

Laser Marking Machine

Operating Manual

(There are many types of fiber laser marking machine designs, so take BEC-FB20 as an example) Please read this manual carefully before using the fiber laser marking machine!



Thank you for using the laser marking machine produced by Freutek Srl.

To the user

This equipment is a high-performance laser marking system developed and produced by our company after years of experience in laser development, production and service. It has the advantages of beautiful appearance, complete functions, reliable quality, stable performance and convenient use. Thereby improving your work efficiency and creating more economic benefits for you.

When you use the system for the first time, it is recommended that you read the instructions carefully in order to fully understand the operation, precautions and routine maintenance of the laser marking system in terms of hardware and software. When you are experiencing difficulties in daily operations, you can always check the relevant content in these instructions for quick troubleshooting.

Please read this manual carefully. If you have any questions, please feel free to contact us at service@freutek.com. Our professional service personnel will be happy to help you.

Chapter 1: Overview

1.1 Introduction of fiber laser marking machine

The laser marking machine uses the laser beam to make permanent mark on the surface. The main effect of laser marking machine is:

- ① Evaporate the target material surface with laser and show the deep material;
- ② Cause the physical chemistry reaction to the surface with laser light and "engrave" the required pattern and text;
- ③ Burn the material with laser, thus show the required pattern and text. The fiber laser marking machine is mainly composed of: fiber laser, galvanometer (marking head), software control card, industrial control computer, equipment cabinet, and horizontal stand for work piece, etc.
- ④ Applicable to pipes industry, cables industry, gift industry, electronics industry, packaging industry, pharmaceutical industry, food and beverage, tobacco and alcohol industry, daily necessities industry, etc.

1.2 Working principle of fiber laser marking machine

It uses the fiber laser to produce laser and educes the laser with fiber, and then cooperate with high-speed optical scanning galvanometer for work piece marking. The core component is the fiber laser.

The fiber laser adopts the rare-earth-doped fiber as the gain medium. The fiber core in the fiber laser is very thin, so the high power density can be easily formed within the fiber under the action of pump light, causing the laser-level population inversion of the laser material. Therefore, the appropriate extra positive feedback circuit can cause the resonant cavity and form the laser oscillation. In addition, the fiber matrix has wide fluorescence spectra, so the fiber laser is generally tunable (its wavelength can be adjusted within a certain scope), and mark several colors when marking (corresponding material).

1.3 The characteristics for fiber laser are as follows:

* BEC-FB20 laser marking machine adopts the fiber laser with the service life of 100000h, and the performance is superior in the world. The beam is high-quality with basic mode output (TEM00), and the focusing spot diameter is less than 20um. The divergence angle is about 1/4 of the semiconductor pump. The single line is thinner, so it is more suitable for the fine and precision marking.

* It has small volume, low power consumption, less than 600W for the complete machine; the built-in air cooling abandons the heavy water chilling unit, so it covers less area, can be installed easily, energy-saving and portable.

* Using imported air-cooled laser, the main beam light path is completely enclosed;

* The electro-optic conversion efficiency is high, easy to use without the optical adjustment or maintenance. The structure is compact with high system integration and less malfunction.

* There is no need for any maintenance, with long service life, can work under bad environment.

* The processing speed is 2-3 times of the traditional marking machine. The optical scanning galvanometer has good laser repetition frequency without distortion under high speed.

* The fiber laser is equipped with the optical isolator, which can effectively shield the reflected light, and can be operated in the highlighted high-reflective materials, such as the gold, silver, copper, aluminum and silicon. The deviation mirror centre is not needed, greatly broadening the application field. And for different metals, the adjustment of frequency and energy can produce different colors.

* The marking software has powerful function that can be compatible with Coreldraw, AutoCAD and other software; it supports the PLT, PCX, DXF, BMP, etc., and can directly use SHX, TTF word stock; it also supports the automatic coding, printing serial number, batch number, date, barcode, QR code, automatic skipping, etc.; USB interface controls the output.

Chapter 2: Equipment Operation Safety and Protection

2.1 Regular safety instructions

BEC-FB20 laser marking machine is specially designed to the reduce the accident exposed to dangerous radiation.

Warning

·It can lead to the dangerous radiation if failing to operate, adjust or control in line with the manual; therefore, please operate and maintain the system after being familiar with all safety requirements and steps.

·Any damage caused by improper operation, adjustment or control according to the manual is not within the warranty scope of the company. If you have any questions in operating the system beyond the manual, please contact Freutek Srl.

In order to ensure the safe operation and optical performance of products, please follow the following instructions and warnings.

Warning: when using the laser equipment, please ensure the safe ground connection.

2.2 Laser type

BEC-FB20 laser marking machine adopts the Class 4 laser, the improper use may cause harm to human body, so the user should take the protection measures according to this manual. The laser used in this laser marking machine is the invisible laser with wavelength of 1064nm, and the maximum power is not more than 20W.

Do not expose the eyes or skin directly to the laser radiation.

Do not try to open the device, and any maintenance and service can be performed only by the authorized technical personnel.

2.3 Harm of laser

The output laser is the invisible infrared light, and can cause the third-degree burn even out of the

focus.

The light beam from the equipment includes the visible and invisible radiation. It is harmful to the human eye. It is prohibited to look at the laser beam directly.

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2.4 Explosion and fire

BEC-FB20 laser marking machine is not suitable to be used in the flammable and explosive environment. Do not use it in the environment with volatile solvent, such as alcohol, gasoline, etc.

2.5 Electrical equipment safety

Do not open BEC-FB20 laser marking machine personally, or it will do harm to human body due to the high pressure inside; in case of the failure, only professional technical personnel can open the machine.

2.6 Workshop mark and label

"Watch out the laser" should be marked in the conspicuous position in the installation workshop of BEC-FB20 laser marking machine.

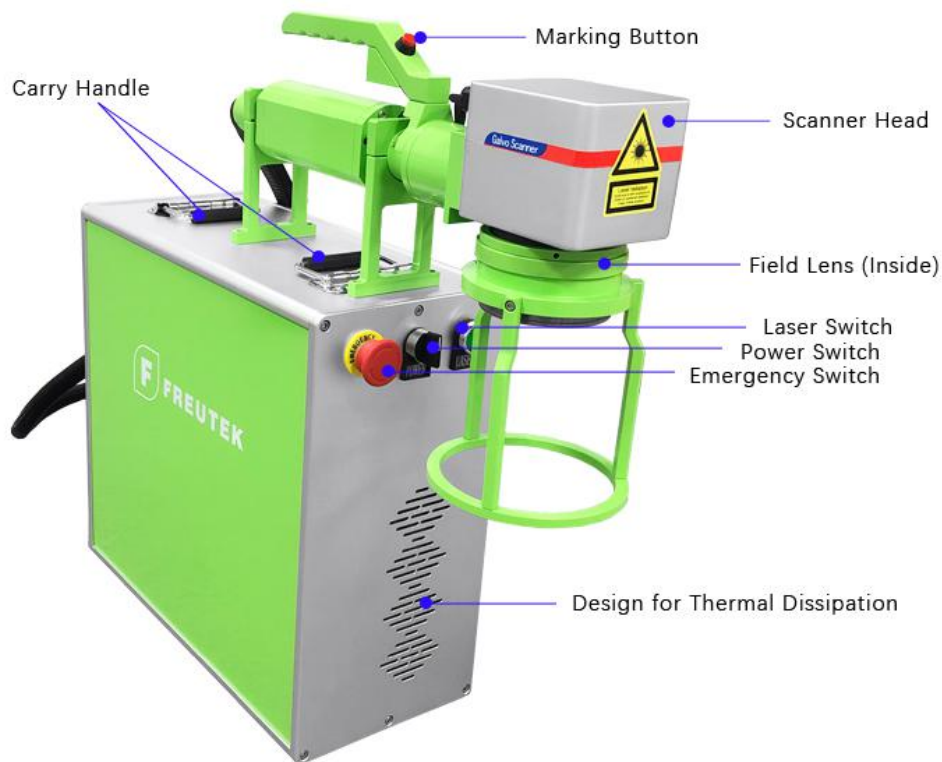
Chapter 3: Technical Parameters and Applicable Environment

3. Technical parameters and applicable environment

Beam quality	M2:1.5 (TEM00 mode)
Average output power Max.	20W
marking line speed Laser	≤7000mm/s
wavelength	1064nm
Marking scope	110 mm*110mm (optional)
Power adjusting range	5%-100%
Min. character	0.2 mm*0.2mm
Engraving depth	0.01-1.0mm (depend on the
Repeated accuracy	material) 0.001mm
Min. line width	0.013mm
Power consumption Cooling system	≤600w Air cooling
Control interface Continuous working time Equipment	USB 24h
work environment	Clean without dust or dirt
Equipment work temperature Work	0°C~40°C(Non-condensing) 5%-75% without condensation
environment humidity	

Chapter 4 Machine Structure

4. Machine structure



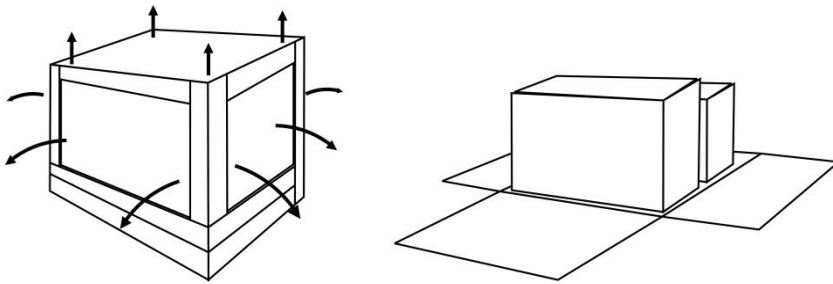
- 1) Scanner Head: consists of an X-Y optical scanning head, an electronically driven amplifier and an optical reflective lens;
- 2) Marking Button: This button can replace the pedal, press this button to mark.
- 3) Field Lens: A lens that works near the focal plane of the objective lens to effectively reduce the size of the detector. It has several types, the most common types include:
F160(110mm*110mm); F210(150mm*150mm);
- 4) Power Switch: “Power” and “laser” to control laser machine working, and “Emergency” button to achieve protection by quickly pressing it in the event of an emergency.
- 5) Laser Source: A device that emits laser light. It is the core of laser machine. Raycus, JPT, IPC are all good options laser source brand provided by Freutek Srl;

Chapter 5 Machine Installation & Operation

5.1 Packaging removal

- * Protective film packaging
- * Wood packaging

Please use the appropriate tool to open the wooden box packaging, please be careful not to damage the machine when removing the wooden box.



Caution: Do not crush your hands and feet during unloading and unpacking. And pay attention to the nails on the wooden box.

Remove the inner packaging film and use a forklift or manpower to slowly move the equipment to the reserved working place. And then place the machine parts on an open space to prepare for installation.

5.2 Environmental requirements



Caution: Ensure that the equipment is used in the following environments to prevent adverse effects on the performance and functionality of the equipment. Doing so may damage the equipment and cause an accident.

This device can only be used indoors and is not intended to be used outdoors or in the following environments.

- * Directly exposed to the heat radiation environment of the heating equipment.
- * Environment with liquid splash or oily air.
- * Environment exposed to direct sunlight.
- * Environment with dust or corrosive gases (sulphur and ammonia).
- * Environment with drastic changes in temperature.
- * An environment that will freeze and dew.

- * An environment with vibration and strong impact.
- * Environment with strong electronic electromagnetic interference.
- * Use and store the device within the rated temperature and humidity range. Humidity $\leq 80\%$,

temperature $5^{\circ}\text{C} \sim 30^{\circ}\text{C}$.

- * Use the device within the rated power range. The voltage fluctuation range is $\pm 5\%$, and the frequency is 50 to 60 Hz. (If the voltage and frequency are not correct, the regulated power supply and the variable frequency power supply must be installed, and an effective grounding wire must be installed).

5.2 Start the operation

Note: Please ensure that the connection power and grounding environment are correct and effective before starting to use the machine.



Boot sequence

1. Laptop → 2. Emergency → 3. Power switch → 4. Light **Shutdown**

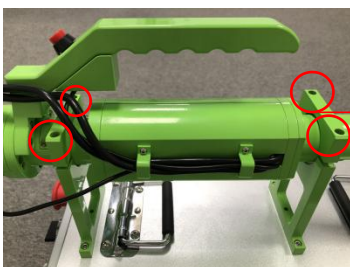
sequence

1. Laptop → 2. Light → 3. Power switch → 4. Emergency

Detailed operation please check the videos.



Press this button to mark.



Remember to hold the scanner head of the machine when unscrewing the 4 screws to prevent damage.

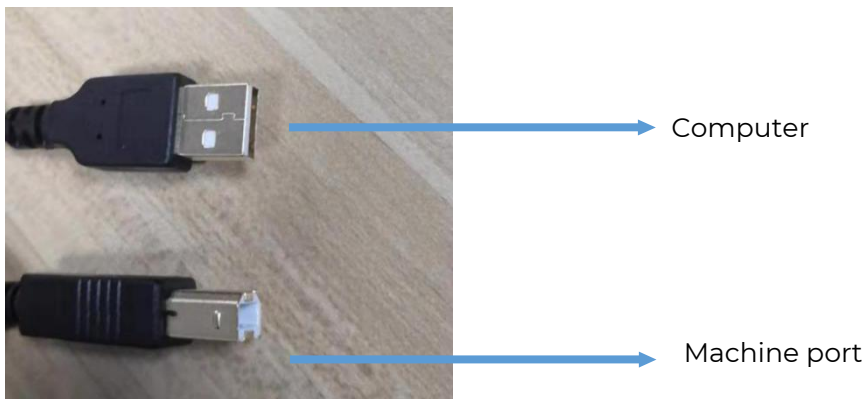
Chapter 6 Software and Its Settings

6.1 This software mainly has following functions:

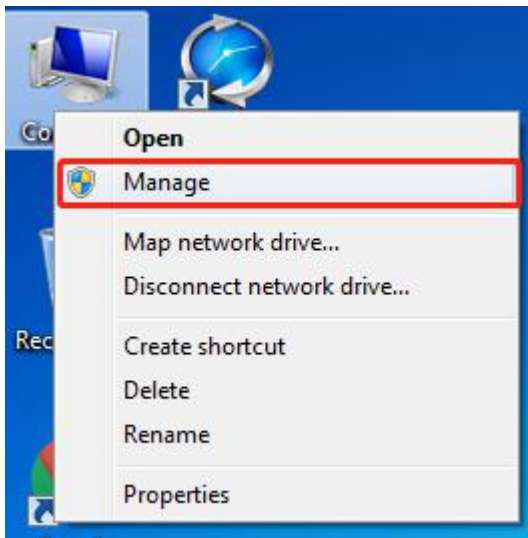
- Freely design the graphs and patterns to be processed.
- Support TrueType, JSF, SHX, DMF, one-dimensional bar code and 2D bar code.
- Have flexible variable text processing, change the text in real time during the processing, and read and write the Word and Excel files directly and dynamically.
- Can read the text data directly through the serial port.
- Can read the text data directly through the network port.
- Can adapt to complicated processing with the automatic segmentation of text.
- Can conduct curve soldering, clipping and intersection operation with strong node and graphic editing functions.
- Support as many as 256 pens (layers), and can set different machining parameters for different objects.
- Compatible with common image formats (BMP, JPG, GIF, TGA, PNG, TIF etc.)
- Support ring-shaped filling with a strong filling function
- Users can freely control the interaction between the system and external devices with a variety of control objects
- Directly support the G3 fiber laser of SPI and the latest IPG_YLP fiber laser Support dynamic focusing (Three-axis machining system)

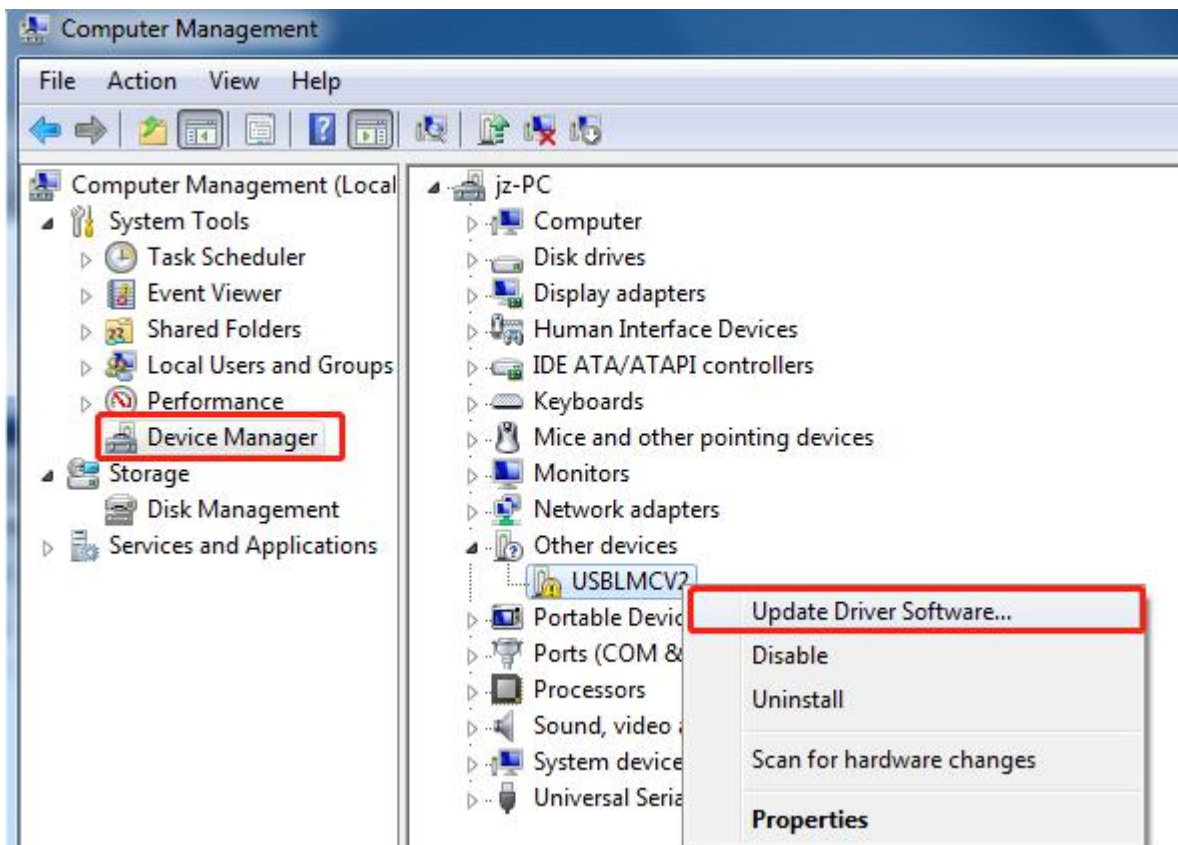
6.2 Software Driver Installation

Step 1 Connect the USB cable between computer & machine.

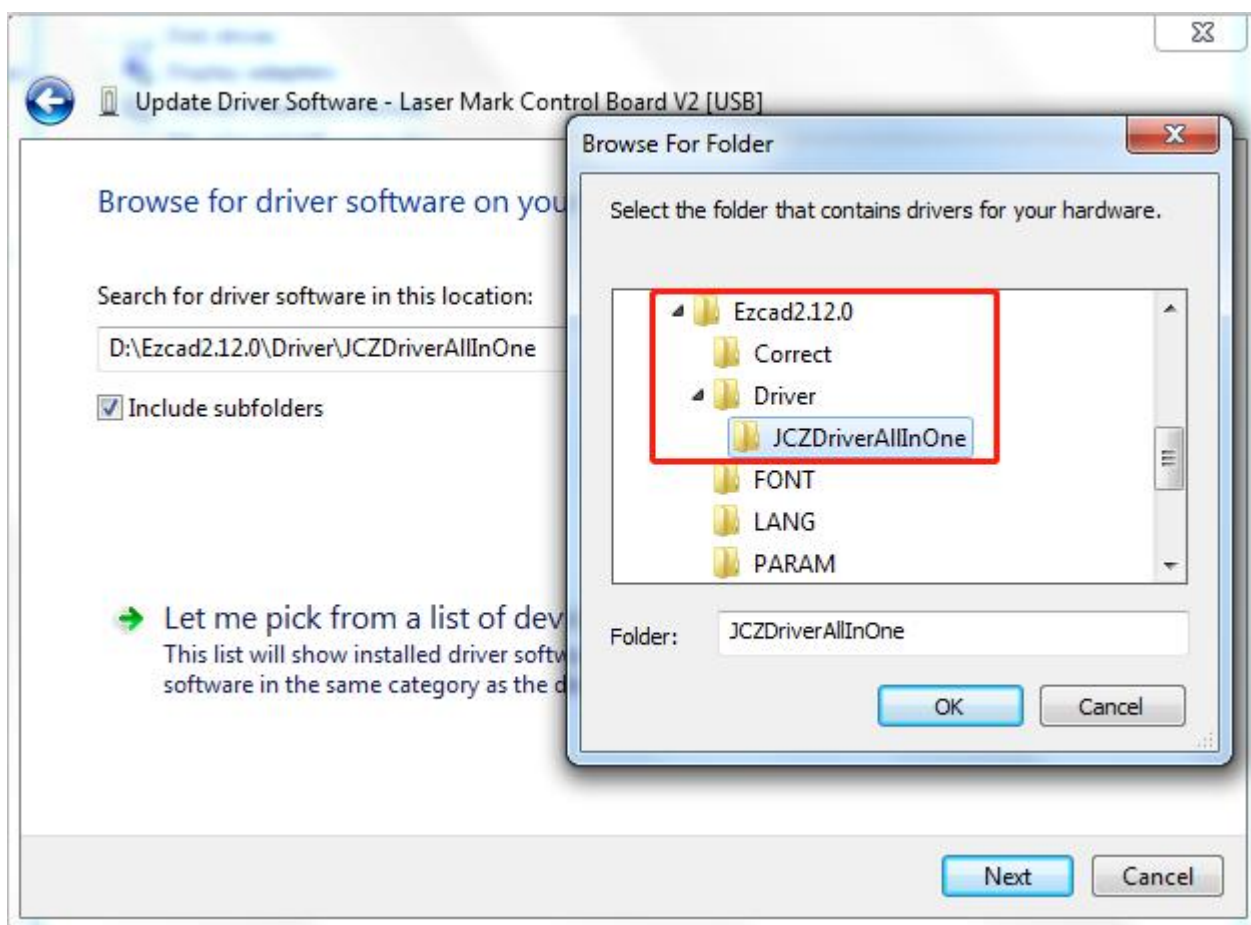


Step 2 Open the Hardware Manager of your computer, and right click the hardware, choose Update Driver Software

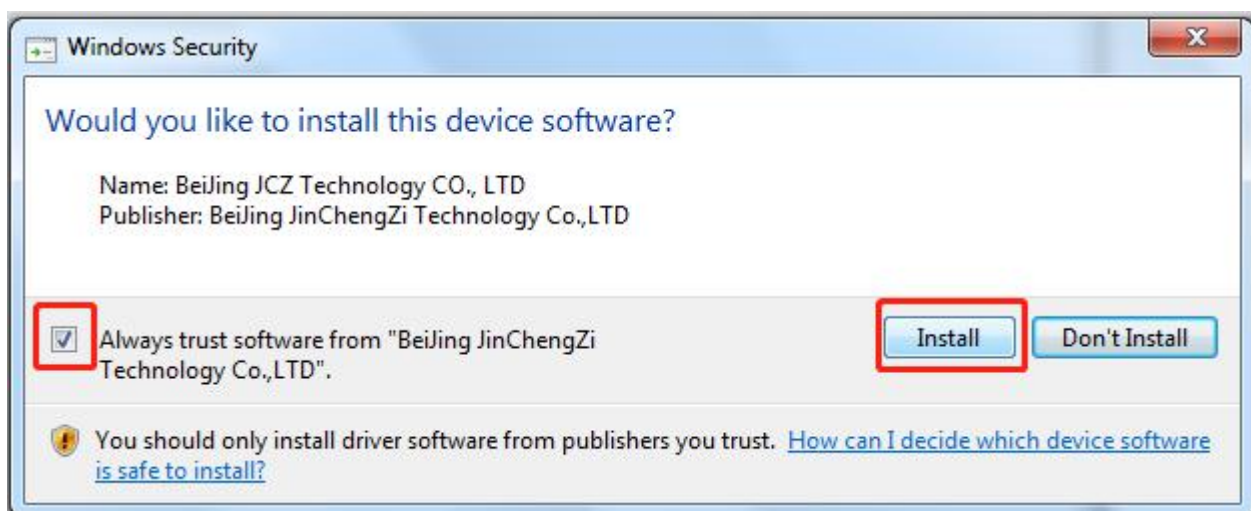




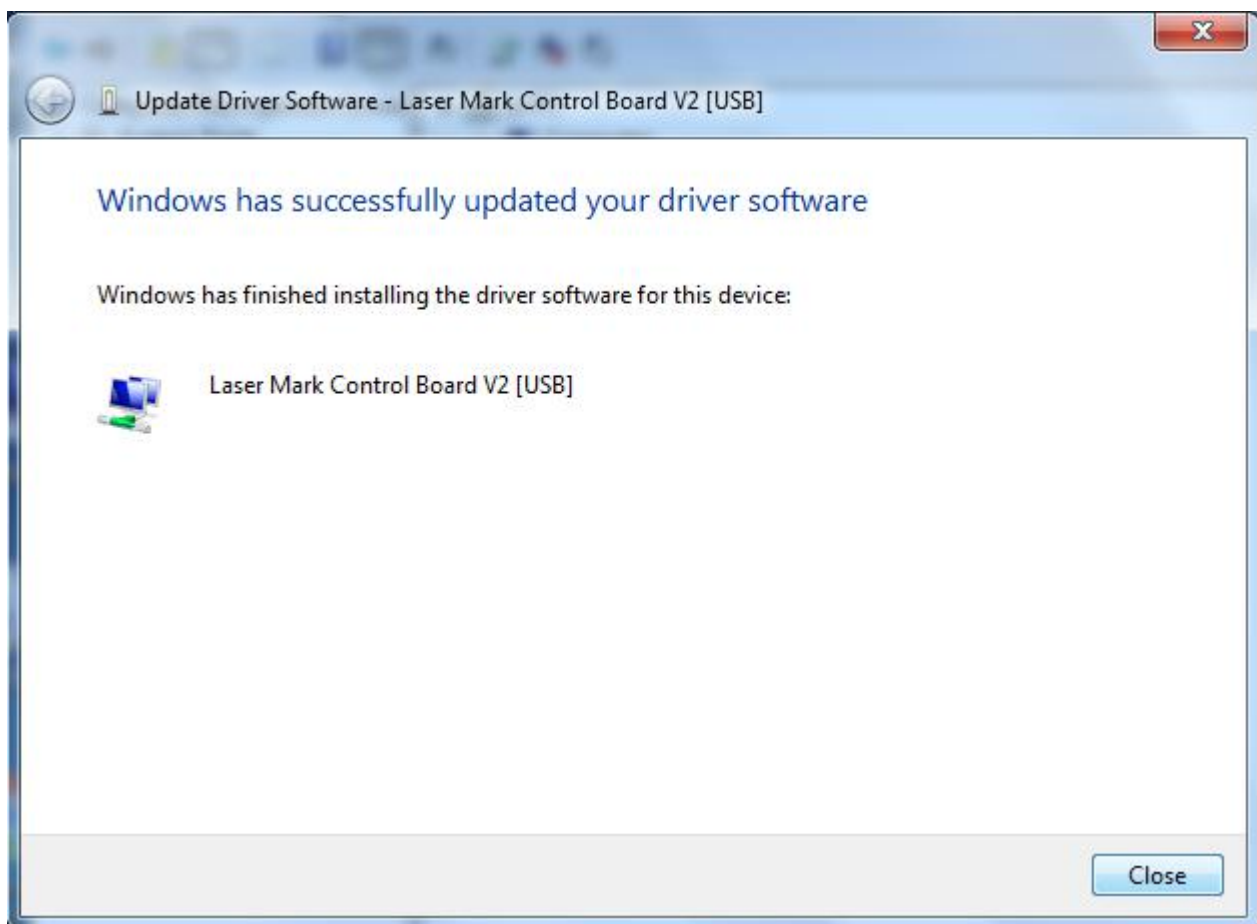
Step 3 Browse computer for driver software, and find the driver folder which in the Ezcad folder usually.



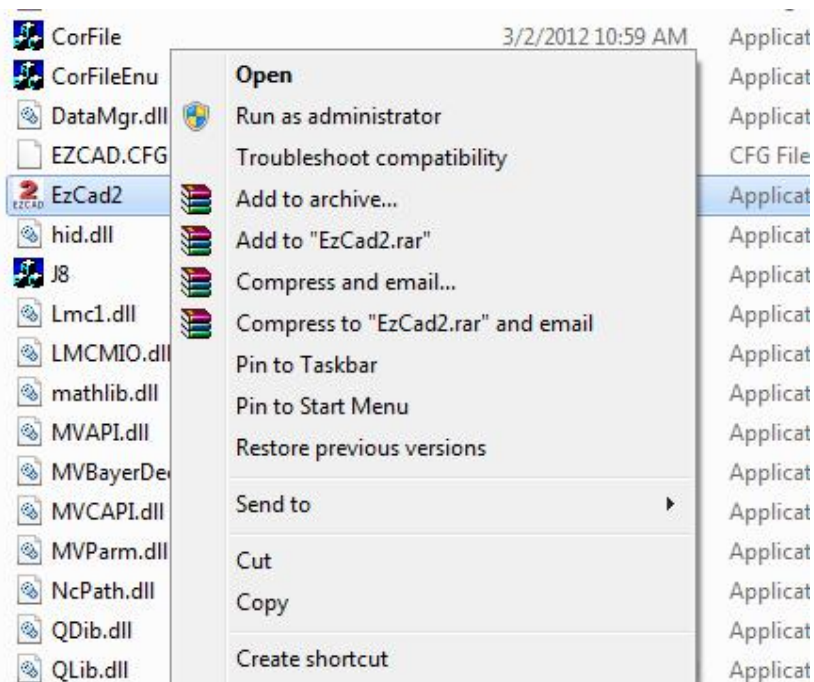
Step 4 Install the driver software



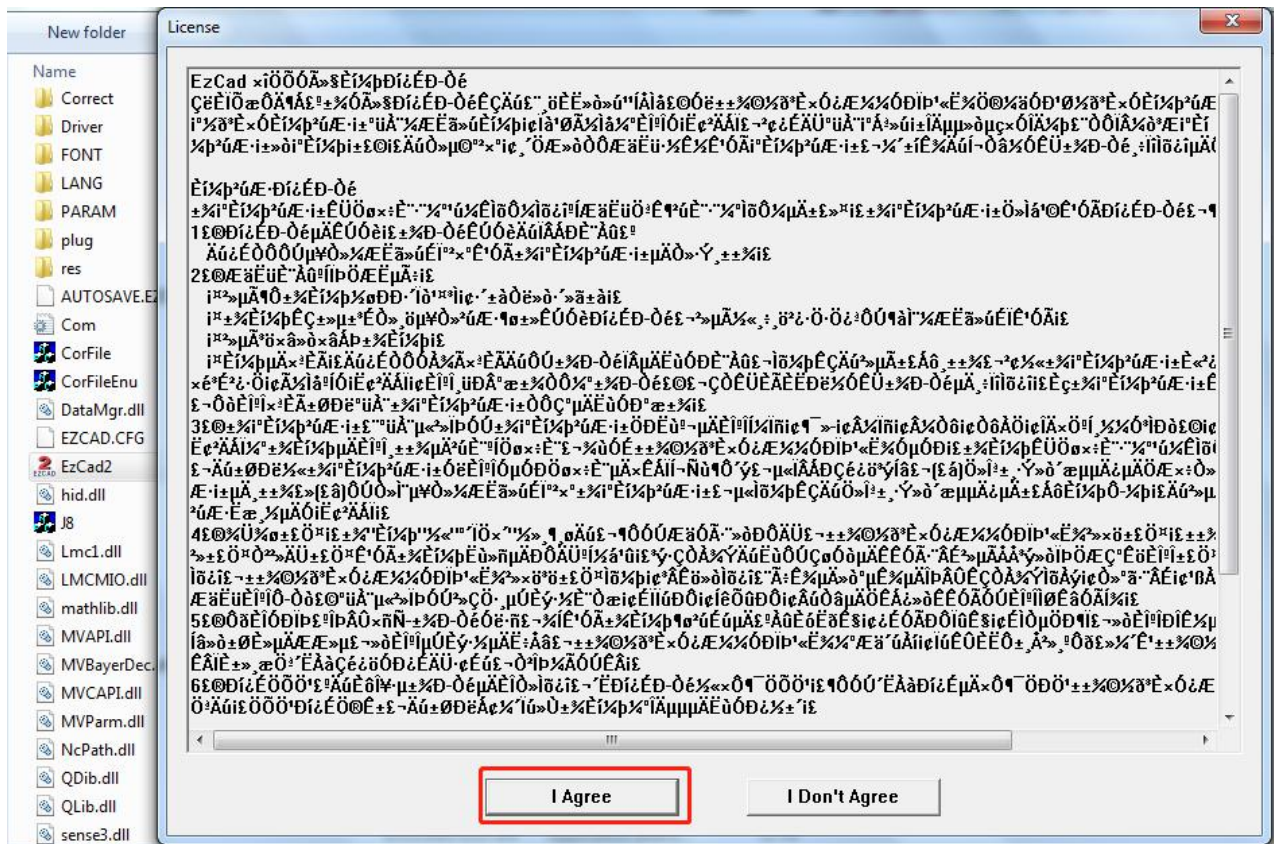
The following window will popup once the driver is installed successfully.



Step 5 Find the Ezcad software and open it, you can add a shortcut to the desktop to facilitate you use it next time.

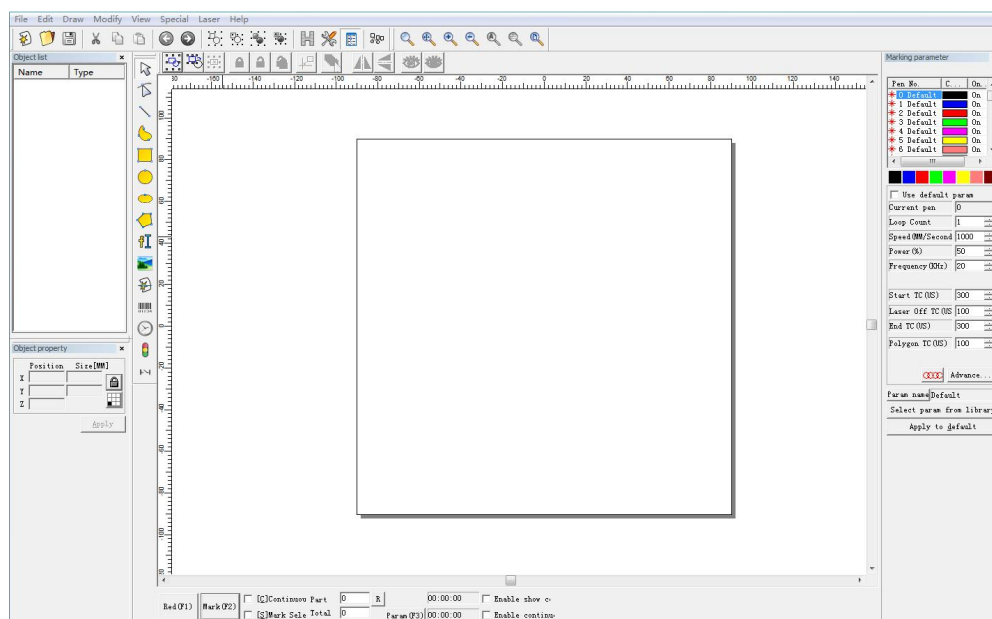


Once pop-up this license window, please click I agree, then the software would be opened.



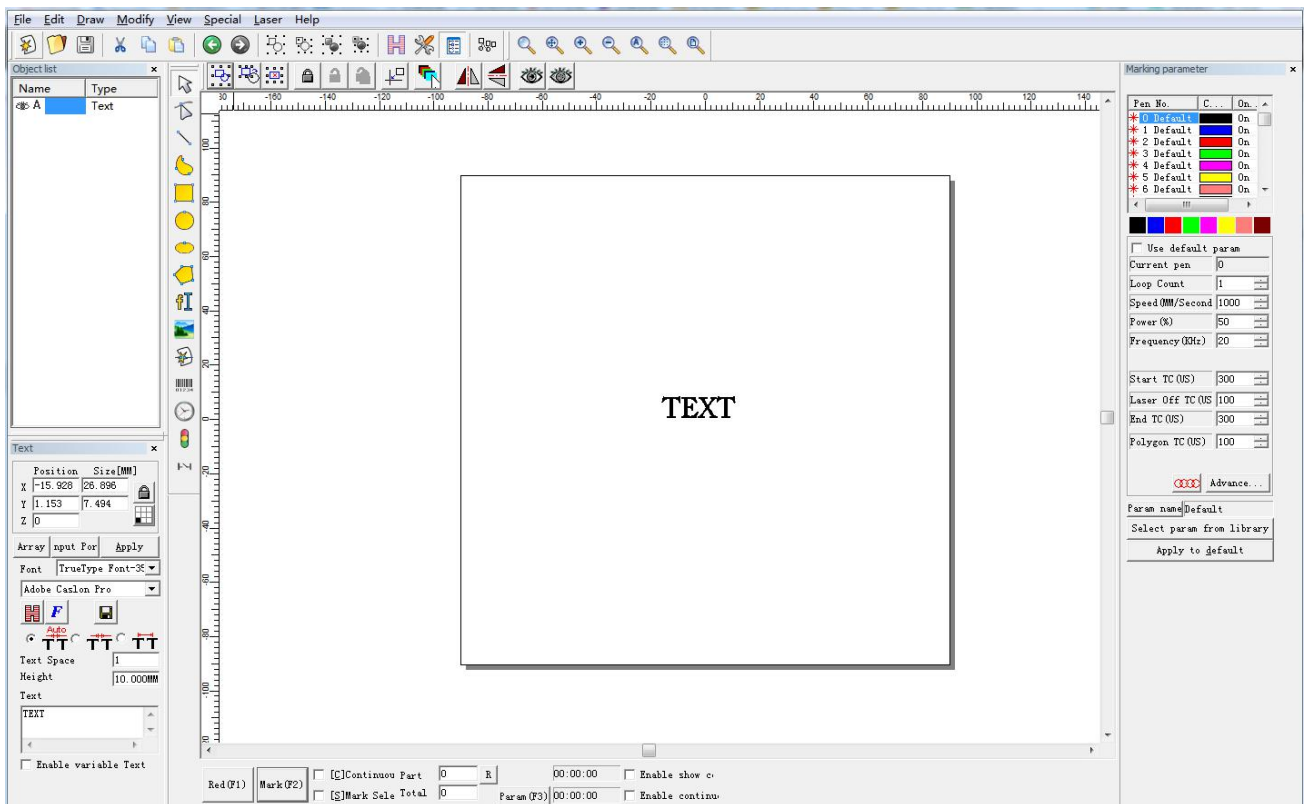
6.3 Interface Description

Display the startup interface when the programs run, and the programs conduct the initialization at the backstage.



Ezcad main interface

6.4 Parameter adjustment



Parameters that need to be adjusted: speed, power, frequency

Speed: 1—2000mm/s (Slow the marking depth and speed according to the marking effect) Power: 1%—100% (The greater the percentage of power, the deeper the marking will be) Frequency: 1—80KHz (low-frequency marking depth)

Note: Please kindly check the EZCAD software manual book for the operation instruction.

Chapter 7 Maintenance and preservation

BEC-FB20 laser marking machine is mainly composed of electronic devices, precision instruments and optical devices and it requires a high standard of service environment and daily maintenance.

7.1 Notes for maintenance

- * The marking machine and computer should be powered off when the machine doesn't work.
- * The field lens cap should be well capped to prevent the optical lenses from being contaminated by the dust when the machine doesn't work.
- * The circuit is in a state of high voltage when the machine works, and non-professional personnel are forbidden to conduct an overhaul at start-up, which may result in electric shock.
- * The power should be immediately cut off if there is any failure of the machine.
- * As the devices have been used for a long time, the dust in the air absorbs on the lower-end surface of the focusing mirror, which may lower the power of the laser and affect the marking effect, or may even overheat and then crack the optical lenses in serious cases. The surface of the focusing mirror should be carefully checked whether it is contaminated when the marking has not showed a good effect.

If the surface of the focusing mirror is contaminated, the lower-end surface of the focusing mirror should be removed and the cleaned.

Be particularly careful when removing the focusing mirror and take care not to cause any damage to it. At the same time, do not touch the surface of the focusing mirror by your hands and other objects. The surface of the focusing mirror should be cleaned as follows: mix ethanol (pure) with ethyl ether (analytic pure) at a ratio of 3:1, immerse a long fiber cotton or lens tissue into the mixed liquid and then gently scrub the lower-end surface of the focusing mirror, and the cotton swab or lens tissue should be changed for the other side.

- * Do not move the marking machine when it works, so as not to cause any damage to it.

7.2 Common failures and solutions

BEC-FB20 laser marking machine may break down as a result of the use or other reasons.

For you to judge and rule out some simple faults in time

we provide the basic fault diagnosis and analysis of its causes and methods.

1 power indicator is off

* power line is not connected well - Connect the power line

* power indicator is broken - Replace the indicator

2 laser indicator is off

* laser indicator is broken - Replace the indicator

3 laser indicator works, no laser output

* field lens cap is not removed - Remove the cap

* power ratio too small - Increase power ratio

4 laser indicator is off, no laser output

* signal line is not connected well - Reconnect the signal line

5 laser indicator is off, with laser output

* laser indicator is damaged - Replace laser indicator

* laser indicator is desoldering - Solder laser indicator

6 marking reticle is not even

* The marking work piece is not in the focal plane, adjust it into the focal plane.

7 Some of the marking texts and graphics are not clear, and the marking surface is not parallel to the field lens

- adjust the marking surface of the work piece

BEC-FB20 laser marking machine is assembled by unit module parts, and these module parts have a stable performance. If there is any failure and you cannot judge the cause according to the symptom, please contact our after-sales service department. Thank you!

Made in PRC

– Certificate – Certificat – Zertifikat – Certificato – Certificado –



Certificate of Conformity

LVD Directive 2014/35/EU
Registration No.: YAKE20190627738

Applicant.....: SHENZHEN BEC LASER TECH CO.,LTD
Address.....: 4th Flr, Bld 4, Yijiayang Industrial Park, Longhua Dist, Shenzhen
518109, China
Manufacturer.....: SHENZHEN BEC LASER TECH CO.,LTD
Address.....: 4th Flr, Bld 4, Yijiayang Industrial Park, Longhua Dist, Shenzhen
518109, China
Product.....: Laser Marking Machine
Brand Mark.....: Beclaser
Model(s).....: BEC-FB20, BEC-FB30, BEC-FB50, BEC-FB100, BEC-UV3,
BEC-UV5, BEC-C10, BEC-C20, BEC-C30, BEC-C60, BEC-C100,
BEC-W100, BEC-W200, BEC-W300, BEC-W400, BEC-W500,
BEC-FB30D

The test sample of product has been passed, the test according to requirements of the following standards:

Standard(s): EN 60825-1:2014
Test report(s) No.: YAKE20190627738S

Remark: Based on the voluntary assessment of the product sample and technical file, we confirm that the above-mentioned product meets the requirements of the EC directive. The CE mark as show below can be used, under the responsibility of the manufacturer or the importer, after completion of an EC declaration of conformity in compliance with all relevant EC directives.



YAKE Testing & Certificate Co., Ltd.

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This machine is manufactured under request of Freutek Srl, C.so Tassoni 21 (To) Italy