3D UV Laser Crystal Engraving Machine Manual

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1. Safety Instructions

1.1 The hazards of lasers and precautions

Please read this user manual carefully before using this product.

In this user manual, we provide you with important product safety operating procedures and other reference information. To ensure your personal safety when operating this product and to achieve the best performance of the product, please follow the following precautions and warnings as well as other relevant operating procedures in this manual during operation.

Laser marking machine is a Class 4 laser product with dangerous, the NOHD distance is 20M, invisible laser radiation. This product emits infrared laser radiation with a wavelength of 355nm, which can cause damage to eyes and skin directly or indirectly exposed to such light intensity. This infrared radiation is invisible, and the laser beam can cause irreversible damage to the retina or cornea. Before operating the laser marking machine, be sure to wear appropriate and certified 355nm near-infrared band laser protective glasses,the glasses should conform to OD6+ standard;

Important:

✧ Never look directly at the fiber output connector, and make sure to wear appropriate protective goggles when using the laser to avoid injury.

✧ Do not open the laser, because there are no product parts or accessories for users to use inside the laser.

✧ When using this product, please use a properly grounded power supply and normal voltage.

✧ Before starting the laser product, please ensure that the ambient temperature and humidity are within the specified range.

✧ Do not expose the product to an overly humid environment.

✧ The laser is cooled by air. Please ensure that the ambient air is dry and clean.

✧ Operations or adjustments beyond the scope specified in this manual may cause dangerous radiation damage.

✧ Keep the output galvanometer clean. After each use, please cover the protective cover. Do not touch the field lens with your hands, and do not use any solvent to clean the field lens. When necessary to clean and maintain the lens, be sure to use lens paper.

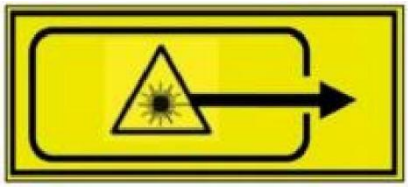
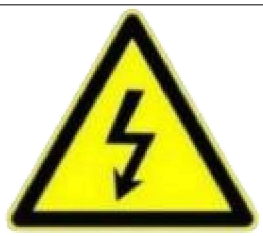
✧

Warning:

✧ Operations or adjustments beyond the scope specified in this manual may cause radiation damage.

wavelength （ nm)	optical density
355	>6

As shown in the table below, all safety warning signs (not limited to those affixed to the body of the laser) during the operation of the laser marking machine are included:

		
Warning label – Hazard symbol	Explanatory label (Take 5W as example)	Alternative label for laser aperture
		
Alternative label for Class 4	Must be grounded	Electrical Hazard

2. Reference standards

1. IEC 60825-1:2014
EN ISO 12100:2010; EN 60204-1:2018
EN ISO 11553-1:2020+A11:2020
EN ISO 12100:2010;
EN ISO 11553-1:2020+A11:2020
FDA number: 2320736-000

2.Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

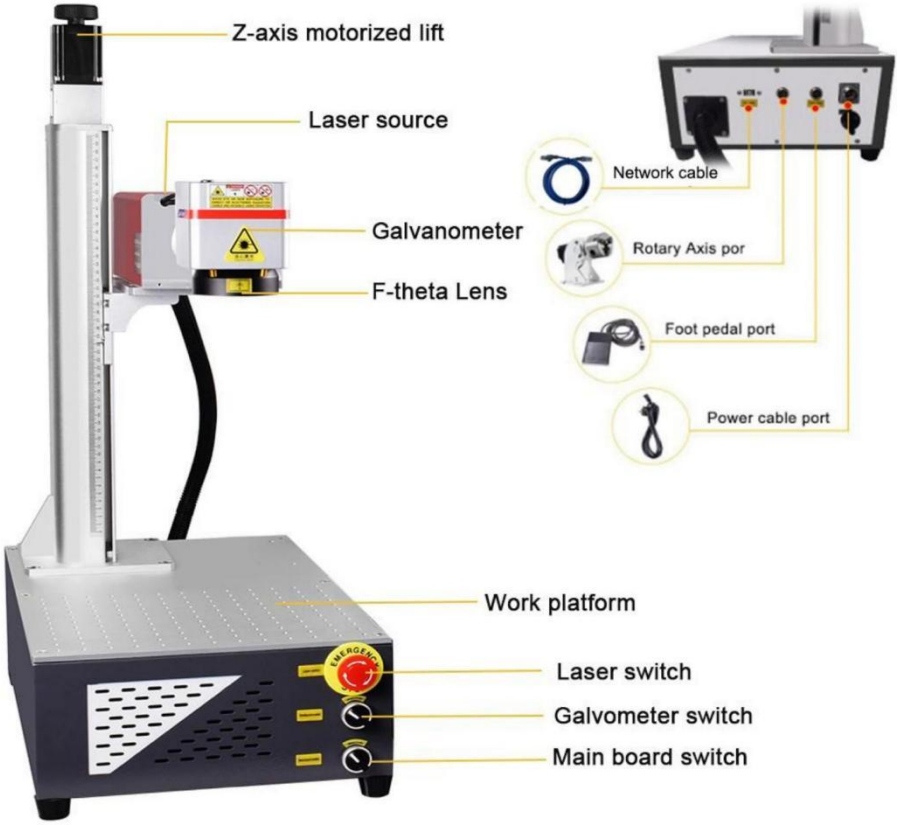
3.The laser safety classification of this product is based on EN 60825-1: 2014+A11: 2021.

4. The level of laser radiation emitted through the laser aperture exceeds Class 1.

Please note:

◎ According to EU and national standards and requirements, lasers must be classified according to their output power and laser wavelength. All high-power MFSC series laser products belong to Class 4 products (according to EN 60825-1, Chapter 8)

3.Machine introduction



Two type of chiller

3W and 5W machine use 05 model chiller

10W and 15W machine use 10 model chiller

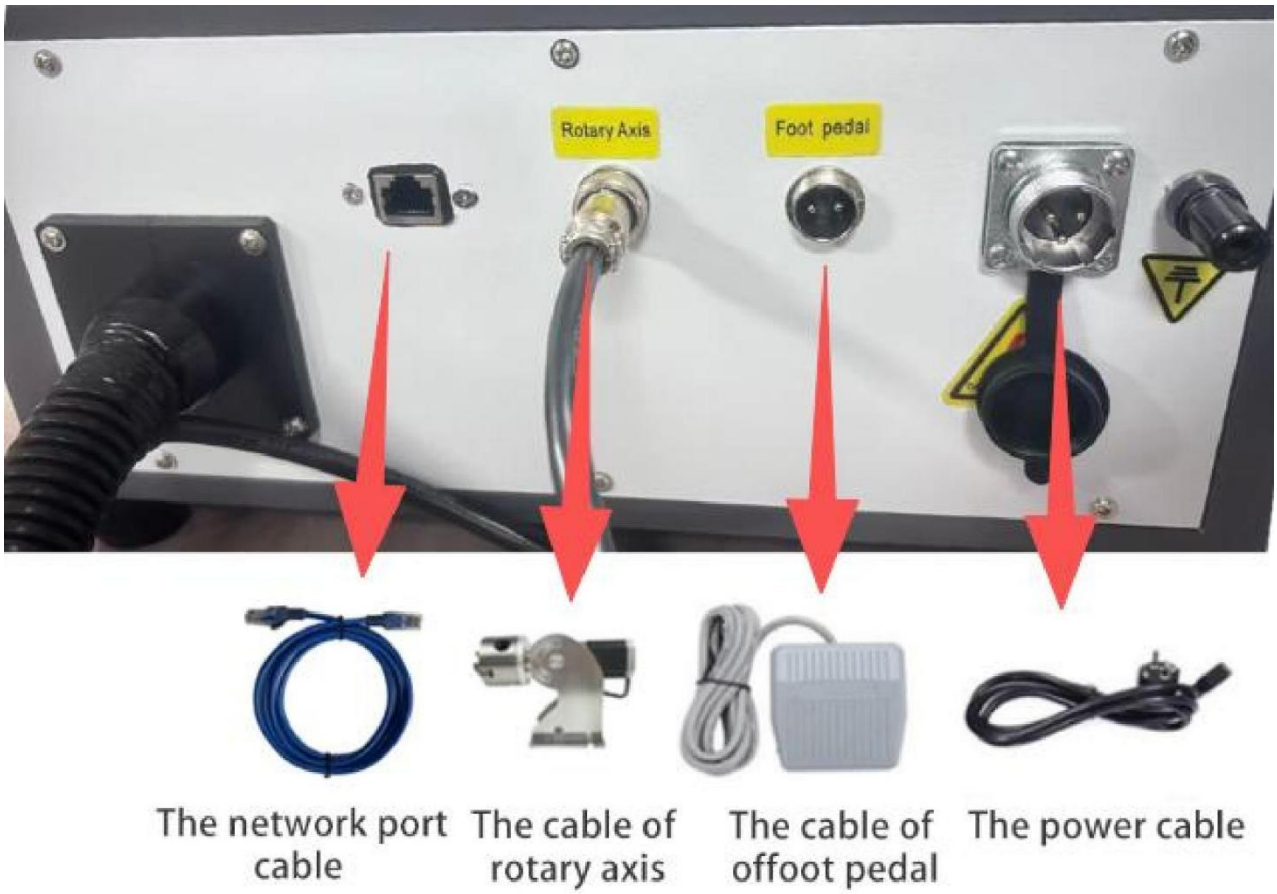
Note: TWO brand water chiller can be choosed, depend on yourself.

4.Packing list

3. Machine Connections

You will get 4 cables as following picture, USB cable, power cable, the cable for foot pedal and

rotary axis (optional):



Connect the water pipe like above picture, not distinguishing between inlet and outlet.

(Tips: If your UV laser is air cooling version, please ignore this step.)

4. Power on

Turn on the following three switches: Main board switch-->Vobrating mirror switch-->Laser switch+Emergency switch

(When the machine is in working, keep the emergency switch in the open position)

5. Software installation

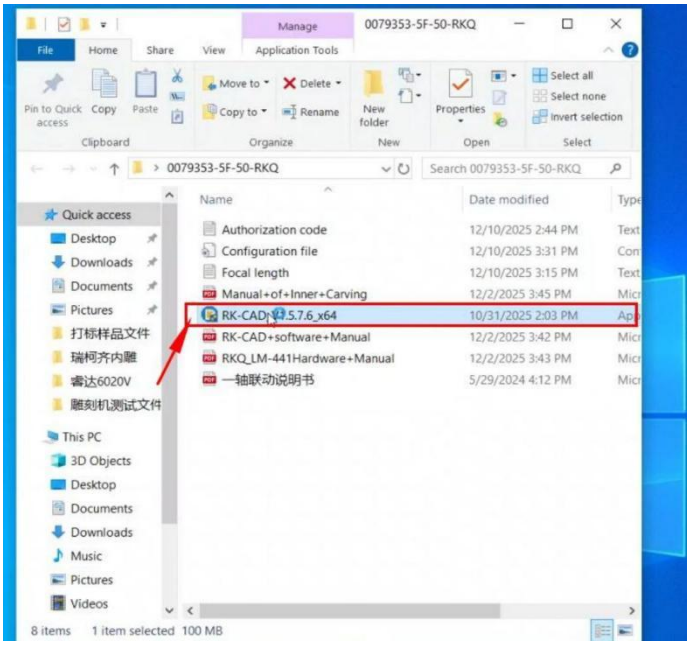
Note: Turn off the anti-virus software(if there are any) and firewall before downloading and then install the software.

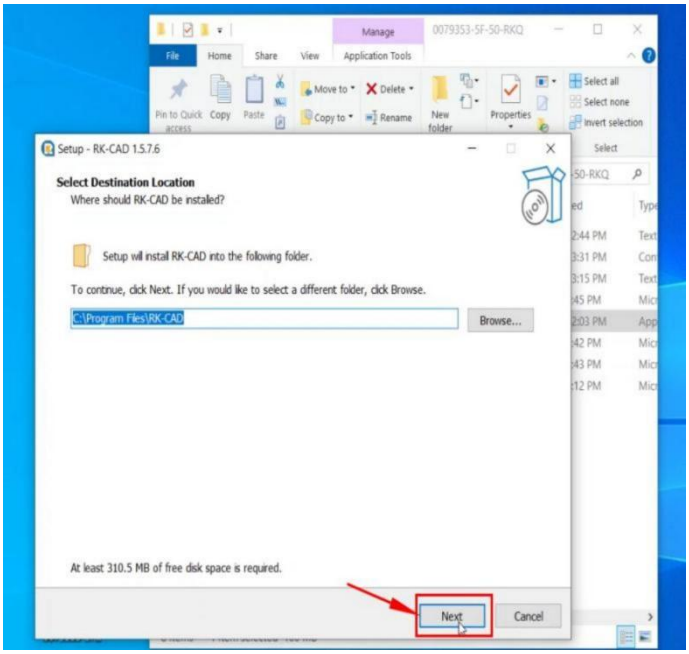
The connect method between Laser and software is through the Ethernet port, and there is no need to install drivers.

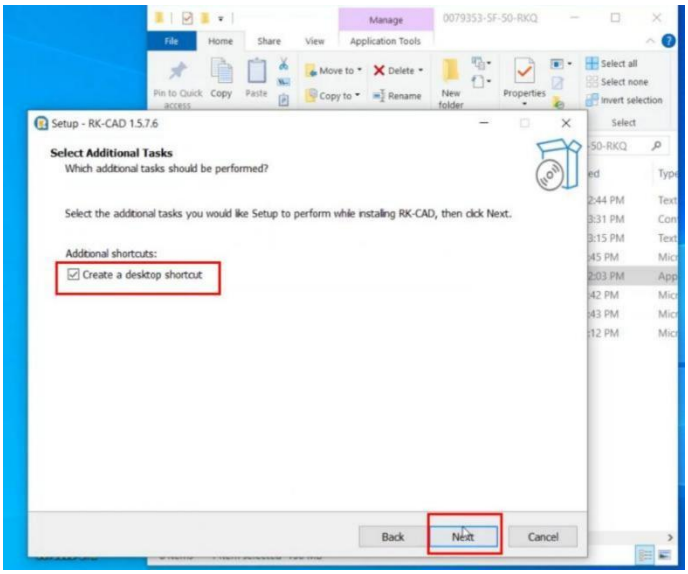
5.1 install software

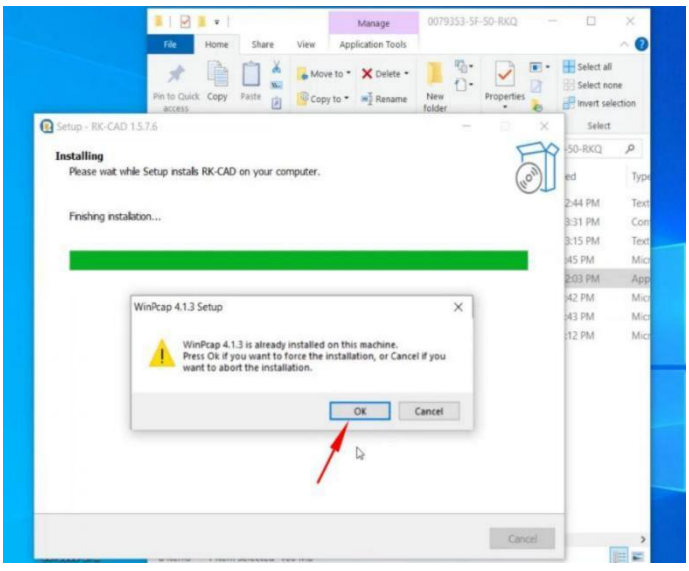
Step1: Open USB flash drive folder on computer for spare

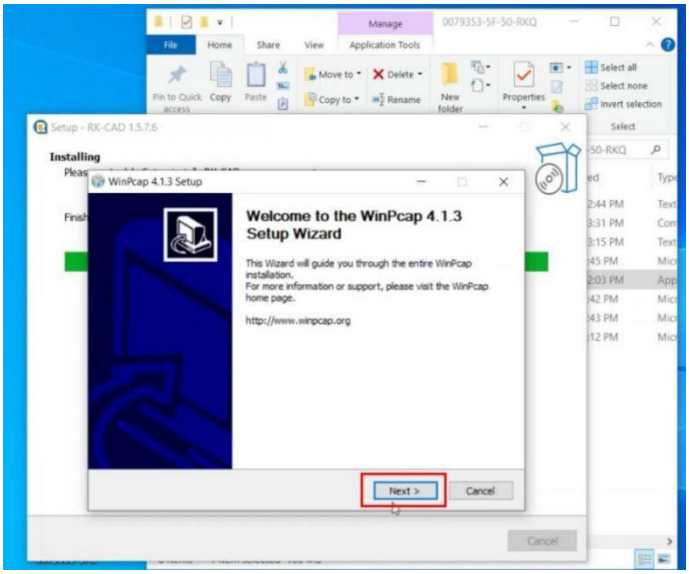
Step2: Start install software--Open the software folder--Click “RK-CAD_V1.5.7.6_x64”

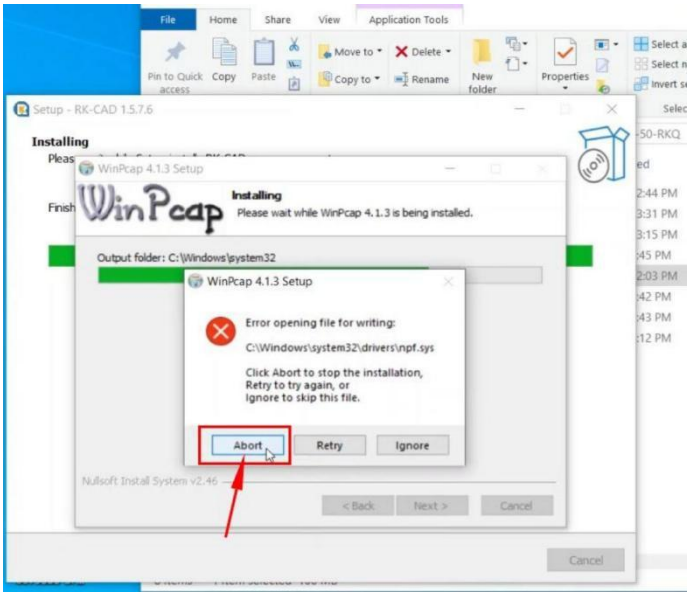


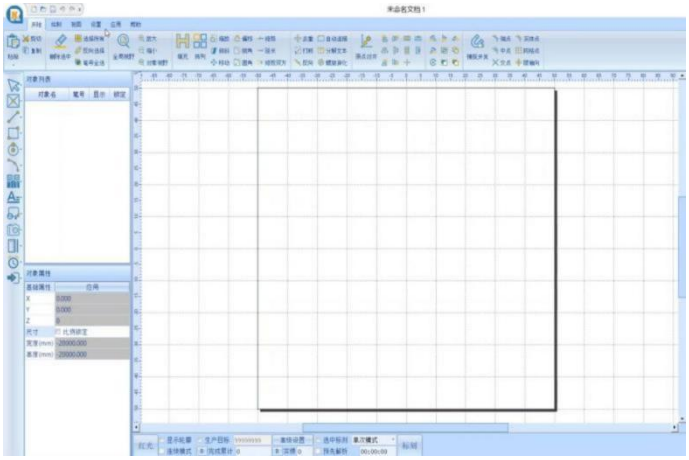












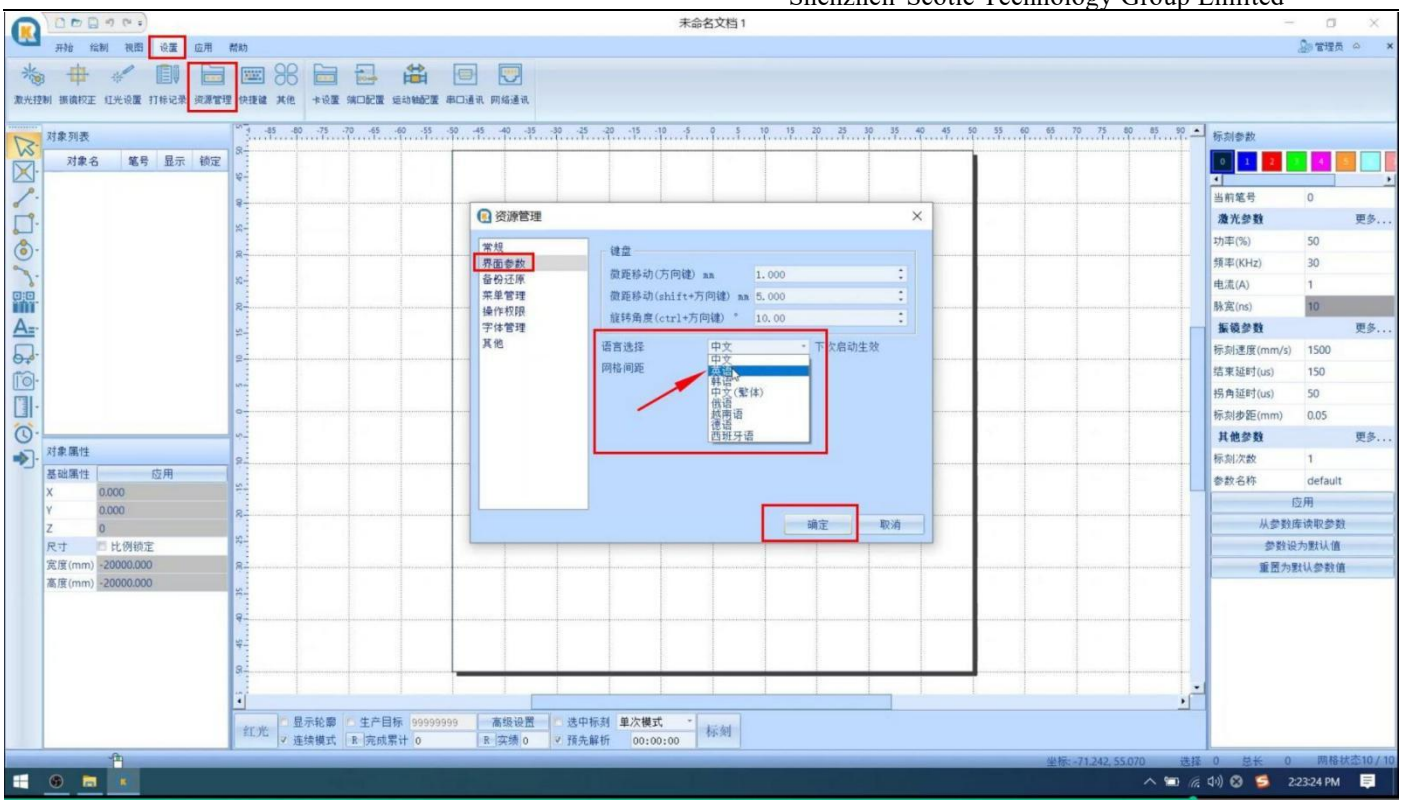
Software Home page

Note: Get a video of install software please click the below link :
https://www.youtube.com/watch?v=FtLhcoRwH9k

5.2 Change language to English

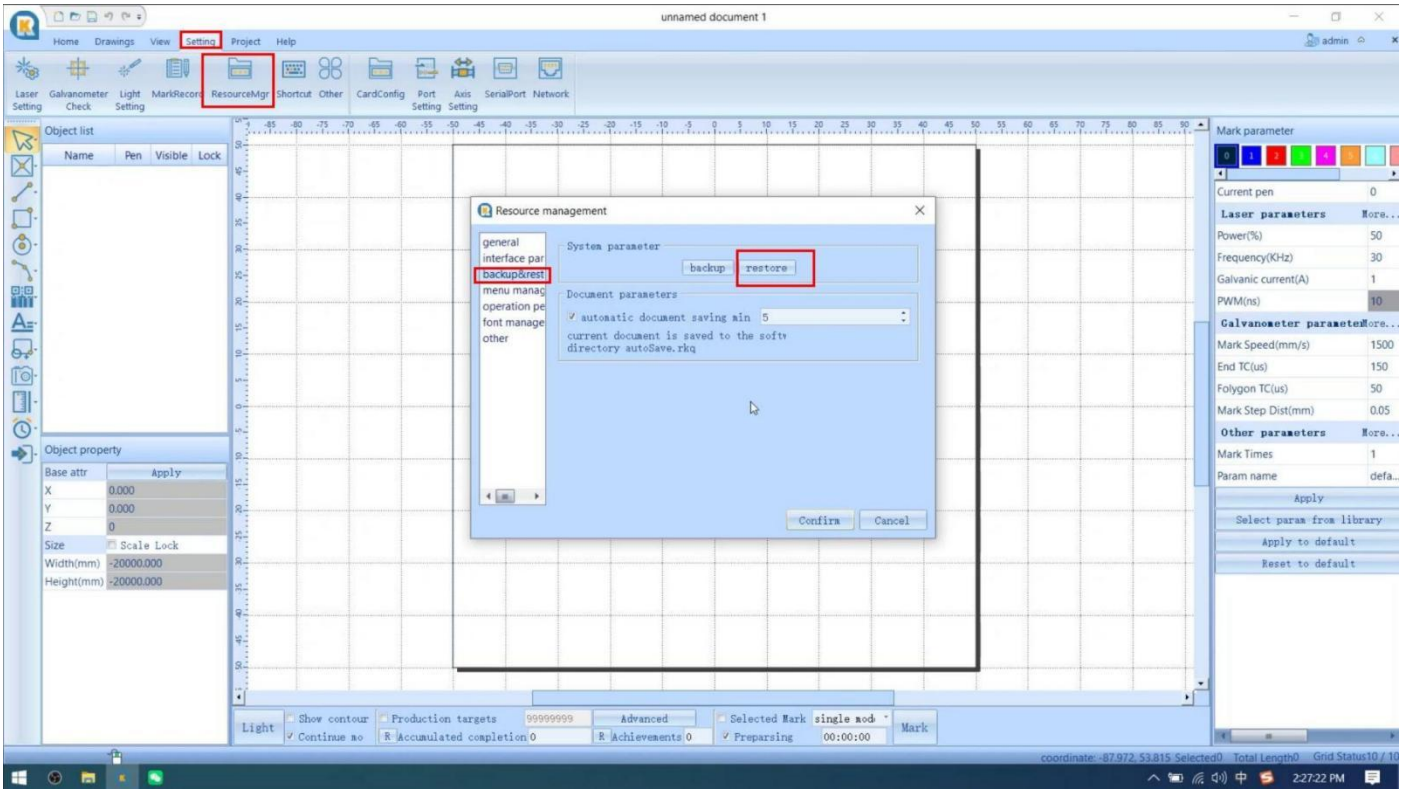
Open RK-CAD Home Page--Click 设置--资源管理--界面参数--语言选择 英语,--确定

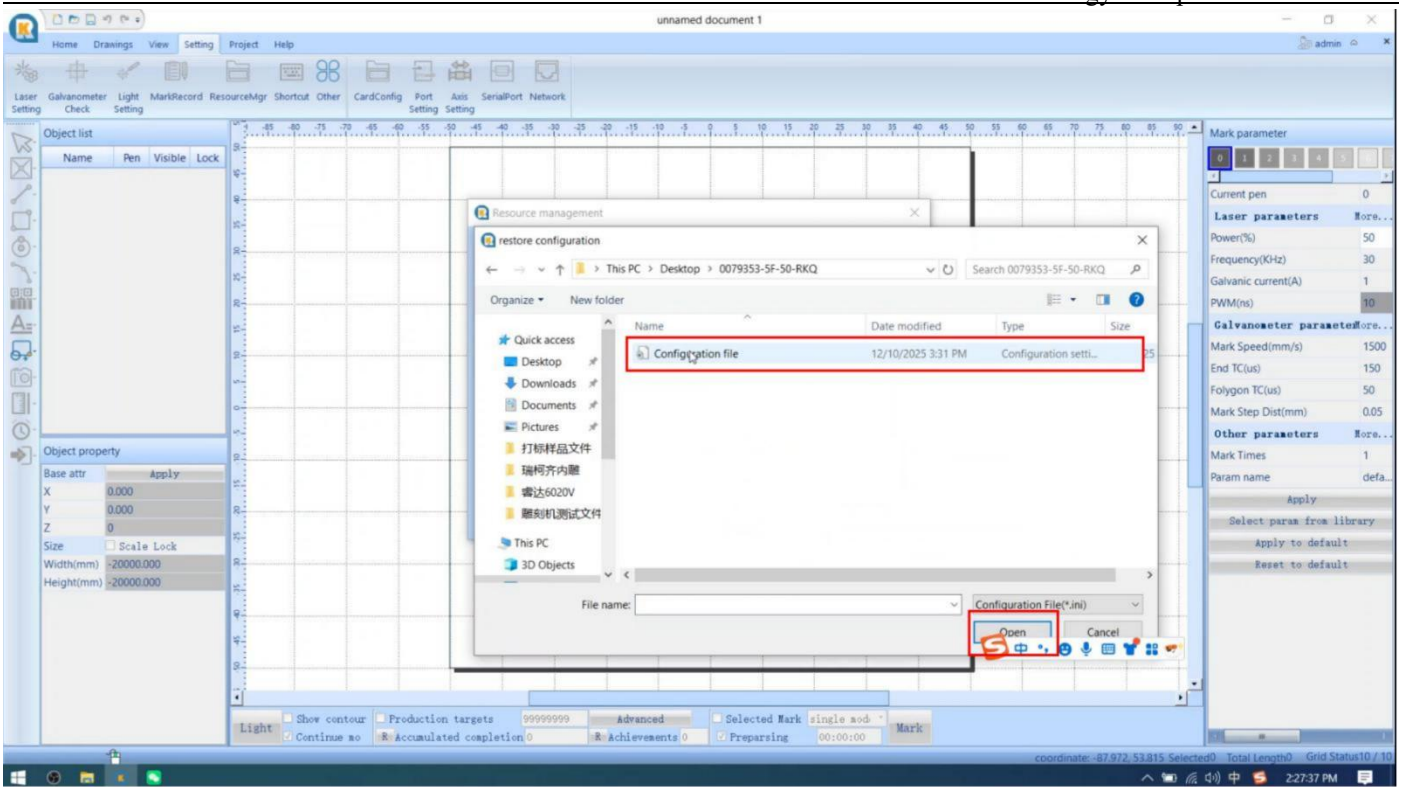
Choose the language you need, and then click OK--Close the software and open it again, and the new language will be applied.

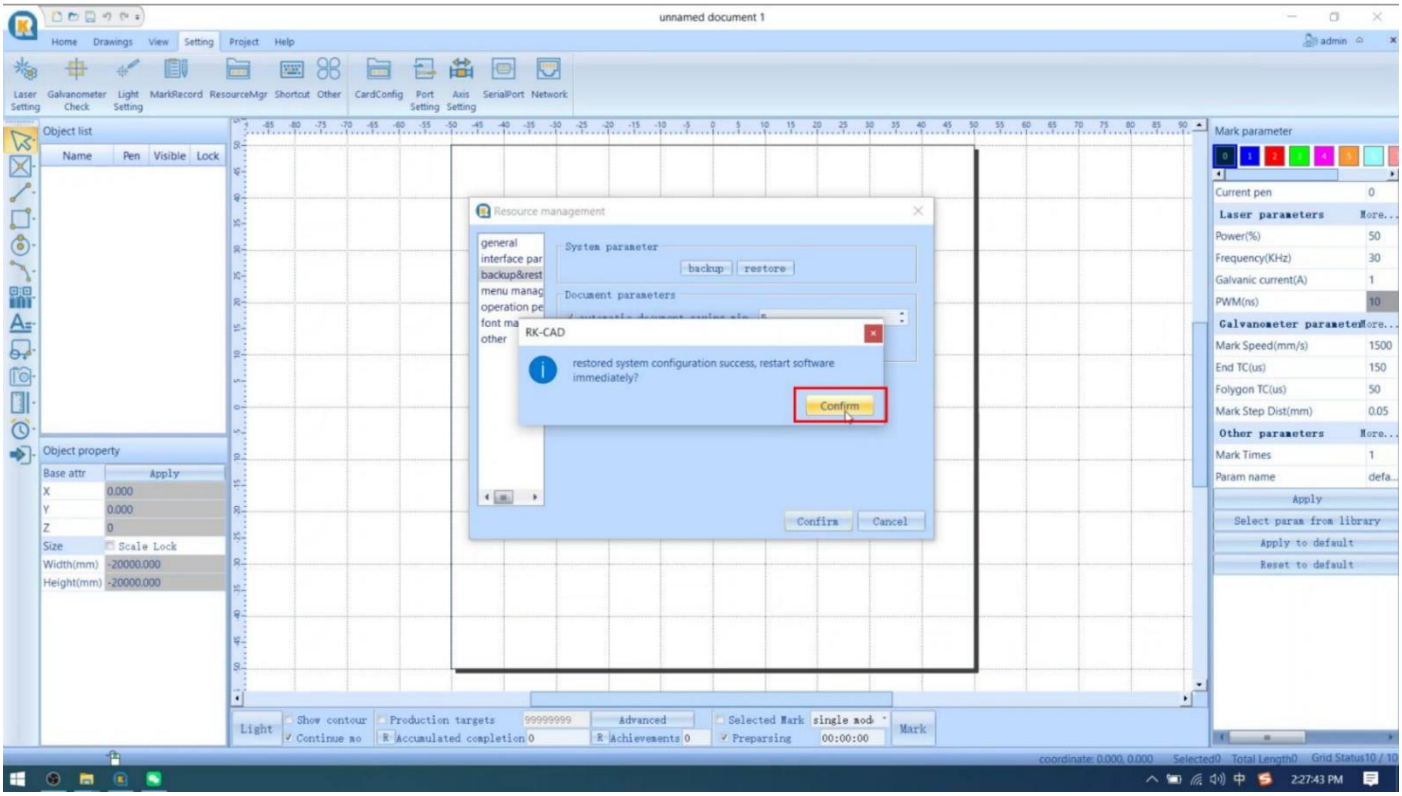


5.3 Restore configuration file

Open RK-CAD Home Page--Click Setting--Resource management --backup&reset ,click restore,select configuration file-confirm.





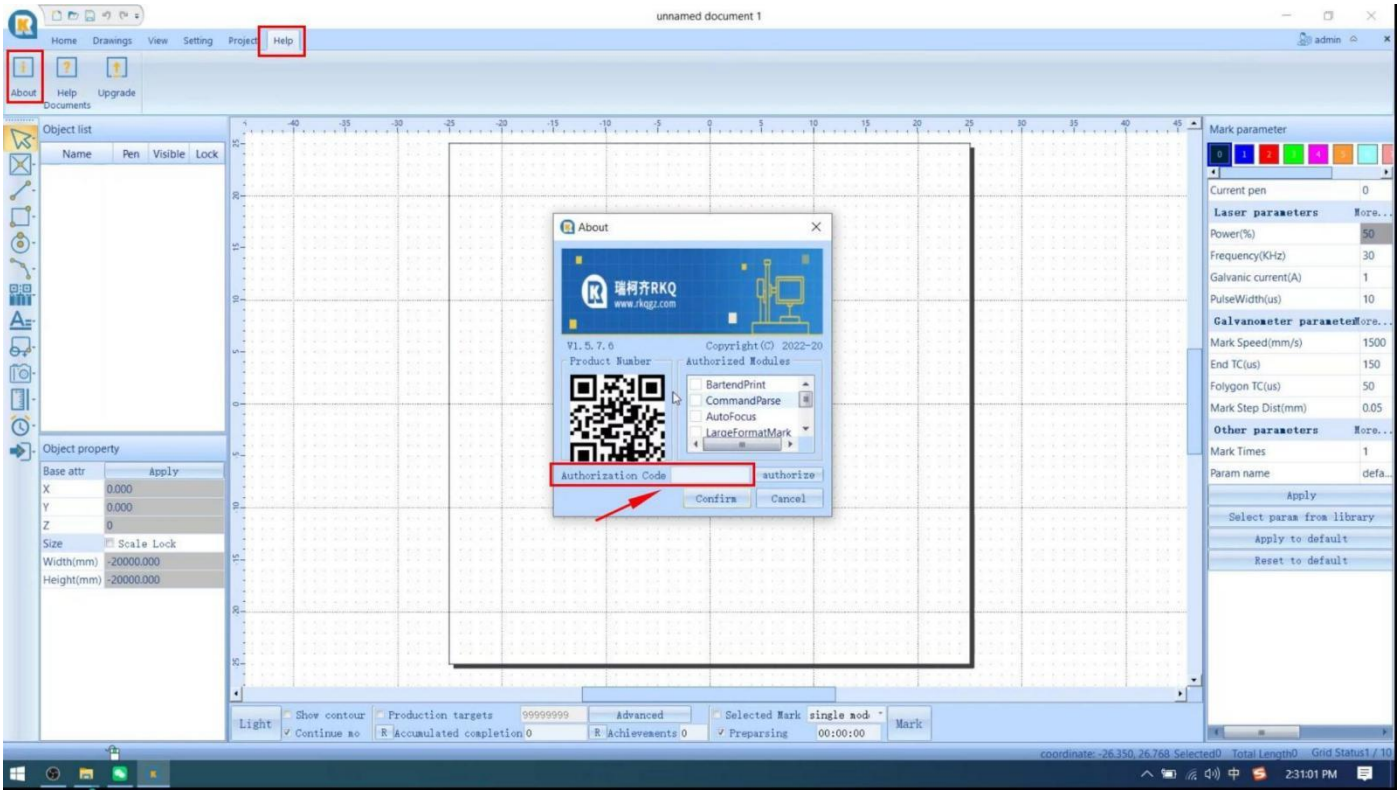


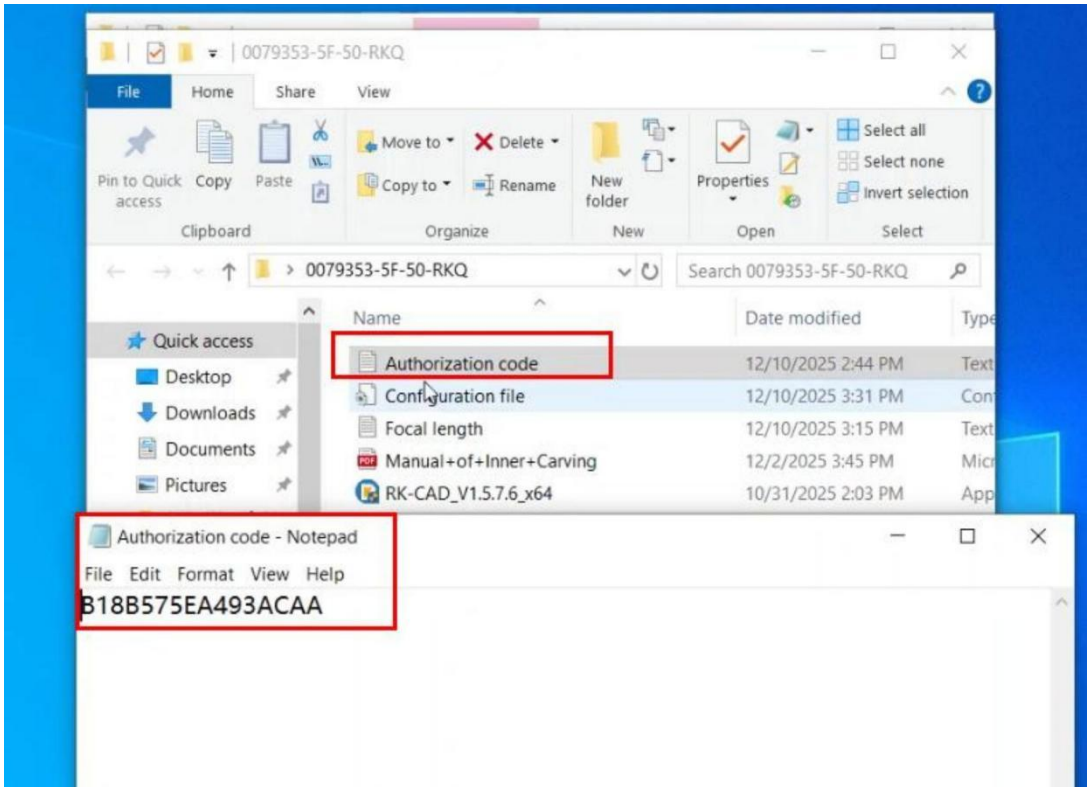
Note: Get a video of Restore configuration file please click the below link：

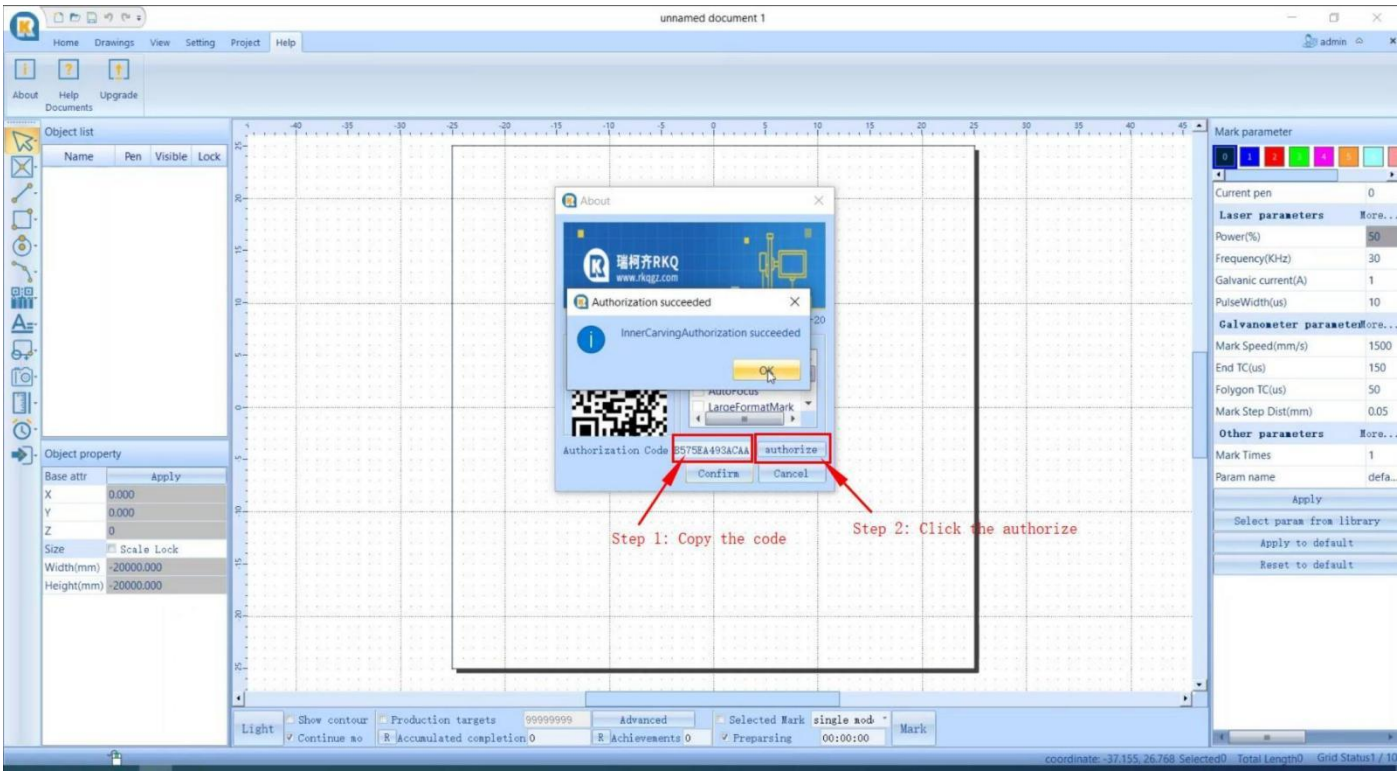
https://www.youtube.com/watch?v=o36UkemQJrs

5.4 Activate internal marking function

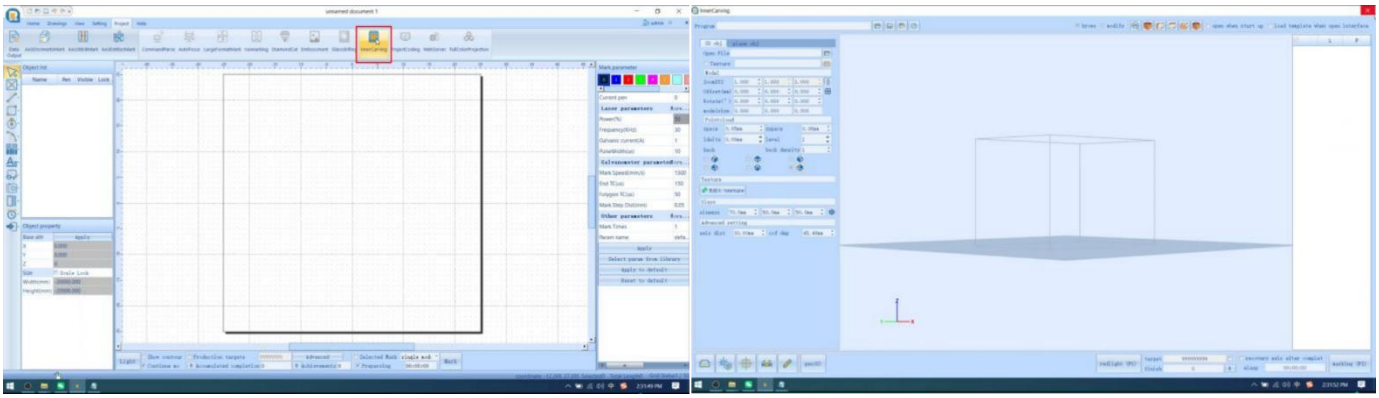
Open RK-CAD Home Page--Click Help--About --enter authorization code-Click authorize.







Note:The QR code on the page indicates that the software has successfully connected to the machine. If it has not been connected, the QR code will not appear.



Activate internal carving function

internal carving home page

Note: Get a video of Restore configuration file please click the below link：

https://www.youtube.com/watch?v=FtLhcoRwH9k

6. Focus setting

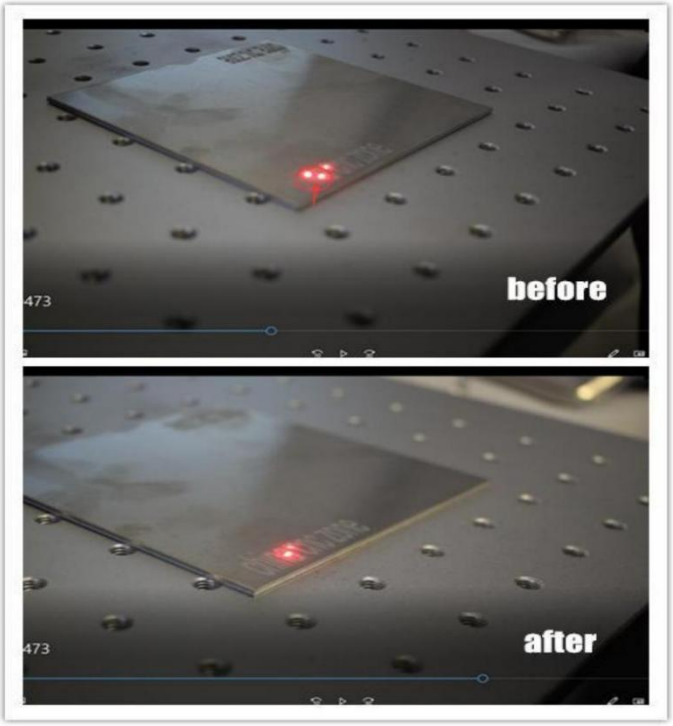
6.1 In the case of using the original field lens

This way just fit for the filed lens which come with machine. After you change new filed lens and can't use this way to adjust focus length .

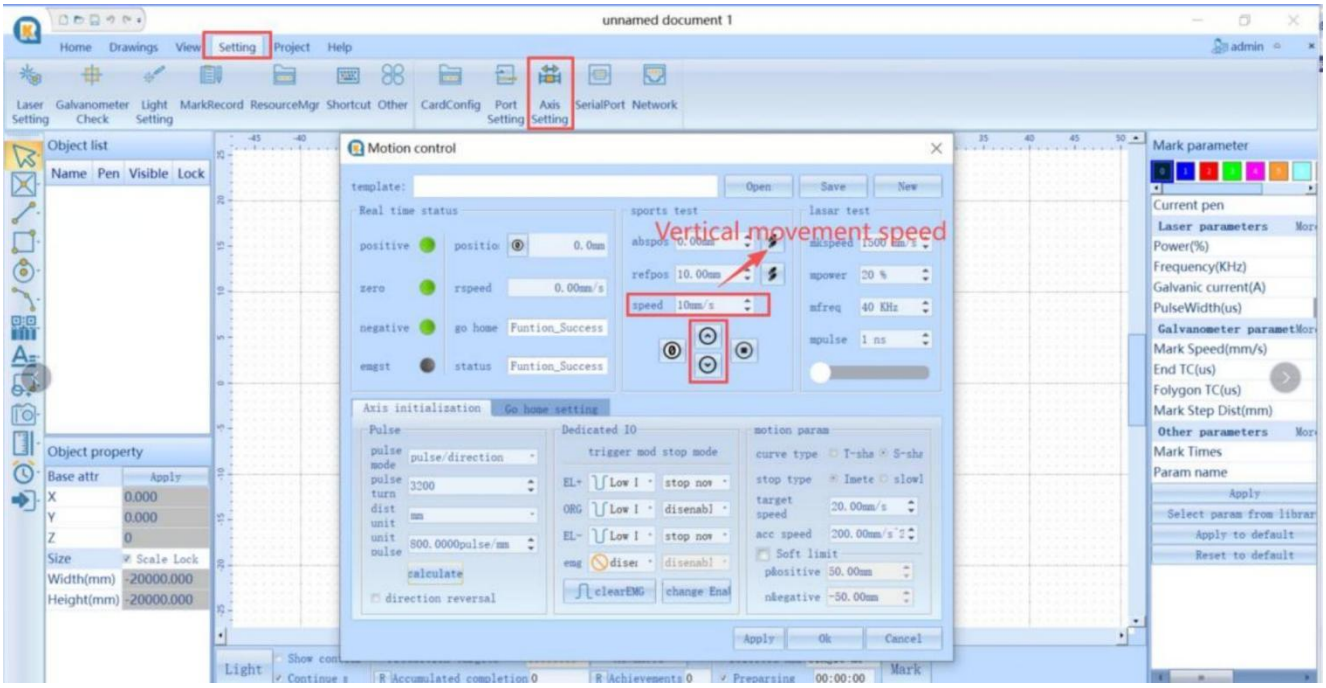
This machine has double red lights for positioning, no need focusing ruler. Double red light help customers make focus quickly and easily.

Step 1: Open the lid of Field lens and press the button on the top;

Step 2: When you turn on the machine and complete the software installation, you will see two red light spots on your work table. When the two red lights overlap, it is the best focal length.



Click Up  or Down on  the software page, then check the position of the two red lights each time until they overlap.

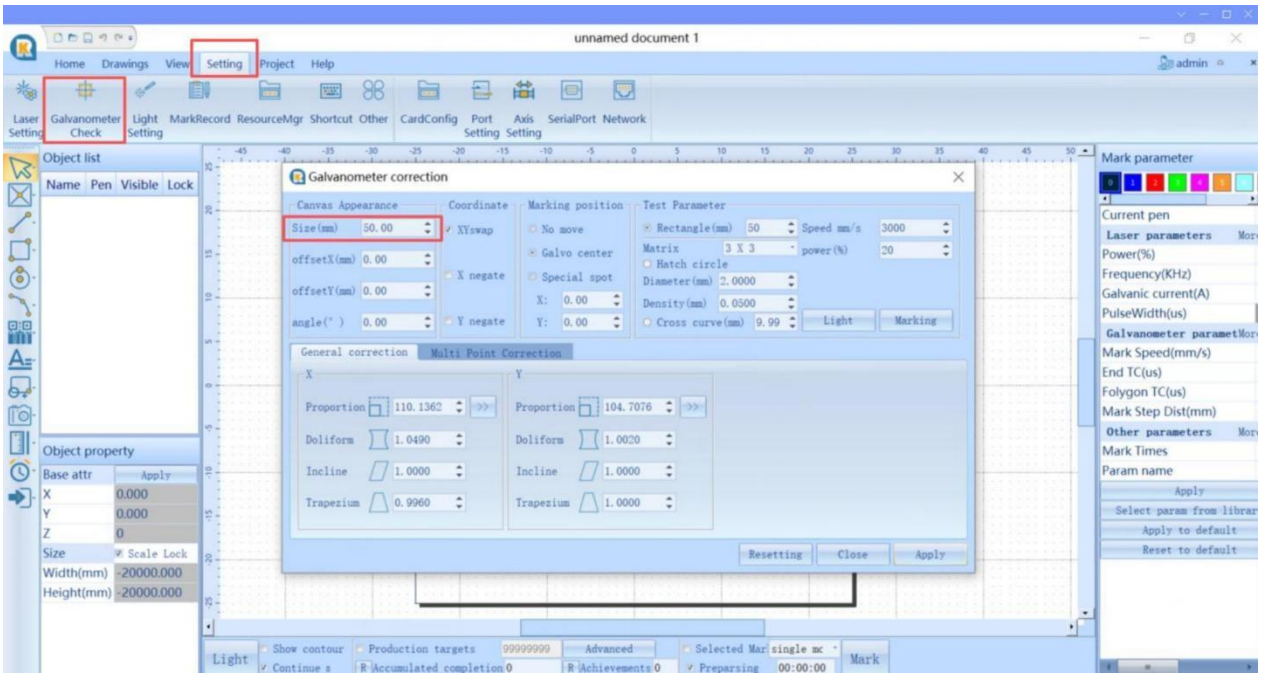


6.2 In the case of using another field lens

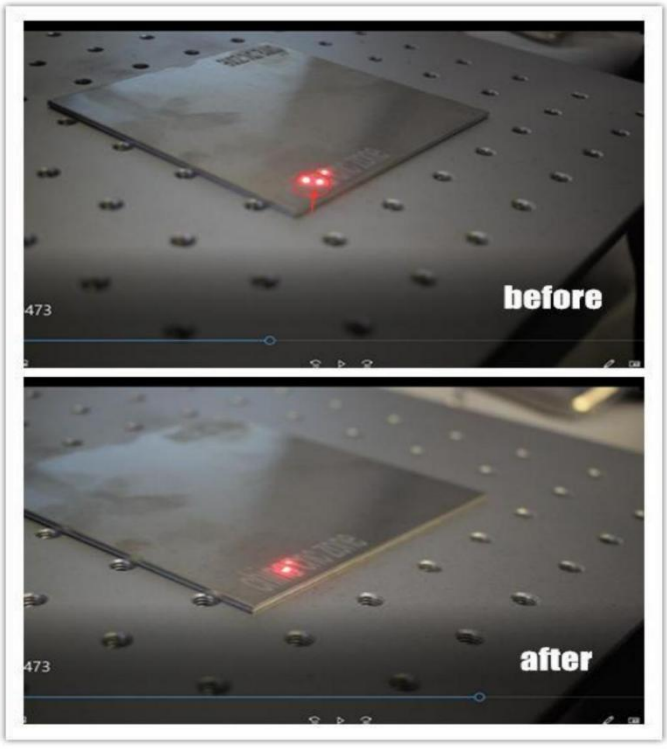
For example: if your machine is 5W 50*50mm type, the default factory setting of the machine is 50*50mm. when you want to change to a 110*110mm field lens for marking.

(1) please open the machine and software.Marking a “TEXT” file by choosing continue,Adjust the lifting wheel through software(Refer to the focus setting way) till get the brightest spark of laser (or the sharpest voice of laser), then this point is the best focus length.

(2) Enter the size of the field lens that needs to be replaced in software,if is 110*110mm,change the "size(mm) "to 110.



(3)When the machine is at the best focal length, loosen the screws,Finally you adjust double red light overlap by the screw, this point is best focus lenght. When the two red dots are coincident, tighten the screws to complete setting. So each time when you put different thickness of materials, just adjust Z axis by software and make the two dots coincident will be ok.



6.3 Field lens replacement

Step1: Hold the field lens and then turn the field lens clockwise

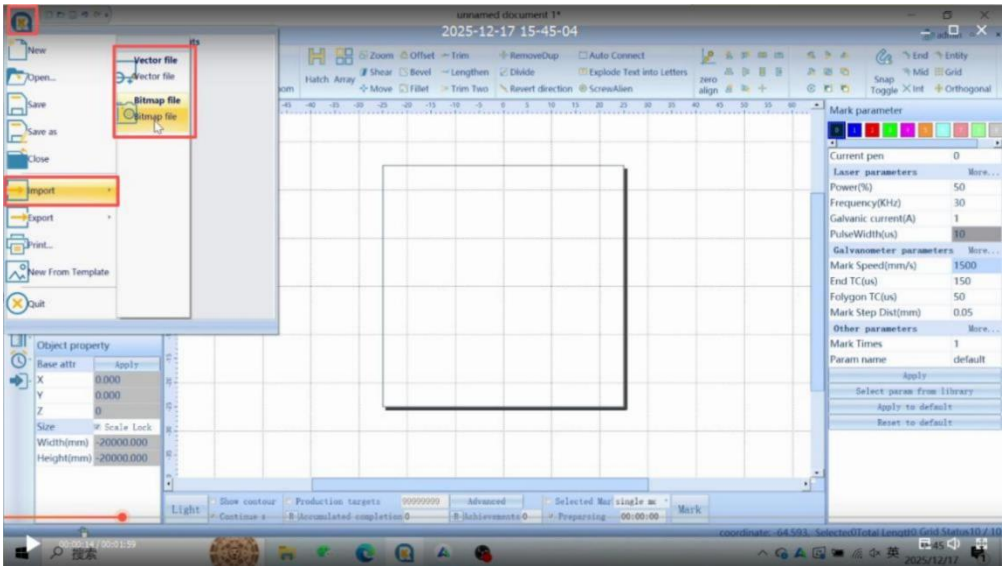
Step2: Software change the filed lens: Click "Files"--Parameter system parameter--change the filed size after replacement

Step3: Readjust the focus (Refer to the focus setting way)

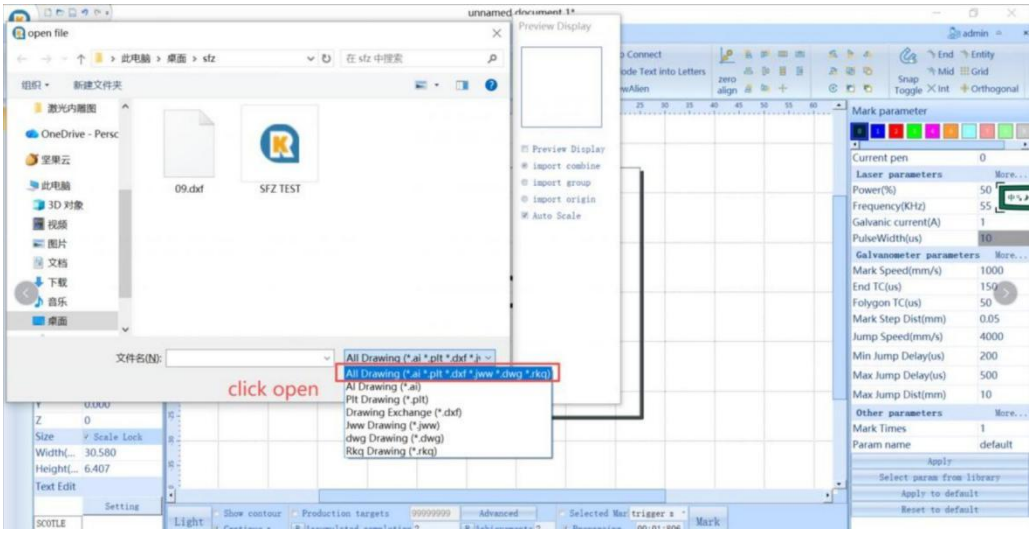
7. How to use the software to mark?

7.1 How to use the software to 2D mark?

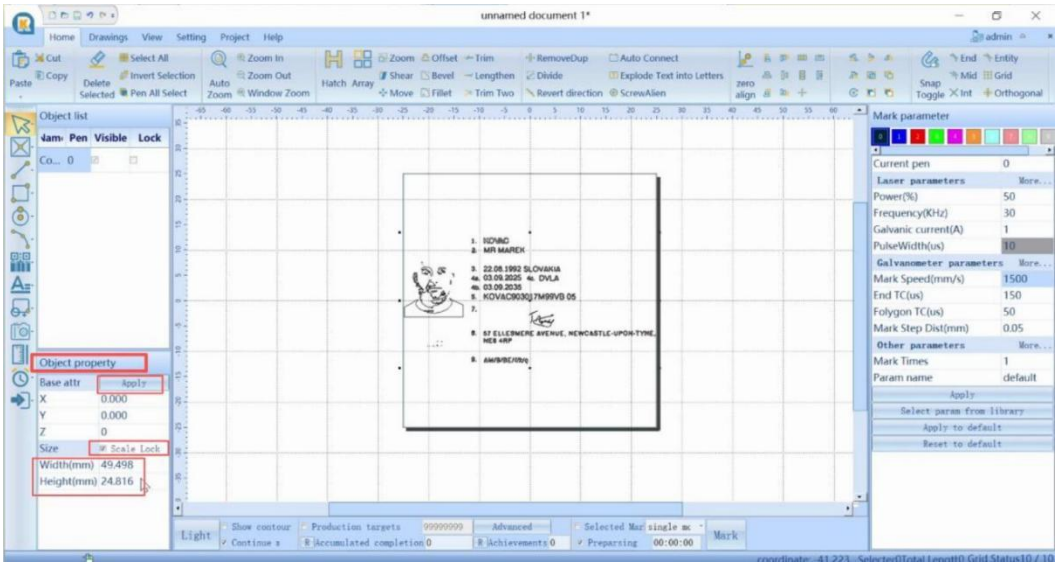
Step 1: Click in the upper left corner--Import--Click Vector film or Bitmap file(Image Format)



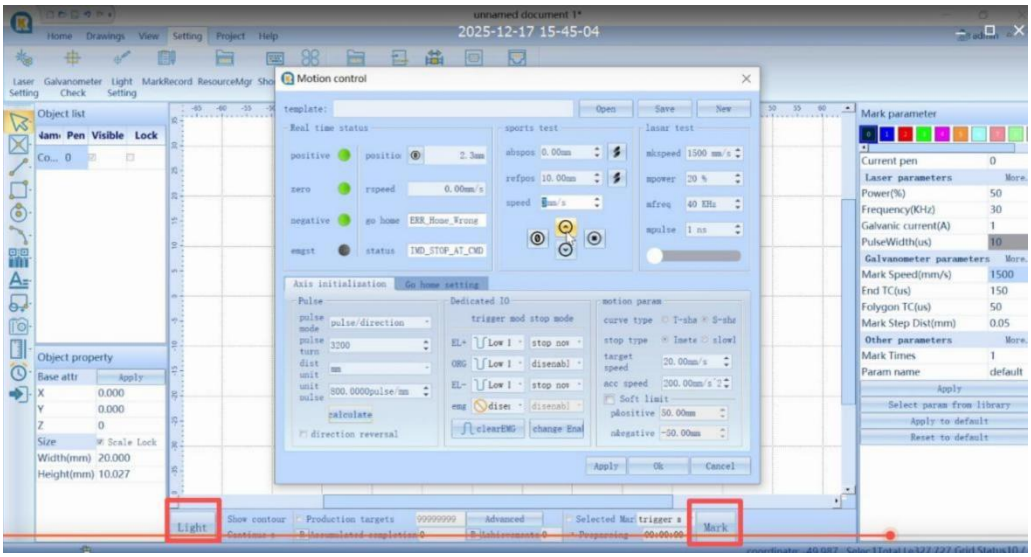
Step 2: Look for the Picture you'd like to mark, Click Open



Step 3: Under Object properties,can adjust the image size. After setting the Width (mm) and clicking Scale Lock, then click Apply, and the Height (mm) will be automatically adjusted based on the set width.

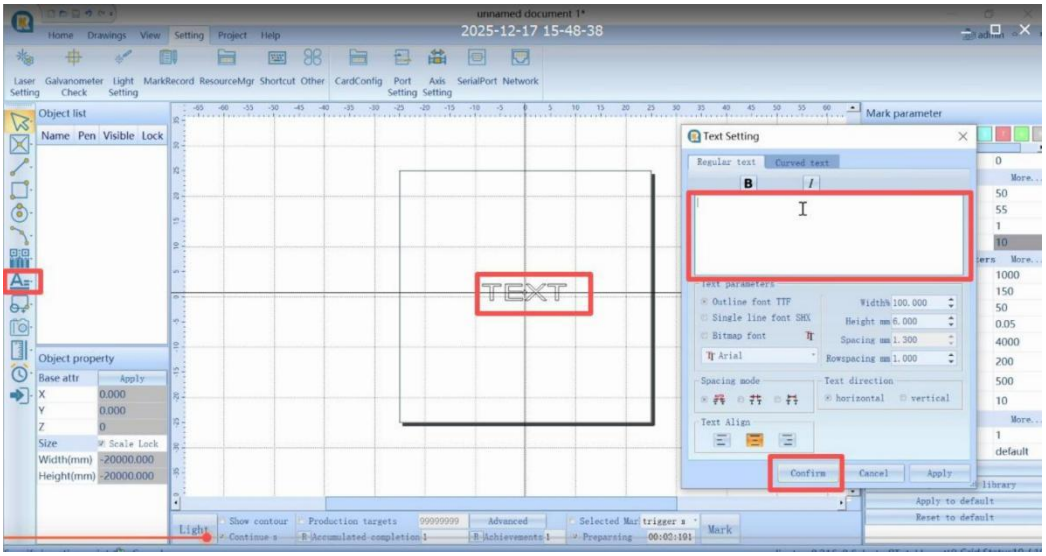


Step 4:Adjust the focus(Refer to the focus setting way),Click Light--Mark



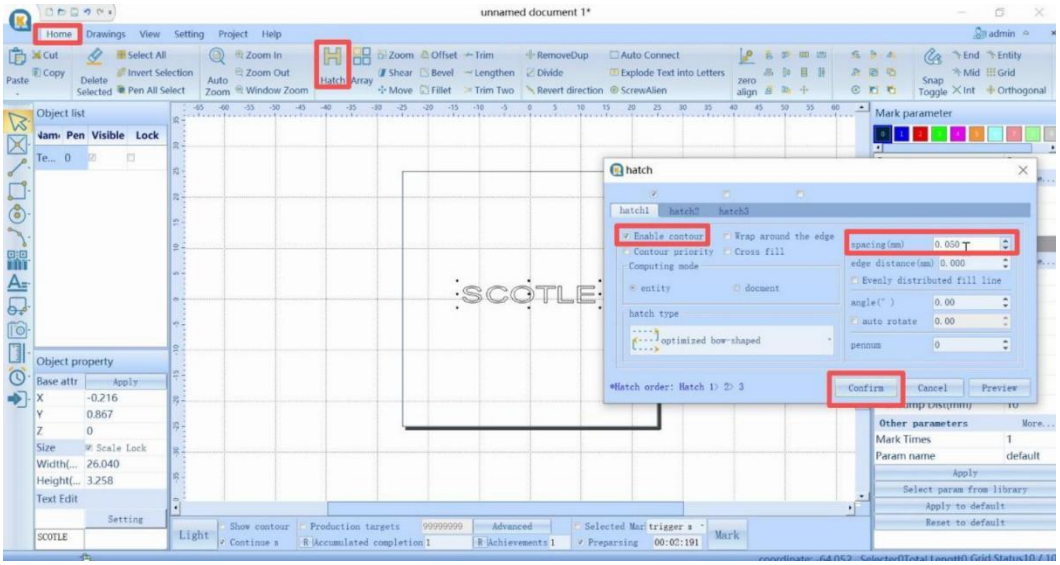
7.2 How to create text directly on the software

Step1: Click --Click on the Text--Enter content within the white box--Confirm.

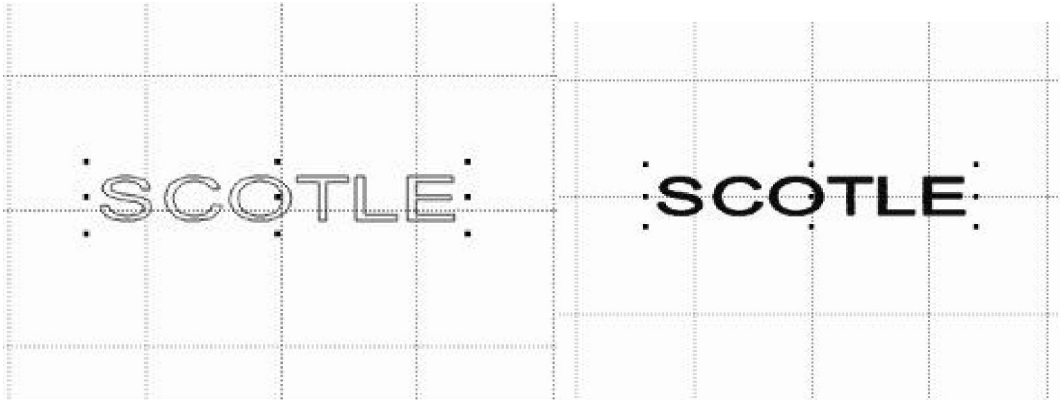


Step2: Click the Home--H, Tick the “Enable Contour” to make the marked contours clearer.Space (mm) Fill in 0.05.

Fill in the text if you need; For example, if the text you type is empty, it needs to be filled to obtain solid text.(Refer to the sample pictures)

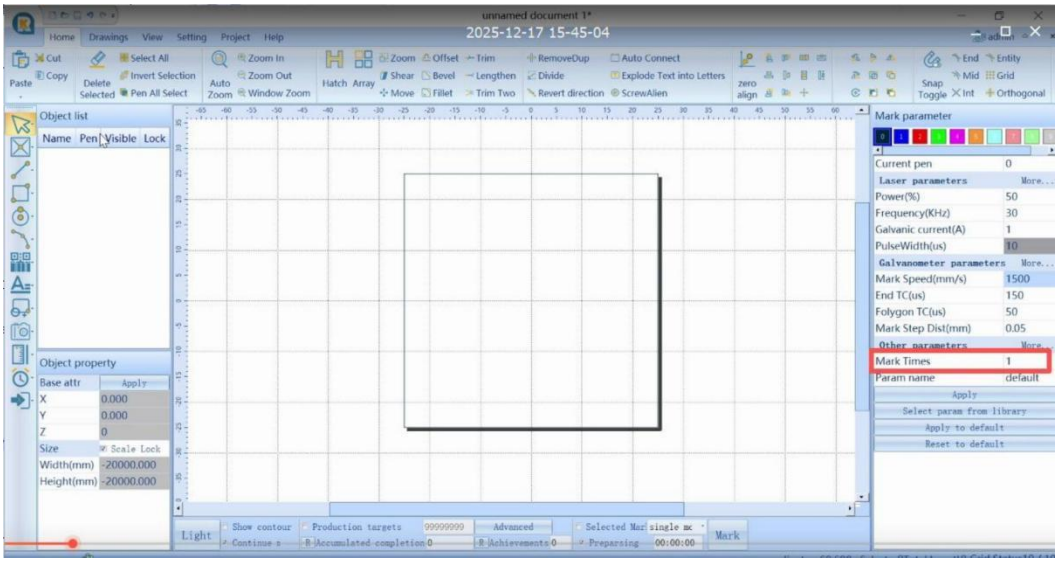


Sample:



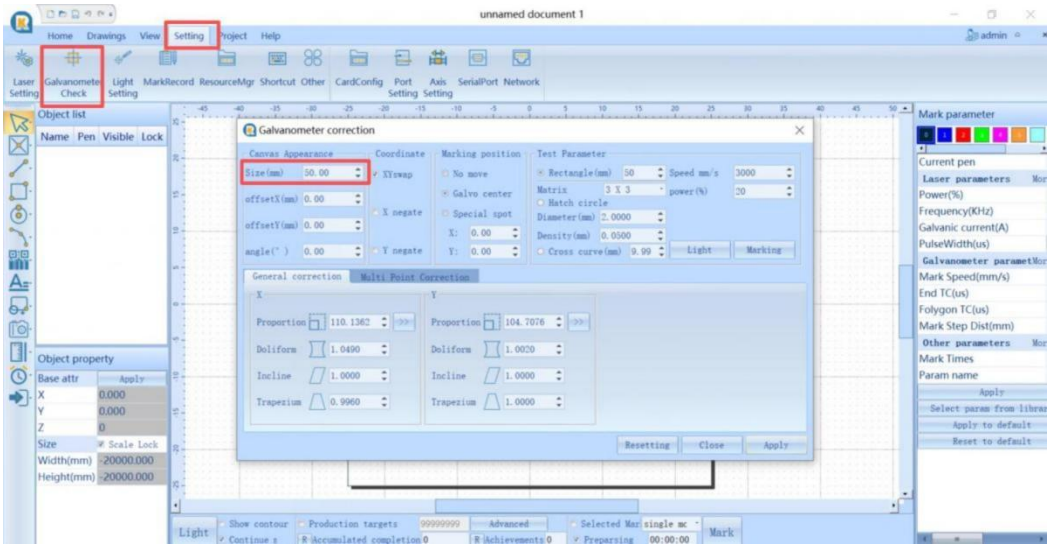
8. How to set up single marking and multiple times marking

Find out the Bottom left “Mark Times”,The number of marks is determined by the amount of data entered.



9. How to set up marking range?

Change the size (mm), for example, the field lens size is 50mm × 50mm. the changed value must not exceed the field lens dimensions of 50 × 50mm.

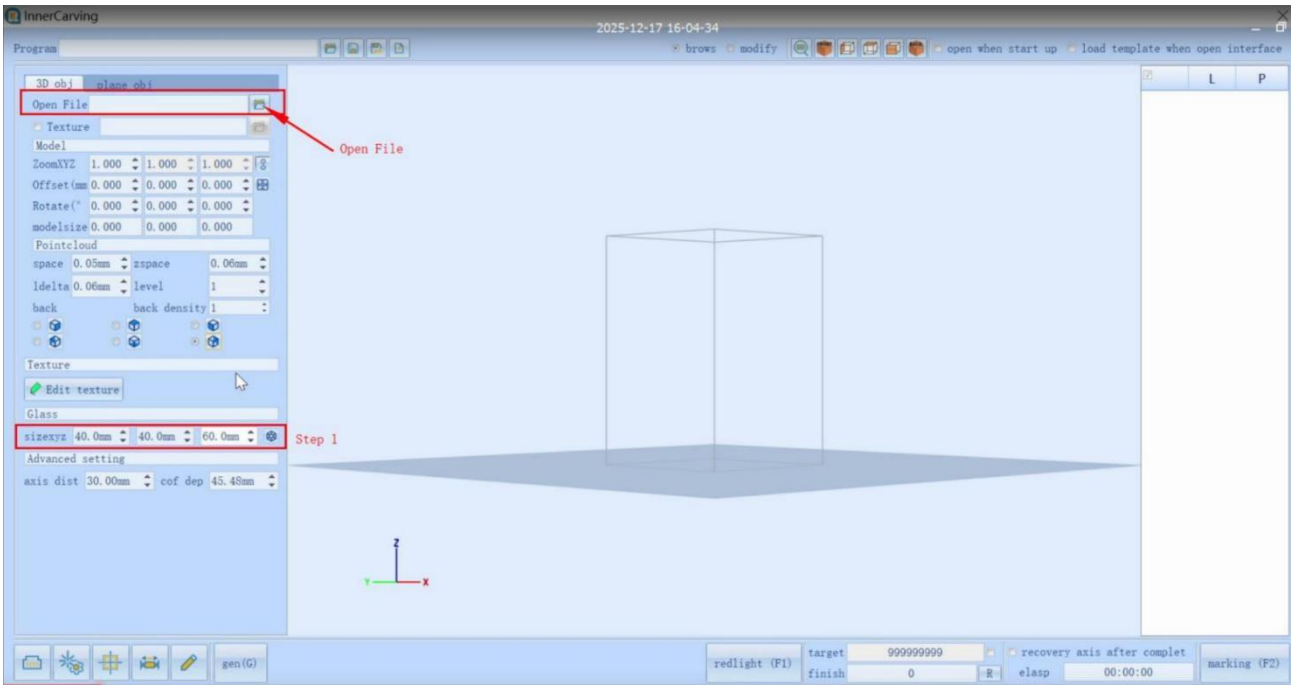


10. How to mark inner carving?

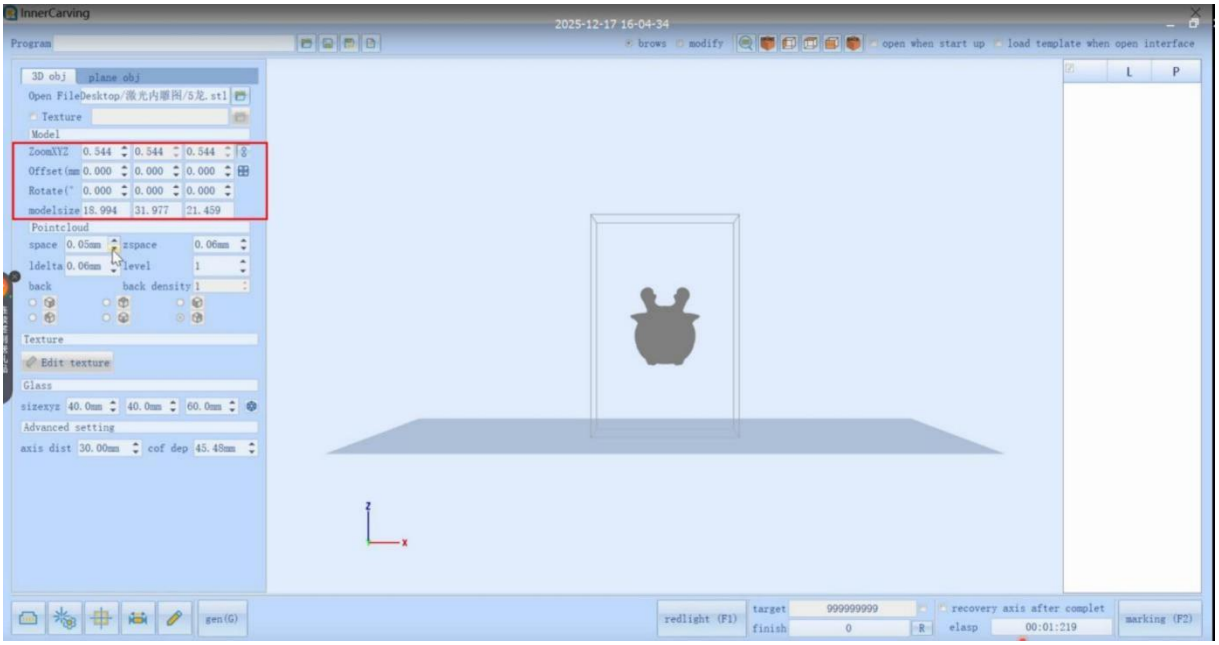
10.1 3D obj marking

Step 1： Open Inner carving - enter the size of the crystal

Step 2: Open the file you want to carving

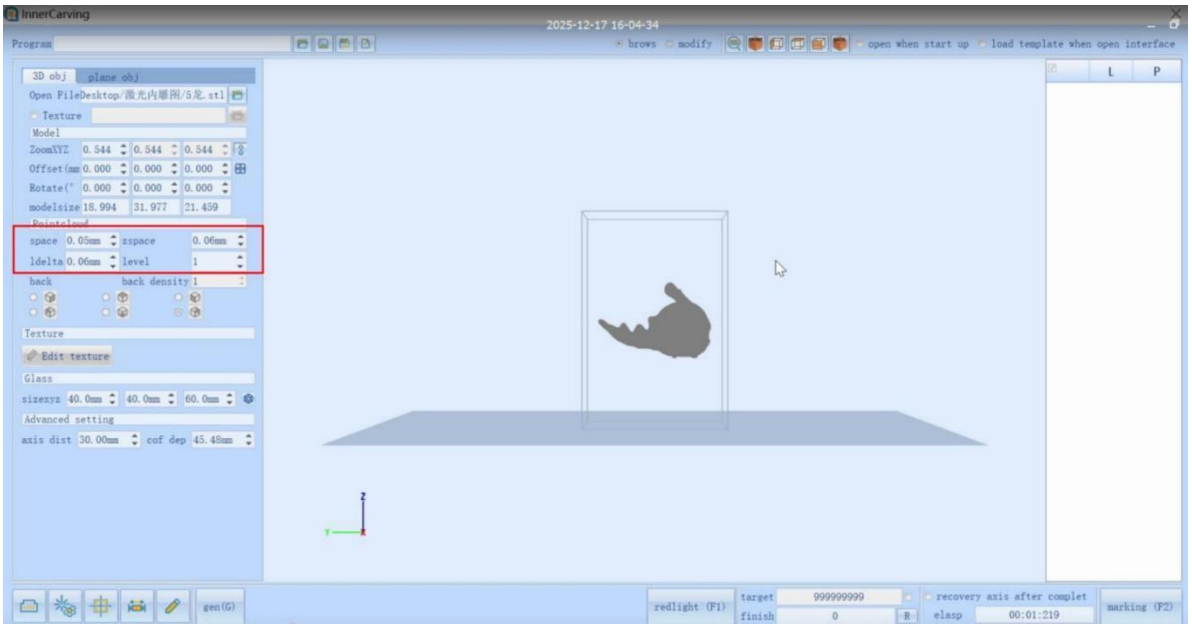


Step3: Adjust the size of the image inside the crystal



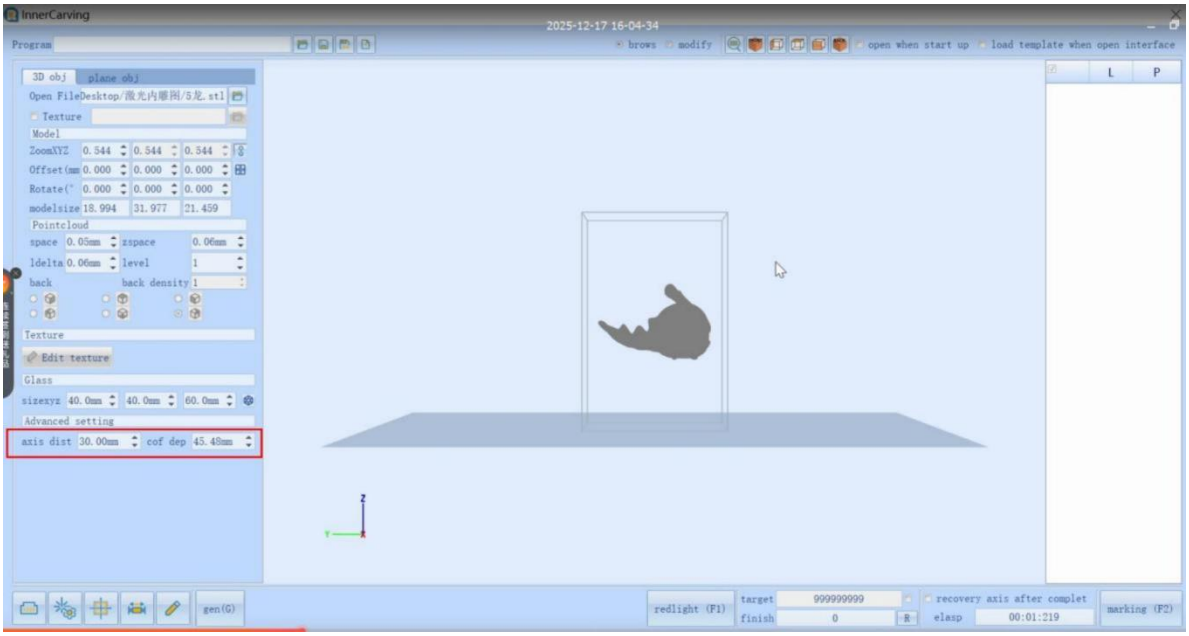
Step 4: Set point spacing. The default parameters:

Space(X,Y)=0.05mm; zspace=0.05mm; Idelta=0.06mm; level=2

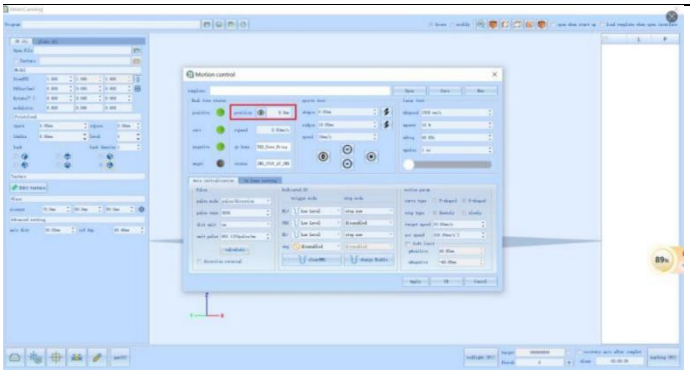


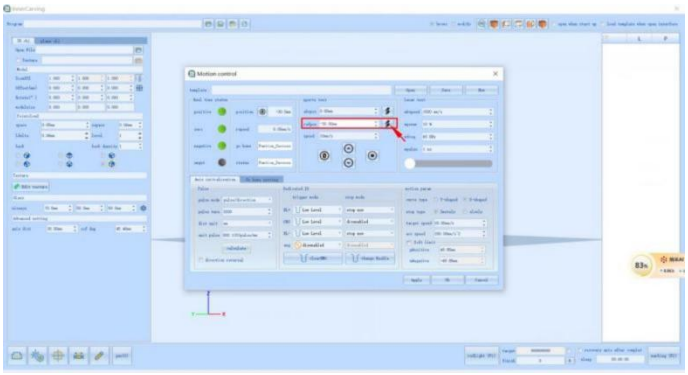
Step 5: Axis dist and Cof dep setting. The default parameters:

K9 crystal has undergone our refractive index testing, and the Axis dist （1/2 of the crystal height) and Cof dep do not need to be changed. If you are using other materials for internal carving, you will need to re determine the axial depth and correct the deep carving

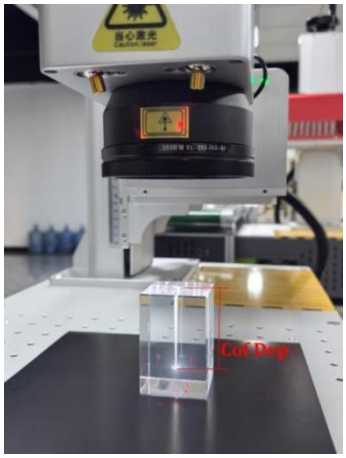


Tip: How to find out the axis dist and cof dep ?





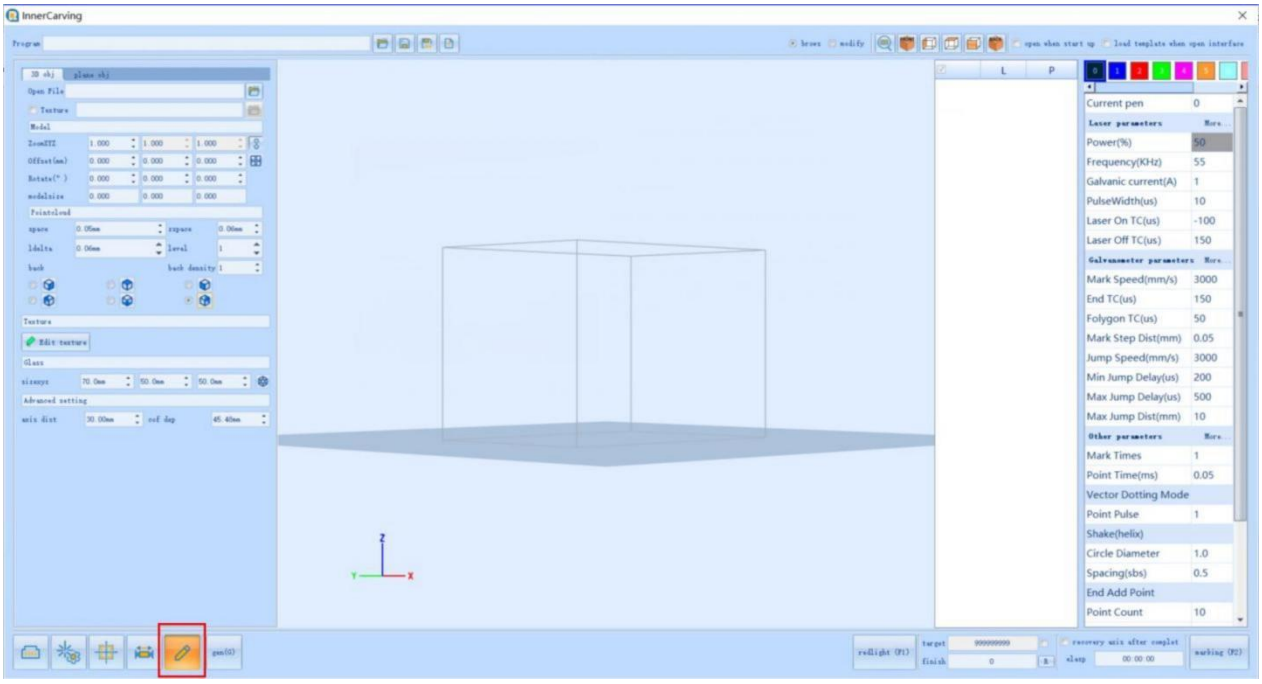
Step1: align two red light points on the crystal surface and set it as the best focal length



Step2 : Enter 30mm (half of the crystal height) and move the Z-axis down 30mm

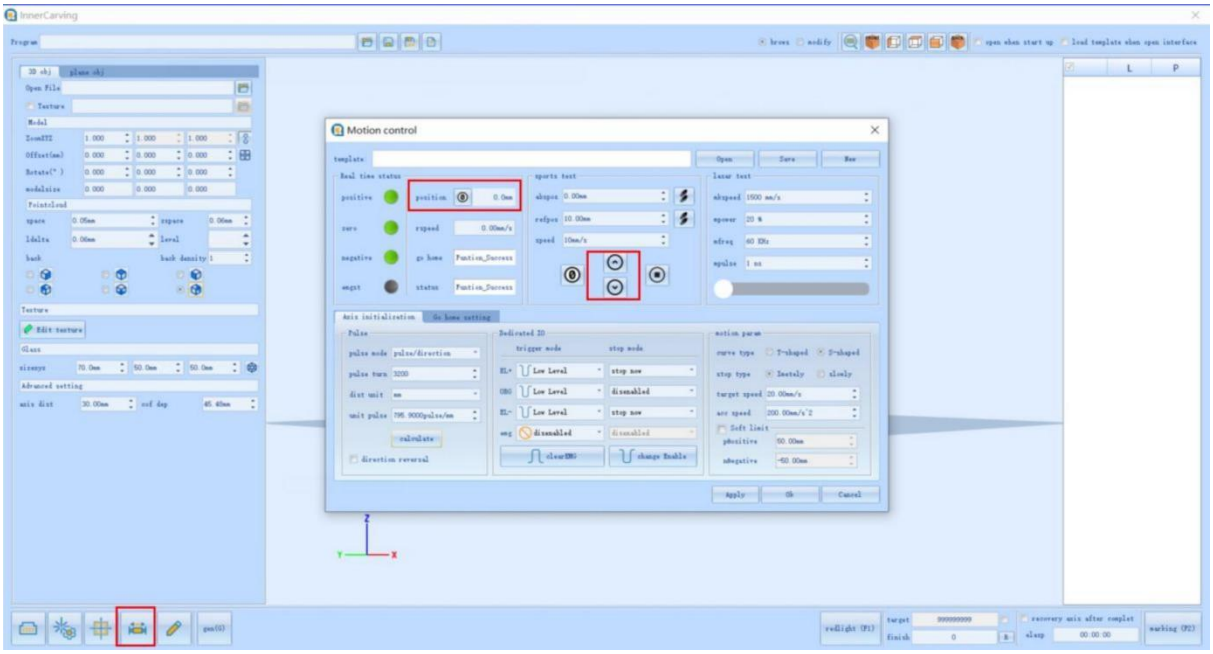
Step 3: The position of light emission is the refractive point, and the distance from the position of light emission to the crystal surface is the Cof dep.

Step 6： Click  Set laser parameters:



Step 7： Click  , Adjust the best focal length and set the position to 0

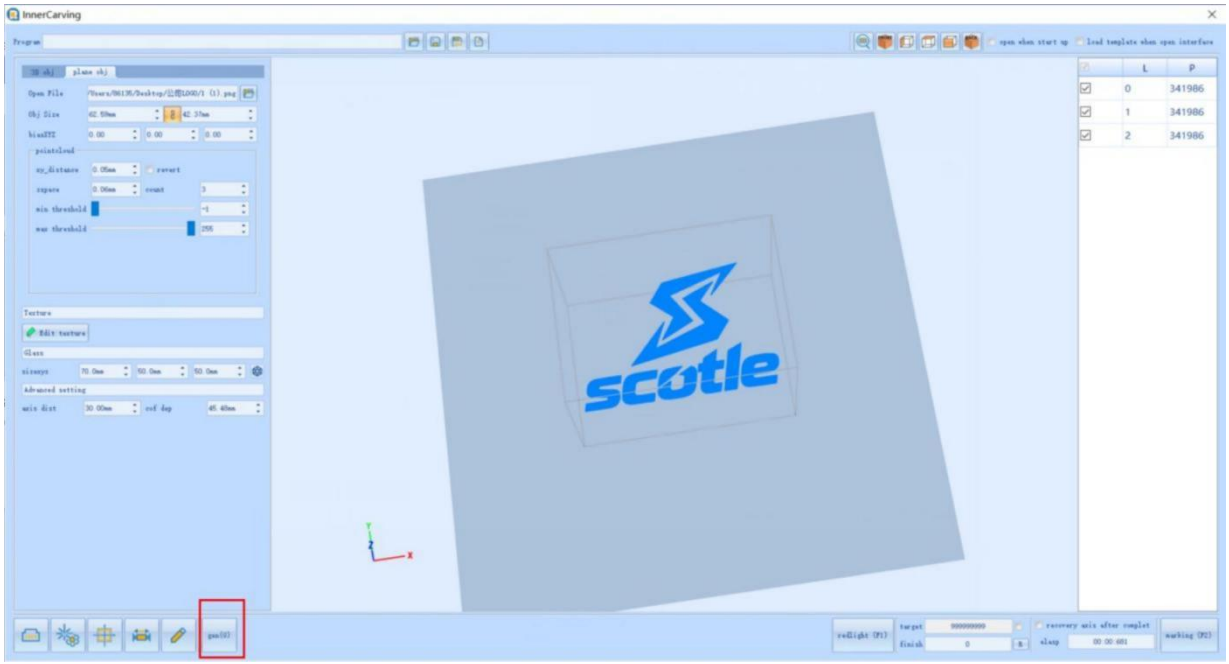
Click the redlight (F1) and marking (F2)



10.2 Plane obj marking

The steps are the same as 3D obj, except that after importing the 2D file, you will need to click the Gen (G) ,so 2D files will be displayed.

Tip : When marking a plane obj, we often suggest mark multiple layers to make them clearer (count >2)

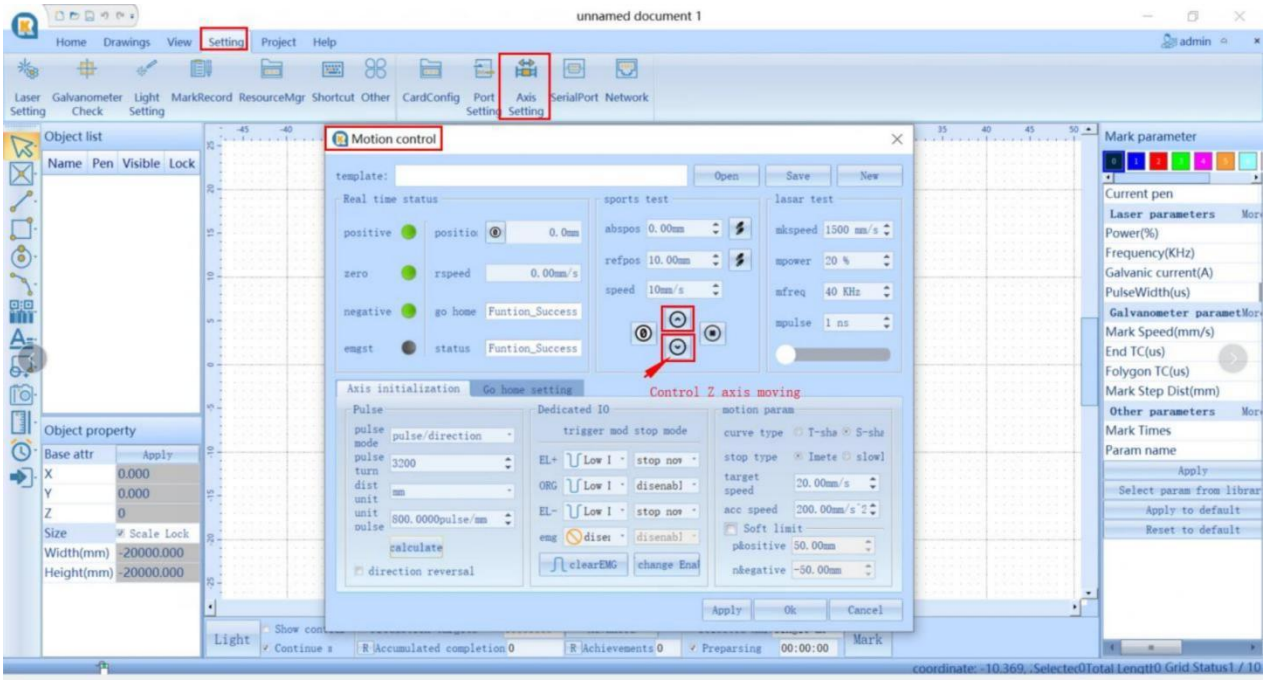


11. Rotary axis setting （ if you bought a rotary axis ）

Step1: Taking out the rotary axis and connect it to the machine as following picture.

Step2： Fixing the marking material to the rotary axis, hold the material by the tool until the material is fixed on the rotary axis.

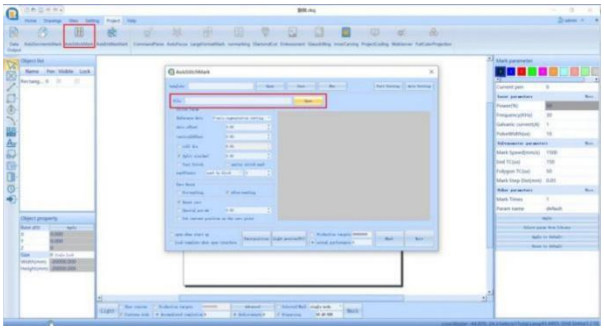
Step 3: Focusing. Adjust the Z-axis height in the software to make the two red light points coincide



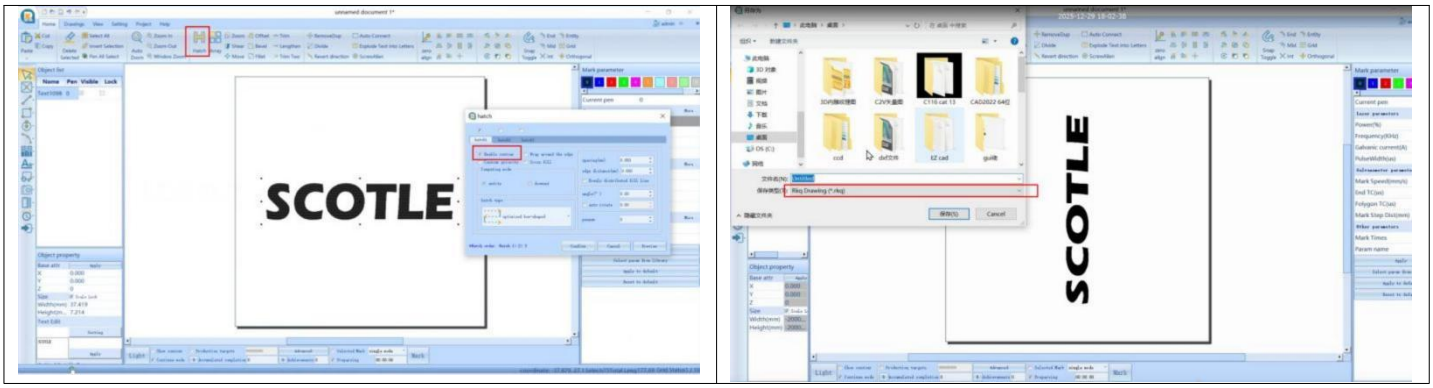
12. Doing marking on rotary axis

Step 1 ： Option 1: Click 

, open the file you want to mark



Option 2 ： Input text,and then save it as rkq format

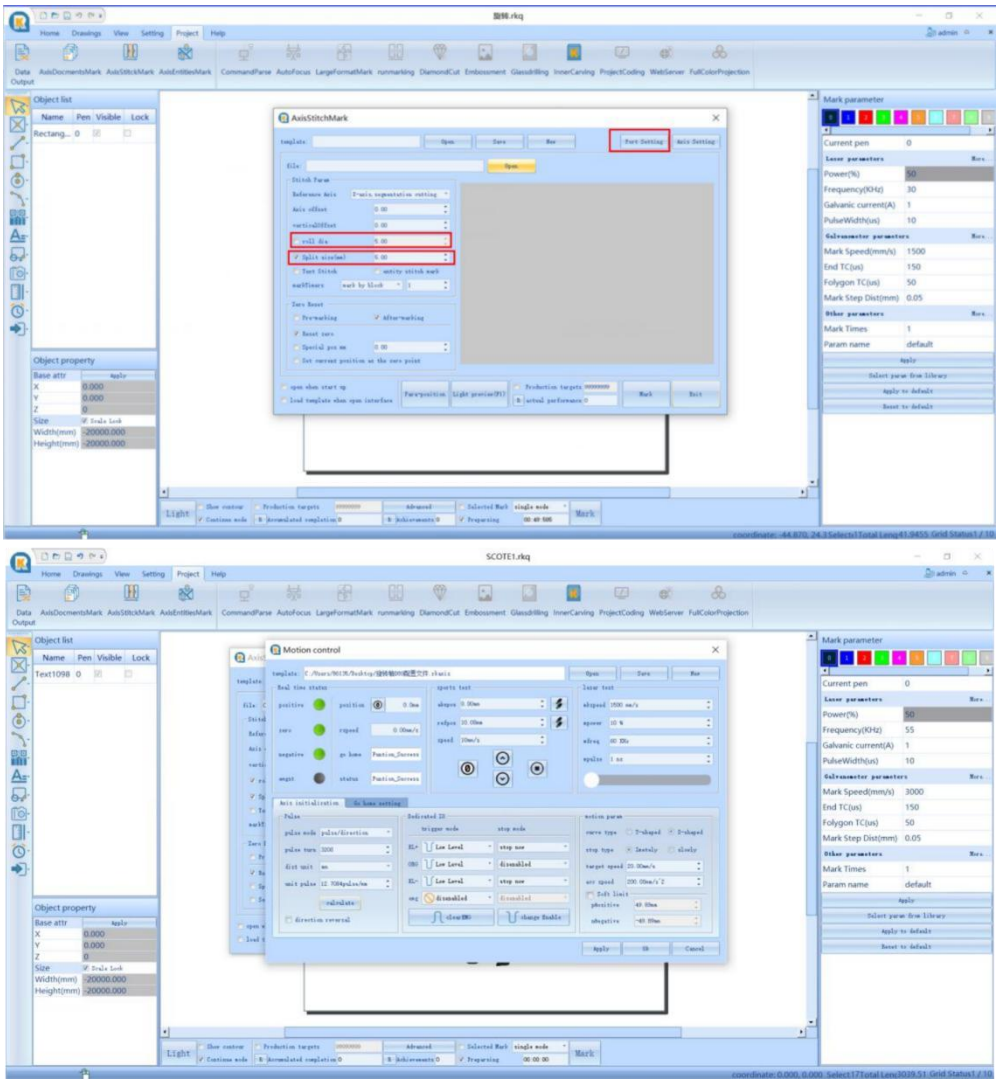


Step 2 ： Import the parameters of the rotary axis, This default file is also stored on the USB drive.

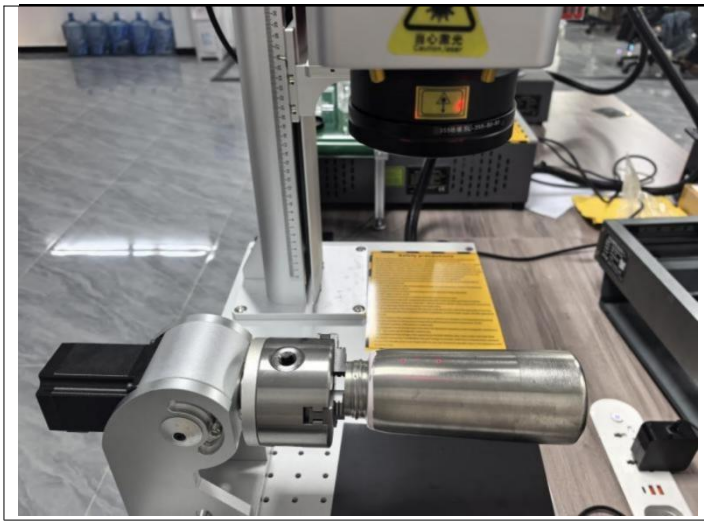
Note:The machine defaults to Z-axis electric lifting function at the factory. If you need to use a

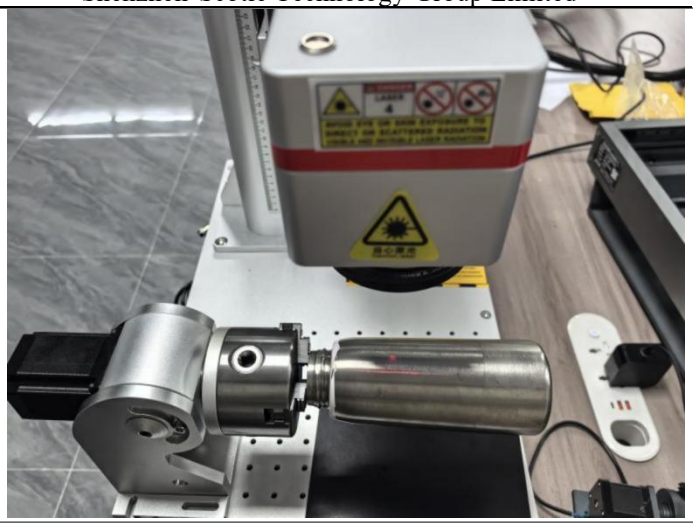
rotary axis function, please copy and open the rotating axis parameters in the USB flash drive, and switch to Z-axis manual lifting. If the rotation axis is no longer needed, copy the Z-axis parameter file again and restart the Z-axis electric lifting. (Configuration file for parameters only).

Roll dia =measure the diameter of the marked item
split size(mm) = Distance of laser marking marks



Step 3: After connecting the rotation axis, it is not possible to use the Z-axis automatic lifting to determine the optimal focal length. Therefore, it is necessary to manually rotate the Z-axis to make the two red dots coincide and confirm the Best focal length.

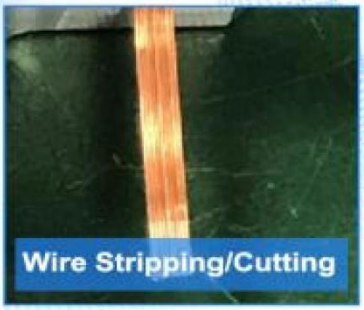




Step 4:Click Light previwe (F1) and Mark

13. Reference parameter

Note: These are just some sample data references. For specific products and effects, you need to adjust the parameters yourself



Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
5W UV LASER Paint Stripping	F=160mm	10X	0.01mm/s	1μs	150KHz	1000mm/s
Cutting			0.01mm/s	1μs	140KHz	120mm/s

Process analysis: Fiber laser stripping will cause oxidation, and will lead to plastic melting affect the subsequent soldering process, UV light source stripping plastic heat-affected zone, cutting copper wire burr small

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
5W UV LASER	F=254mm	10X	0.04MM	8μs	45-60 KHz	2000mm/s

Process analysis: The individual pulses of energy are more moderate so that they damage the substrate as little as possible, and the material removes more cleanly with UV stripping.

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
5W UV Laser	F=170mm	10X	0.02mm	1μs	80-100KHz	20mm/s

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
10W UV LASER	F=100mm	10X	/	1μs	120-150 KHz	/

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
5W UV LASER	F=254mm	10X	0.04mm	4μs	80-100KHz	2000mm/s

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
5W UV LASER	F=170mm	10X	/	1μs	30-40KHz	10mm/s

Process analysis: The ceramic surface is a highly reflective material that requires a high energy density for marking, otherwise it is prone to instability or light color.

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
5W UV Laser	F=254mm	10X	/	8-12μs	45-60KHz	2000mm/s

Process analysis: Narrow pulse width version of the laser, the peak power is higher in the marking can be done without feeling the effect.

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
5W UV LASER	F=254mm	10X	0.08mm	1-2μs	30-40KHz	2500mm/s

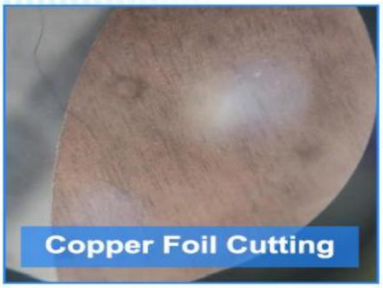
Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
5W UV LASER	F=163mm	10X	0.03mm	1-3μs	30-40KHz	1000mm/s

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
5W UV LASER	F=254mm	10X	0.03mm 0°+90KHz	6μs	80-90KHz	1000~1200 mm/s

Process analysis: As the surface layer of plastic is not broken, but is presented as a plastic heated blistering effect. Therefore, in the use of high-frequency relatively more heat for debugging.

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
10W UV LASER	F=100mm	10X	/	1μs	70KHz	1000mm/s

Process analysis: Higher energy is required to cut the mulch film, and the fewer cuts you make the less carbonization will occur.



Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
10W UV LASER	F=100mm	10X	/	1μs	120-150 KHz	150-200 mm/s

Process analysis: <0.1mm copper foil cutting with UV can get a better edge effect, while the blackening brought about by the thermal effect is more slight.

Laser source type	Filed lens	Beam expansion	Fill Density	Pulse width	Frequency	Speed
10W UV LASER	F=100mm	10X	/	1μs	120-150 KHz	/

14. Care and maintenance

14.1 Regular cleaning

Keep the surface of the equipment clean to prevent dust accumulation

14.2 Cooling system inspection

- Regularly check the coolant level and the operation of the cooling system
- Cooling system water temperature setting:
- Water cooler 25 ± 1 ℃ (no need to change in summer)
- Coolant requirements:
- Purified water is used as cooling water, and it is recommended to use purified drinking water and replaced every month.
- To prevent mold growth in the water in the chiller from causing pipe blockage, it is recommended to add ethanol with a volume ratio of 10% when adding purified water.
- When the ambient temperature of the equipment is between - 10 ℃ and 0 ℃, the ethanol solution with a volume ratio of 30% must be used and replaced every two months.
- When the ambient temperature of the equipment is lower than - 10 ℃, the dual-system (with heating function at the same time) water chiller must be used, and the uninterrupted operation of the cooling system must be guaranteed.
- Other requirements for the cooling system:
- When starting the cooling system for the first time, check the entire water system and connections for water leaks. The external water pipes must be installed and connected according to the water inlet (IN) and water outlet (OUT) marked by the laser.Otherwise, the laser may not work properly.
- If the laser is not used for a long time, the cooling water inside the cooling system and the laser should be drained, otherwise the laser will be irrecoverable damaged.

15. Q&A

Q: What should I do if the U-Disk is not found in the package?

A: This is because the customs took out the U disk during customs clearance.

Please contact customer service in time and leave your email. We will send you the U-Disk Files.

Q:Can I use Lightburn software to control the machine

A: No, this laser machine isnot compatible with lightburn software

Q: Does this machine support marking on glass

A: yes, we will suggest you to use 70/110mm field lens to mark on glass

Q: What should I do if the effect of my marking is too shallow?

A: You can choose continuous marking. If you're using 300x300mm field lens, please change to 110x110mm field lens.

Q: I bought a UV 5W laser machine, can i change a 300x300mm field lens,

A: Perform internal carving function, it is recommended to use a 50/70mm field lens.
When performing flat marking, it is recommended to use a 110/175/200mm field lens.