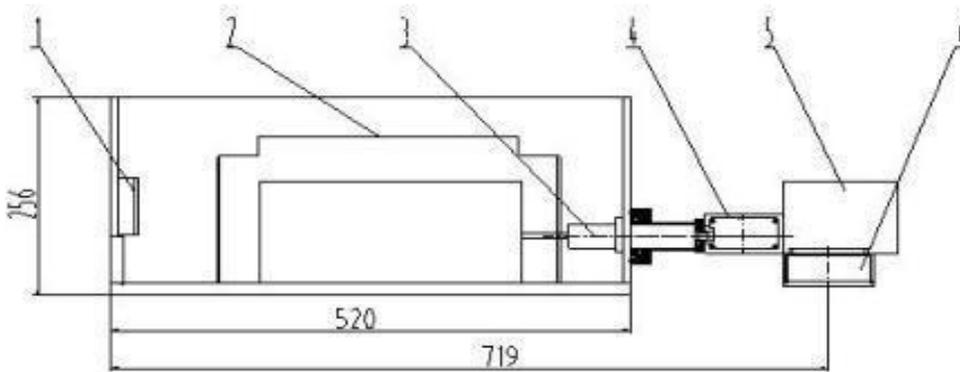
CS-F20 optical fiber laser marking machine with the scanning method, the laser beam is incident to the two mirror, the use of computer controlled scanning motor drive mirror along the Y, X axis rotation, laser beam focusing on the work piece after the marked, thus forming a laser marking.

## Chapter 5 Equipment System Description

### 5.1 Equipment System

fiber laser marking machine is a high-tech product which integrates laser, computer, automatic control, precision machinery and technology.

## Component structure of fiber laser marking machine:



1. fan 2. fiber laser 3. optical fiber and coupling device 4. red light indicator system 5. imported digital mirror 6. flat field lens

### 2. Laser Power Supply

fiber laser marking machine laser power supply is a device that provides power for the fiber laser, and the input voltage is AC220V. Installed in the control box.

### 3. Fiber Laser

fiber laser marking machine adopts imported pulse fiber laser, whose output laser mode is good for long service life and is designed and installed in the frame of the machine.

### 4. Mirror Scanning System

The vibrating mirror scanning system is made up of two parts, which are optical scanner and servo control. The whole system adopts new technology, new materials, new working principle design and manufacture.

The servo motor of the optical scanner used in the working mode of the dynamic magnetic deflection. Has the advantages of large scanning angle, high peak torque, large load inertia, small electromechanical time constant, fast working speed, stable and reliable. Precision bearings elimination clearance mechanism provides the lowest axial and radial jumping error; "electronic torsion bar" to replace the traditional elastic torsion bar, greatly improving the service life and reliability; arbitrary zero position power to keep working principle so as to reduce the use of power, but also reduce less components of the heating effect, save the thermostat; advanced high stability precision position detection sensor technology provides high linearity, high resolution, high reproducibility and low drift performance.

The optical scanner is divided into the X scanning system and the Y scanning system, and each servo motor shaft is fixed with a laser reflective mirror. Each servo motor is controlled by a Computer.

### 5. Focusing System

The focusing system is focused on a parallel laser beam. Mainly adopts an f-theta lens, different f-theta lens with different focal lengths, marking effect and scope are not the same, fiber laser marking machine adopts imported high performance focusing system, the standard configuration of the focal length of the lens  $f = 160\text{mm}$ , effective scanning range  $\Phi 110\text{mm}$ . Users can choose according to the needs of the lens.

F- lens is optional:

F = 100mm, the effective focus range with 65mm. F = 160mm, the effective focus range with 110mm. F = 210mm, the effective focus range with 150mm.

### 5.6 Computer Control System

computer control system is the center of the whole laser marking machine control and command, but also the carrier of the software installation. Through the coordinated control of the acoustic optic modulation system and the vibrating mirror scanning system, the work-piece is controlled. Fiber laser marking machine computer control system mainly consists of chassis, the motherboard, CPU, hard disk, memory, a / D card, floppy drive, monitor, keyboard, mouse and other.

## Chapter 6 Equipment Installation and Commissioning

### 1. Installation and Location of Equipment

optical fiber laser marking machine should be installed in good ventilation, clean and bright interior. To ensure good ventilation and maintenance needs, the machine has a minimum distance between the wall and other obstacles 0.6m.

### 2. Out of the Box and Check

Only dedicated laser company authorized personnel to open the packaging, installation and commissioning. The box should be Caution!, avoid damage to equipment and accessories. According to the "number of equipment and spare parts list" random inspection of the equipment and the relevant documents are complete. Before opening the package if it is found that the packaging have any injury or in the installation process found in the machine parts have injury shall immediately notify the photoelectric company or its authorized agency.

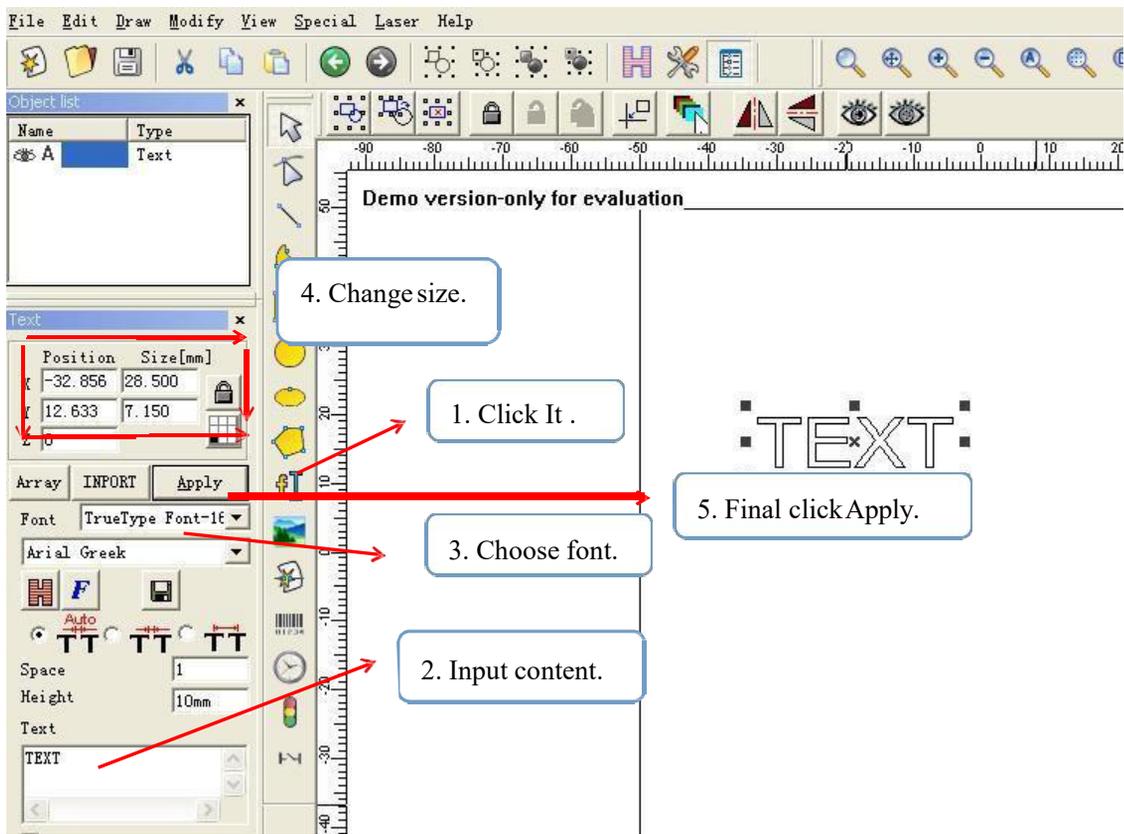


### 3. Equipment Installation

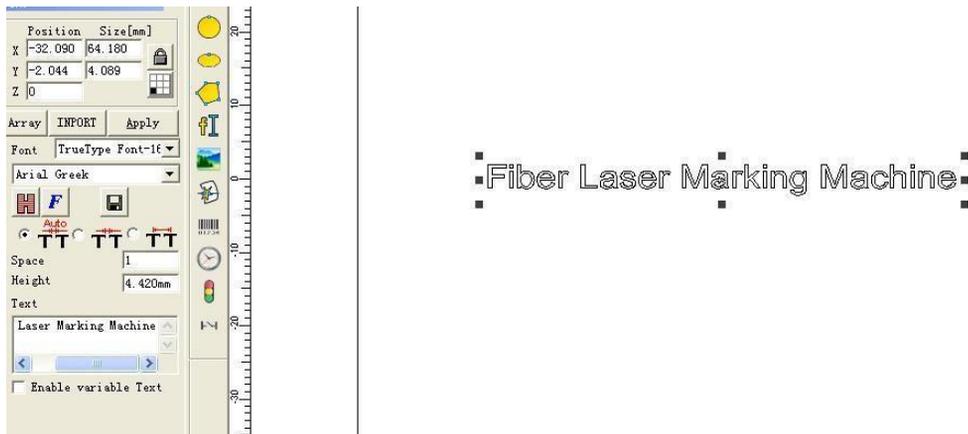
The fiber marking machine hosts in a prepared flat tops, countertops must have sufficient load-bearing capacity and stability, and with six (also 4) M6 screws countertops and fiber marking machine host securely connected. You need fix computer screen on the holder by 4 pieces M4 screws.

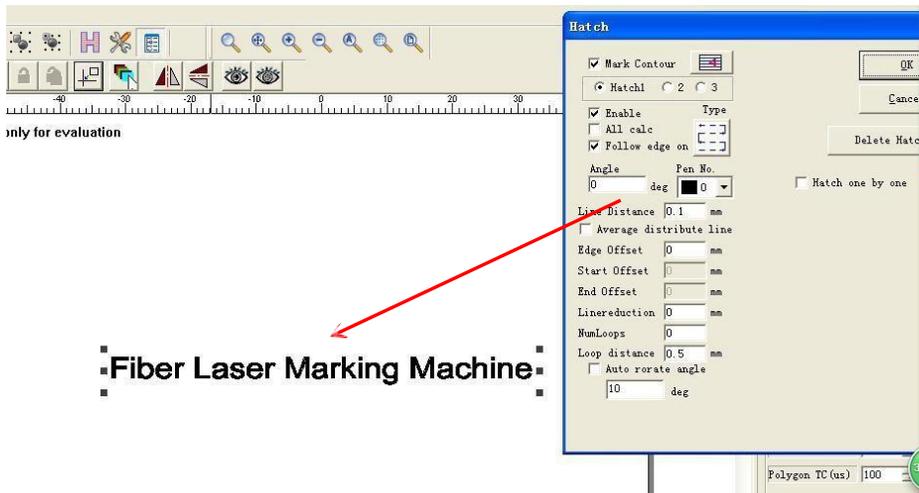
### 4. Equipment Operation Procedure



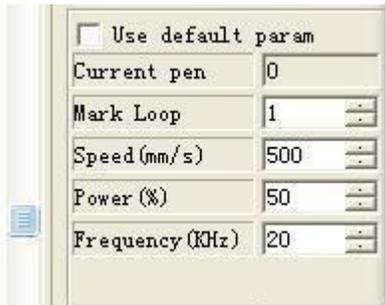


7) Make Hatch for content words. Normally it is 0.1mm. It is adjustable according to customer requirement for different marking solution.

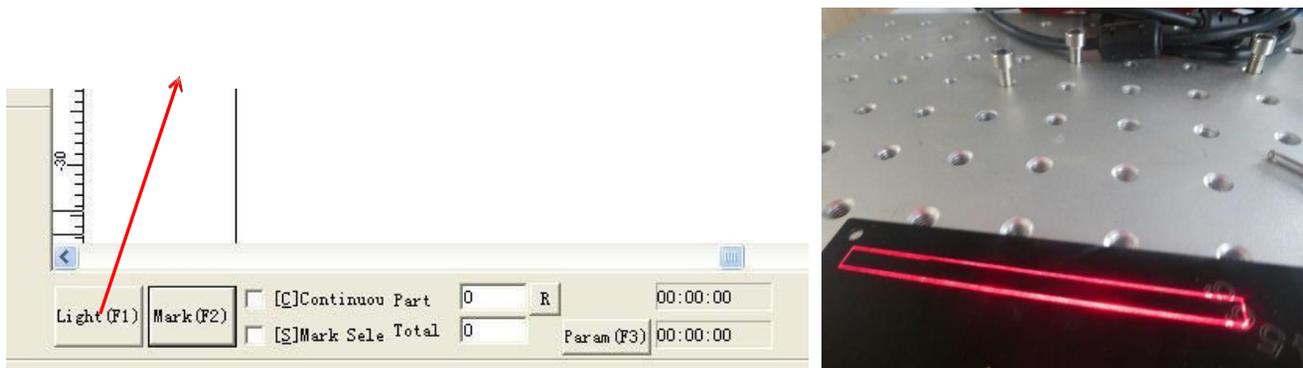




8) Set the speed and power. Maximum speed is 3000mm/s, you can change speed, power freely to get different marking solution. As for maximum power, you'd better not use 100%, that is bad for laser source. You can set it such as 80%, 85% 90% or 95% when need big power.



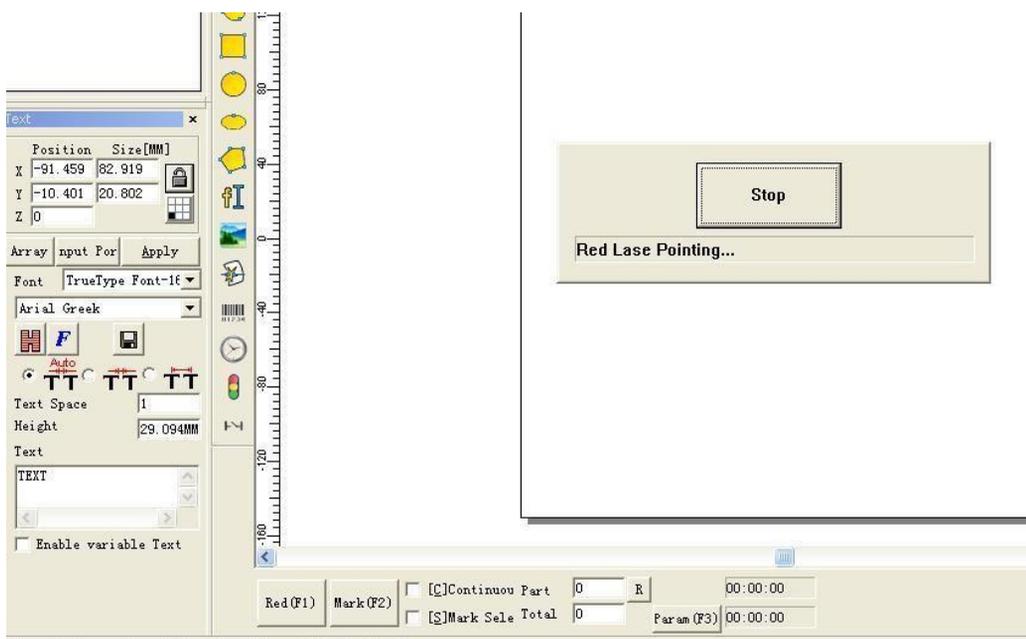
9) Click "Light" then there is red square to show where laser machine will mark.



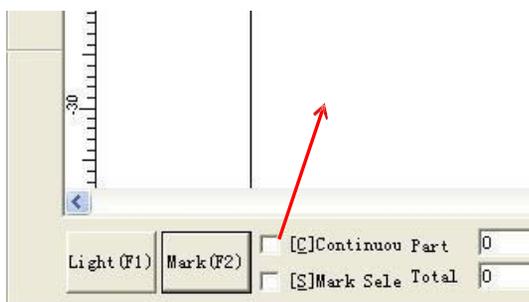
10) Adjust focus distance between edge of field lens and material surface.  
 110x110mm Focus Distance: 185mm  
 200X200mm Focus Distance: 305mm



11) Click Stop Red Light Pointing, then click Mark. Machine will work.



Note: As for focus distance: You can choose “Continuou Part”, then click “Mark”, at the same time, you move Lifting Column manually. You will see laser beam weak or strong. When the laser beam is the most stronger, that is the correct focus distance.



Specific software operating instructions please read laser software Ez cad Manual.

## Chapter 7 Maintenance and Maintenance

fiber laser marking machine is mainly composed of electronic components, precision instruments, optical devices, the use of the environment and daily maintenance has a higher requirement.

### 7.1 Points for Attention During the Maintenance of the Machine

- 1) when the machine is not working, it should be cut off from the machine and the computer power supply.
- 2) this machine does not work, put the field lens cover, to prevent dust pollution of optical lenses.
- 3) the machine is a high voltage circuit, non professional personnel, not in the starting time to repair, so as to avoid electric shock accident.
- 4) the machine appears that any faults should be immediately cut off the power supply.
- 5) equipment used for a long time, dust in the air of the adsorption in the lower end surface of the focusing mirror, to a lesser extent, reducing the laser power, influence marking effect; caused severe thermal lens optical absorption that burst. When the marking effect is not good, it should be carefully examined whether the surface of the focusing lens is contaminated. If the focus lens surface is contaminated, the bottom surface of the polymer mirror should be removed. Unloading under focusing mirror should be particularly careful, take care not to damage or hurt; at the same time, also do not use hand or other objects touch the focusing mirror. The cleaning method is ethanol (pure) and diethyl ether (analytical pure) according to the mixing ratio of 3:1, with long fiber cotton sign or lens paper mixed liquid invasion, gently scrub mirror focusing on the lower end surface, each wipe side shall be replacement of a poor quality cotton swab or lens paper analysis.
- 6) in the course of the work of the marking machine, the machine is not allowed to move, so as to avoid damage to the machine.
- 7) do not cover the top of the stack or other items, so as not to affect the machine heat effect.

### 7.2 Common Failures and Troubleshooting Methods

Due to the use or other reasons, fiber laser marking machine may be a failure. In order to you can judge and rule out a number of simple faults, we list the easy occurrence of the failure phenomenon and the method of solving the problem, for reference only.

	cause the obstacle to present	as a result of the original cause	solution
1	power indicator light does not shine	without electricity	
		Power cable is not connected to the power line	Connected well
		power indicator is broken	Change new power indicator
2	laser light is not bright	laser pointer has been bad	replacement indicator
3	laser light, No laser output	mirror lens cover is not discharged off	Discharge the mirror lens cover
		Power percent set to a small	Adjust bigger power

		percentage	percent
4	Lines not well	lines are not working in the focal plane	Let the mark surface in the focal plane
5	dozen text, graphics and some Clear and some not clear	the standard and the mirror is not parallel	adjustment of the workpiece
6	Some places in the plane can not beat the target	Some places in the plane can not beat the target	Ethanol wipe

optical fiber laser marking machine is assembled by the unit module components, the performance of each module is stable, if there is a failure, according to the phenomenon can not judge the cause of failure, please contact our service department.