



EM-Smart Fiber Laser Marking Machine

User Manual

Version: 1.0

To ensure correct use, please read this user manual carefully before using the product

To ensure safe use, please read the [Safety Instructions] in this manual (see page 3-6 for details)

After reading it, please keep it properly for future reference

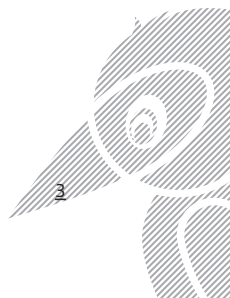
Foreword

- * Please read and know well about this operating specification before use this product, it will provide detail information like product safety use notices, installation method, operating procedure, maintenance and after sales service for you, make ensure that you can correctly use this product after received it and able to protect your own legal rights.
- * Please follow the safety notices in this operating specification to make ensure personal and product safety, and must carry out operating according to this specification.
- * Please contact Wuhan CHUANGDIAN intelligent technology Co., Ltd (Hereinafter called CDI) in time if this product has any quality problems. CDI will not undertake any responsibilities because self assemble/disassemble and repair caused product damage or personal injury.
- * If not follow each item in this specification and caused equipment damaged, this not in our maintain guarantee range. CDI will not undertake any responsibilities because users not follow each item in this specification and caused personal injury.
- * CDI maybe update the contents in the operating specification because the software or hardware updates, all updated content will be input the new version specification and without prior notice.
- * The contents in this operating specification all are protected by the copyright laws, any organization and personnel can't copy, save in data base or search system through any method and type without permission of CDI.
- * Please contact us if have any questions out of instruction of this manual.

Revise version

S/N	Revise date	Revise content	Revise version
1	May, 2020	The information of product safety use notices, installation method, operating procedure, maintenance and after sales service	Version1

Content



Welcome

Thanks for your choice EM-Smart series laser marking products, we divided this specification into six chapter/sections, introduce the laser safety notices, EM-Smart product summary, product install and use notices, common failure analyse and troubleshooting, product maintain, maintenance and storage items in detail.

You can check the relate chapter and sections in this specification to obtain the solve methods if you meet the problems during use EM-Smart product.

You can call our after sales service hotline or sales manager phone if you want to consult technical issues

We are expecting and thanks for you propose valuable ideas and suggestions of our products, this is power for us continue improve our products and service!

1 Laser safety notices

■ 1.1 Laser safety level

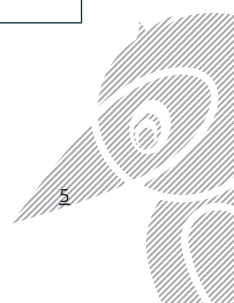
▶ 1.1.1 Laser safety level divide

The laser production spreading all over our daily produce and live environment along with the laser application technology quickly popularizing in the current society produce. Incorrect use or operating laser products maybe caused eyes hurt and skin scald when using the corresponding products to manufacture the products, even though caused disasters like scald, electric shock and fire. We need completely introduce the the safety knowledge of laser in detail to correct use and operate laser products and avoid accident. So, what' s the standard to divide the safety level of laser?






The wave length and power of laser products decided that laser hurt the different tissue of human body of operators, the wave length decided the absorb characteristics and harm mechanism of different human body tissue to laser, the power and energy will decide the laser harm level. The standard of International Electronically Commission divide the laser product into 7 major safety level according to wave length, the max output laser power or energy of laser products. No matter common consumers or professional operators, we all need correctly know well about laser safety level, understand it represented harm degree and notices then can avoid many laser hurt accidents. The laser safety level classify and detail description as the below table:

Safety level	Detail description	Sample of the related laser products
Class1	It been regarded as safe base on current medical science. The eyes will not be harm by the optics radiation under any condition. Or it' s product with harm laser but been placed in the corresponding sealed product, no any harm radiation able to out of the sealing device.	Ophthalmology laser curvature measure instrument DVD player
Class1M	Big diameter or high diffuse ratio light beam. No harm when normally use, will have the harm which exceed the limit value in Class 1 when use the optics equipment like telescope.	Small power optics communication laser device
Class2	Small power, visual light (wave length 400-700nm), these belong to low dangerous laser, generally, eyes will natural photophobia reaction and protect eyes, only intentionally continue gaze then can caused eye harm.	Laser sLaser pen
Class2M	Small power, visual light (wave length 400-700nm), big diameter or high diffuse ratio light beam. Same to Class 2 when normally use, will have the harm which exceed the limit value in Class 2 when use the optics equipment like telescope.	Laser level instrument
Class3R	No harm when normally use, straightly look the light beam will has harm.	Laser distance measurement device
Class3B	Straightly look or watched the secondary light beam maybe caused harm, scattering light beam no harm.	Demo laser instrument
Class4	Direct light beam, reflect or scattering light beam all can caused eyes or skin harm.	Laser welding machine Laser marking machine

1.1.2 EM-Smart laser level and safety marks



According to the standard GB 7247.1/IEC 60825-1, the wave length of EM-Smart is 1064nm, and the radiated out laser power from output head bigger than 20W, this belong to Class 4 laser products. Direct or indirect exposed under these light strength will hurt eyes or skin! Though this radiation invisible but the light beam still will cause damage and can't recover at retina or cornea. Must whole journey wear suitable and qualified laser protection glasses when laser machine running. This product maybe contain the below safety warning marks, please must follow the instruction to operate. Additionally, this product contain the red light beam which power under 1mW and wave length about 650nm to convenient for users adjust the laser focus and indicate laser pathway, it's laser level is Class 3R.

	<p>Laser dangerous The relate staffs can't directly visual or body touch the laser, this maybe caused body and vision obstructed.</p>
	<p>Laser radiation Exist laser radiation harm in a certain range, need prepare the corresponding laser protect actions.</p>
 <p>当心触电</p>	<p>Electric shock warning Exist voltage or current and maybe hurt human body. Please operate according to instruction, otherwise, it maybe hurt human body.</p>
	<p>Wear protection glasses To prevent the unexpected expose when observe laser or reflect light beam harm eyes, should wear the laser protection glasses at corresponding wave length when use and maintain laser.</p>
 <p>注意安全</p>	<p>Warning! It has potential harm at human body, please operate according to the instruction, otherwise, it will hurt human body.</p>

1.2 Emergency handle method

This product set emergency stop switch. When in an emergency, please press down the emergency stop switch immediately to stop running and plug off the power supply plug; Only can normally start the equipment after finish handled the emergency situation and confirmed the surrounding environment are safe.

Also can stop product running through directly plug off the power supply wire of this product under the emergency status.

■ 1.3 The other safety items

Please read all instruction before use this product.

Need closely supervise when use this product nearby the under ages to reduce the risk.

Please cover the lens protect cover well when not use the product, avoid the lens polluted by the dust.

Please don't use this product in dim or dark environment.

Forbid to disassemble the products, it maybe caused the uncertain risks like electric shock and fire after disassemble the product.

This product only suitable to the stipulated materials in this operating specification, please contact our company if need marking the materials which out the stipulates.

2 Product summary

■ 2.1 Product characteristics and application

EM-Smart series laser marking machines are small and compact, portable and easy to carry. Can use this equipment under household electricity, and can directly butt joint the self computer host and suitable to multiply scene.

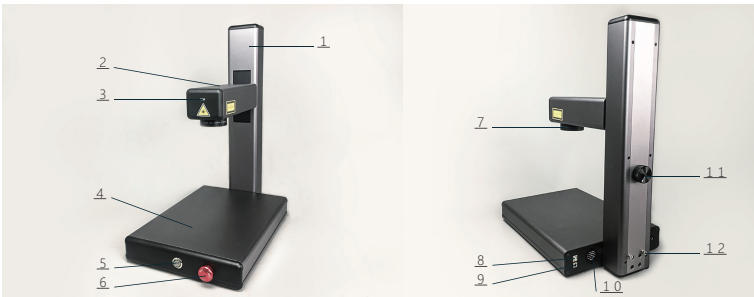
The applicable materials of this machine include: common metal and alloy (all metals like iron, copper, aluminum, magnesium, zinc), rare metals and alloy (gold, silver and titanium), metal oxidize (various metal oxidize all are OK), special surface handle (phosphorization, aluminum anodized and electric plating surface), ABS material (electric apparatus shell, commodities), oil ink (light transmitting keys, printing products), epoxy resin (sealing and insulation layer of electric elements).

■ 2.2 Working principle

The laser machine output the laser beam with wave length 1064nm and interior expanding beam, then ray on the reflect mirror of 2 pieces galvo scanner in the light circuit, the galvo scanner generate quick swing under computer control and make the laser beam scanning at both plane X and Y axis direction. It formed one by one micro thin and high energy density

light spots through the lens laser beam focus on the surface of machined objects, each high energy laser light spot burning etch on the object surface at a moment and formed the grave. Continuous this process through computer control then the layout mark contents in advance like characters and figure permanently etch on the object surface.

■ 2.3 Product structure



1	Support arm: connect the working platform and light path
2	Light path: laser output
3	Status indicator : indicate whether prepared the laser marking
4	Working platform: product laser marking platform surface
5	Power supply switch: start the power supply of equipment
6	Emergency button: press down to stop equipment running under emergency situation
7	Lens: focus the laser to working surface of working platform
8	Communication joggle: connect the USB wire and communicate with computer
9	Quick marking joggle: can quick start laser marking through outer trigger method when working
10	Air Outlet: Heat dissipation
11	Knob: hand clockwise twisting, the light path height upward move, anticlockwise twisting then light path height downward move
12	Fix position bolts: fix the support arm and keep vertically stand status

2.4 Technical parameters

Item	Technical parameters		Unit
Model	EM-Smart		
Average output power of laser	20	30	W
Working method	Pulse type		
Laser wave length	1064		nm
Repeat modulate frequency	30-60	40-60	kHz
Stability of output power	<3%		
Light beam mass	<1.5	<1.6	M ²
Laser marking range	110×110		mm
Marking speed	≤ 7000		mmps
The min line width	0.03		mm
The min character	0.1		mm
Working adjustable range	0-100		mm
Cooling method	Air cooling		

3 Product installation and use

■ 3.1 Unpack inspection and installation environment

▶ 3.1.1 Unpack inspection

Check whether package complete before unpack, please contact our company in time if seriously damaged.

Check the parts according to delivery list of product configurations after unpacked. please contact our company in time if the entity are not in accordance with list.

▶ 3.1.2 Installation environment

- Humidity requirement: 40%~80%, no condensation
- Environment temperature requirement: among 10~35 °C
- Working environment requirements: the working environment no powder dust, no oil fog and no corrode gas
- The outer supply power requirement: 110-240V 2.25A /50-60Hz
- Should no strong electromagnetic signal disturb around the products. Should avoid ratio launch station (or relay station) around when using
- The vibration of product install platform should lower than 5μm, the vibrating acceleration should lower than 0.05g
- [Note] Please don't use this product under the below environment:
 - The place where easy to dew
 - The place where easy to touch the chemical drugs
 - The place where has more garbage, dust and oil fog
 - In the environment with high concentration CO₂, NO_x and SO_x

■ 3.2 Hardware connection

▶ 3.2.1 Product installation

Pick out the product host and place the product on the working platform;

Note

- The working platform need be level and avoid it caused product sliding fallen.
- The working platform should no vibration, avoid the product unable to normally working.
- The place position should ensure there no objects block the heat radiation air

venting port, or products pile up distance not lower than 10cm.

- Assemble the support arm according to shown on picture, the fix position bolts need be firmly twisted when assemble the support arm, no loosen at support arm

▶ 3.2.2 The connection of connect-insert cable

Connect the square port end of printing wire to EM-Smart, the flat port end connect the USB terminal of computer

Insert the round port end of power supply wire into power supply interrupt, make the power supply adapter connect the power supply after confirmed the power supply accordance the requirements

■ 3.3 Power on/off procedure

[1] Clockwise revolve emergency stop button, press down the power supply switch and start computer

[2] Open the marking software, put in wait marking objects on the working platform, take down the lens protect cover and adjust the focus well

[3] Input the required marking content like word, figure and pictures, etc

[4] Adjust the laser machining parameters

[5] The red point preview confirm the marking position, click “Marking”

[6] Close the marking software, press down the power supply button, indicate lamp extincted then cover the lens protect cover

■ 3.4 Software installation

▶ 3.4.1 About the laser marking software

EM-Smart select and use the Ezcad2 marking software, it can running in Microsoft Windows XP, VISTA and Win7 operating system. The all instruction after this manual all default as Win7 operating system.

This software support the below document formats:

- Fonts: Support TrueType font, single line font (JSF) and SHX font
- Bar code: one-dimension bar code, two-dimensional bar code
- Image format: bmp, jpg and png, etc
- Vector diagram: dxf, dst and plt, etc
- More software setting please check the software operating specification in details

▶ 3.4.2 Software running environment

CPU main frequency	900MHz
Memory	1G 以上 Above 1G
Graphics card memory	64M
Hard disk	20G
System	Win7 32/64 and above

▶ 3.4.3 Obtain marking software

The user can download the installation procedure at EM-Smart official website (www.em-smart.com) after received the EM-Smart product; or obtain from the U-disk in the appendix with machine.

▶ 3.4.4 Product power on and software drive installation

Update the LMC drive procedure in the device manager.

[Note] The detail software drive installation steps please check the “First time install and use video” in the appendix U-disk

Open “EM-Smart.exe” procedure after drive installation finished, and observe whether the status indicator is blue, please restart the power supply if abnormal.

▶ 3.4.5 Configure the calibrating parameters

Click the “Parameters” or quick key F3 to open the parameter setting page after normally enter into software, call to use the calibrate document with suffix.cor under the area setting then click to confirm, equipment calibrating finished.

▶ 3.4.6 Adjust the focus

Place the product in the working area, pick down the lens protect cover, add text “TEXT” in the working area, tick the select machining and F1 red light preview after mouse click the blank area in the working area. Observe tow beams red optic point’ s opposite position. Manually adjust the knob to make the both points coincide together, double red points coincided then is the focal point position.



[Note]

The thickness of marked object should $\leq 95\text{mm}$, otherwise, it will over focus range then unable to mark.

Focal point verification:

Place the metal business card, add one $30 \times 30\text{mm}$ rectangle in the working area, click the laser marking, observe whether the laser strength and luminance are in most strong and bright, verify whether laser focus correctly.

[Warning]

Please wear the eyes protect glassed during the machine working , strictly forbid to make hand or other objects extend into the marking area to avoid harm.

▶ 3.4.6 Red light calibrating and align

Place metal business card after focus corrected, add one $30 \times 30\text{mm}$ rectangle in the working area, click “Red light” preview and confirm the mark position, click “Marking” to make the laser marked on the metal business card. Then use red light preview, observe whether the indicate red light are coincide with the laser mark path, if indicate that red light not coincide with laser then user can click “Parameter” to correct it, the red light indicate options modify the shift position under other settings.

▶ 3.4.7 Other parameters setting

Senior marking parameters setting: click “Senior” icon and process senior parameter setting, shown as the below picture.

Jump speed and delay affect marking effect, need set enough time to make the galvo able to jump when laser device start/close laser, prevent to occur vague situation when fill machining.

Laser machining technology recommendation:

- The marking speed is galvo scanning speed then set under 1500mm/s generally
- The laser power adjustable at 0%-100%, generally set under 80%
- 30-60kHz The laser frequency at 20-200kHz adjustable, more bigger value more small output energy at corresponding laser single pulse, generally, set at 30-60kHz
- Laser delay setting affect figure fill effect, set according to default then OK
- Each material advised technology parameters as below (only modify the marking speed, power and frequency)

Metal	Marking light color effect	Focal distance: double red light focus status Marking speed: 1000 Power: 60% Frequency: 30 Fill: 0.05mm
	Mark deep color effect	Focal distance: double red light non focus status Marking speed: 100 Power: 80% Frequency: 60 Fill: 0.05mm
Plastic	Marking light color effect	Focal distance: double red light focus status Marking speed: 1000 Power: 30% Frequency: 30 Fill: 0.05mm
	Mark deep color effect	Focal distance: double red light focus status Marking speed: 1000 Power: 50% Frequency: 30 Fill: 0.05mm

Transparent materials like glass and PMMA can't be machined, the transparent PC plastic can be black, the paper case package can be burned to black carbonizing, unable to carve depth on the wood, the actual laser marking subject to the test effect.

4 Failure analyse and troubleshooting

4.1 Common failure solve method

The EM-Smart laser marking machine maybe occur failure because use or other reasons, we list out the easily happen failure appearance and problem solve method for you judge in time and solve some simple failure. Please contact our company or the local distributors if problem still existing after check the problems.

S/ N	Failure description	Reason	Solve methods
1	No responding after open the power supply switch	<ol style="list-style-type: none"> 1. Outer power supply not connected 2. Emergency switch been pressed down 	<ol style="list-style-type: none"> 1. Connect the power supply of adapter power supply 2. Clockwise revolve the emergency stop button
2	Unable to use laser mark out the marks	<ol style="list-style-type: none"> 1. Wait marking objects not in the focus plane 2. Lens polluted 3. Marking parameters error 	<ol style="list-style-type: none"> 1. Double red light focus and verify 2. Clean the lens 3. Adjust the parameter again 4. Restart software
3	Open the software but can't find the drive procedure or unable to find the encrypt dog	<ol style="list-style-type: none"> 1. Outer power supply not connected 2. Power supply switch not been pressed down 3. wire not connected well 4. Interior control card damaged 	<ol style="list-style-type: none"> 1. Connect the power supply of adapter power supply 2. Connect the power supply of adapter power supply 3. Connect the USB wire again, if still can't LMC drive then re-install the LMC drive 4. Contact after sales to handle it
4	No laser output	<ol style="list-style-type: none"> 1. Software parameters setting error 2. Outer power supply not connected 3. USB wire not connected well 4. Laser source damaged 	<ol style="list-style-type: none"> 1. Adjust the marking parameters and verify again 2. Connect the power supply of adapter power supply 3. Connect the USB wire 4. Contact after sales to handle it
5	Marked figure or word deformation	<ol style="list-style-type: none"> 1. Incorrect figure and filling error 2. Outer environment disturbed 3. Interior control card failure 4. Interior galvo failure 	<ol style="list-style-type: none"> 1. Check the figure and word filling parameters 2. Check the outer power supply grounding situation 3. Contact after sales to handle it 4. Contact after sales to handle it
6	Light way indicate lamp lighting, unable to enter into software, there has one practice sample running	<ol style="list-style-type: none"> 1. Laser prepared well, signal happen interfere 2. Procedure failure 	<ol style="list-style-type: none"> 1. Restart power supply switch and software

5 Product care and maintenance

Should fix time process the maintenance at this product, make it's performance can be the best status to extend the use working life.

■ 5.1 Product maintenance

Avoid move this product when the products are working, avoid to damage the machining products.

Don't cover or stack other objects on the product, don't block objects at front and back air venting position, avoid to affect the heat radiation effect of the machine.

The product should cut off the power supply when working, cover well the lens protect cover, prevent the dust pollute the optic lens.

No liquid storage around the equipment, avoid the liquid topple and make the water in equipment caused short circuit and leak electric

■ 5.2 Product maintain

Fix time check the power supply wire and USB connect wire, check whether joints are complete well, whether outer surface have damages. Please renewal in time if joint or outer surface has damages, avoid hurt human body or damage the products;

[Note]

- Please use the original fittings. Our company will not duty for any responsibilities if use non original fittings and caused human body hurt or equipment damaged.
- Fix time clean this product; cut off the power supply and clean the surface dust after works finished and EM-Smart surface temperature recover the room temperature;
- Should check whether this product connected power supply and whether it reliable grounding before use.
- Fix time check whether the power supply button and emergency stop button of this product can be normally used.
- Fix time clean the protect lens of equipment shot, can use long fibre cotton or lens paper drop suitable 99% alcohol lightly wipe and wash the surface of protect lens. Must one time renewal cotton bud or lens paper after on time wiped.

[Warning]

- The lens maintain need be operated under the situation that product power off, avoid error operation caused eyes and other position hurt.

6 Product storage items

■ 6.1 Storage notices

Please storage according tot the below requirements if long time not use the product:

- The equipment should be put into original package box when storage, the warehouse environment temperature for storage the equipment are 0°C ~ 40°C , the relative humidity are 20% ~ 80%;
- Not allow to make the equipment mix storage with various harmful gases, inflammable and explode objects and corrode objects;
- The storage place should strong mechanical vibration, shock and strong magnetic field action.

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