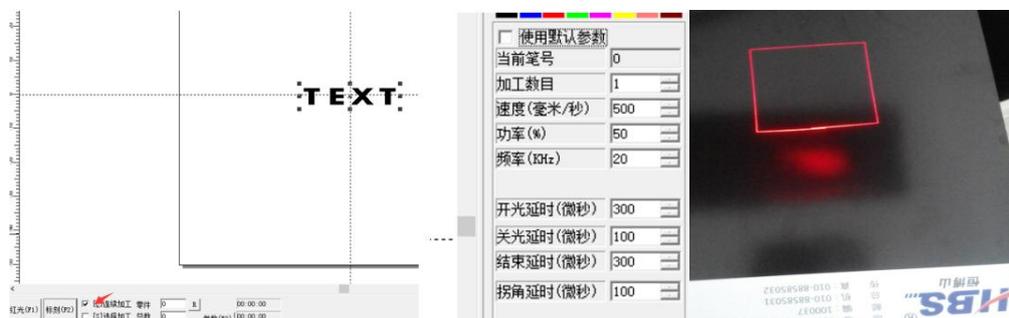


4.8 Debugging Method and Related Instructions

4.8.1 Method for Finding Laser Focal Point

Finding focal point(find the laser focal point before laser marking). Before laser marking on workpiece, the first thing is to find the laser focus, because only on the focal point the laser beam will have the strongest energy/heat, can mark the workpiece easiest, if workpiece is not on focus during marking, maybe can not mark at all. For finding focal point, firstly, open the laser marking software and edit one text with any contents, choose 'continuous marking' as icon [C]Continuou Part (when you choose continuous marking, the marking will not stop, otherwise the marking will complete but you still didn't find the focus). Change the marking parameters as shown in bellowing, generally, The higher the speed value, the faster for marking, the lower for scorching on certain point on workpiece, the more shallow of marking. During this step, there is no need to set very high marking speed. After modified the marking parameters, press F1 to activate the red-light for checking the marking position/location on workpiece.

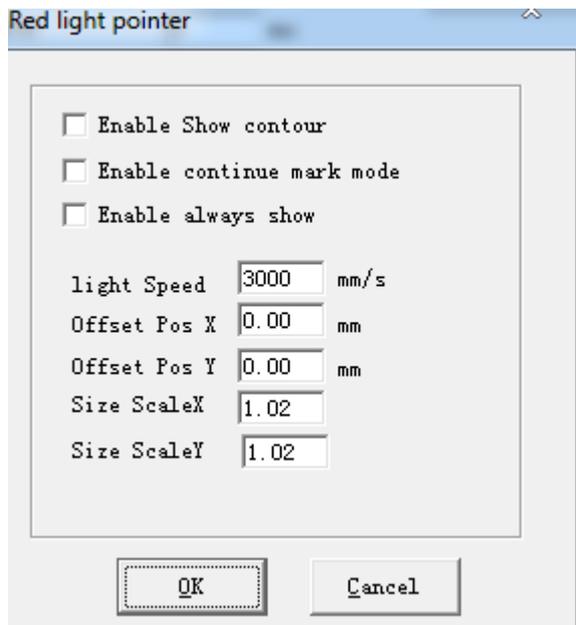


Press keyboard ESC to cancel the red-light and then press F2 to start marking, at the same time adjusting the height of marking head(move up and down) by operate the up/down operating button, until the marking becomes very clear. When the focal point of laser beam near/on the workpiece, the marking becomes very strong with bright flicker and sparkling. After find the focus, cancel the continuous marking [C]Continuou Part .

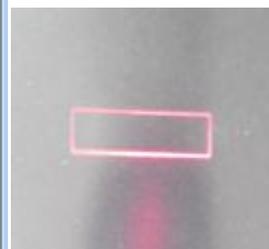
4.8.2 Red Light Indication Mode

There are two modes of red-light indication: the first mode is for showing the outline of text, the other mode is for showing outline of whole marking area. The following is the introduction of exchanging between two modes.

Open the laser marking software, and then press 'F3'(parameters setting), then choose 'Other', and then 'Red Light Pointer', then it comes as shown in following picture 1.3.0



1.3.0



1.3.1



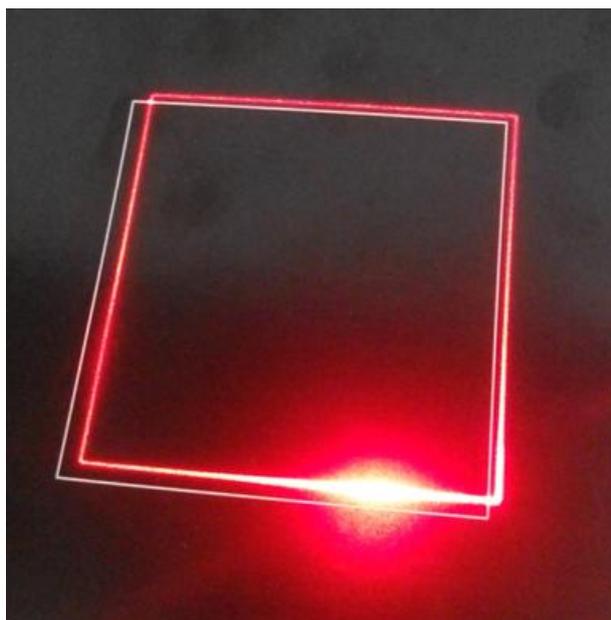
1.3.2

For picture 1.3.0, if not choosing 'Enable Show Contour', the red-light result will shown as 1.3.1, if choosing 'Enable Show Contour', the red-light result will shows as 1.3.2.

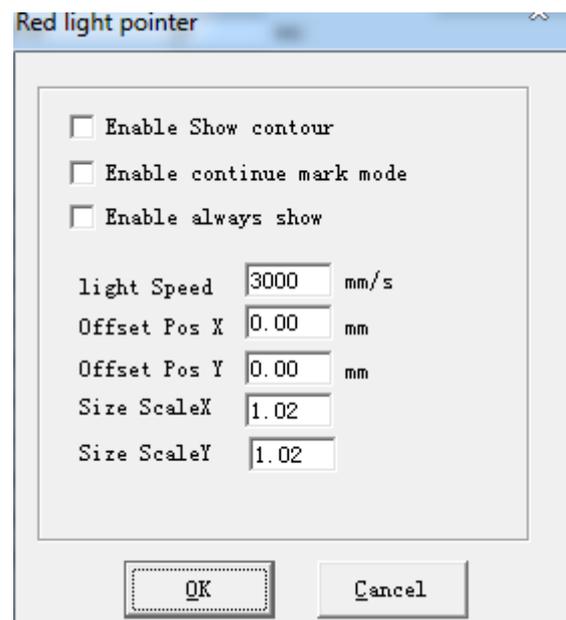
Red-light speed is the red-light flashing frequency

4. 8.3 Adjustment of the Difference Between Red-light Indicating Position and Actual Marking Position

During practical marking operation, we need mark on workpiece in exact position. Sometimes, the red-light shows the right marking position on workpiece but the actual marking position is not same with red-light indicated, as shown in Figure 1.3.3, there is difference between indication and actual marking. In this situation, we should adjust the red-light indicating position, let the red-light indication position matches the actual marking position.



1.3.3



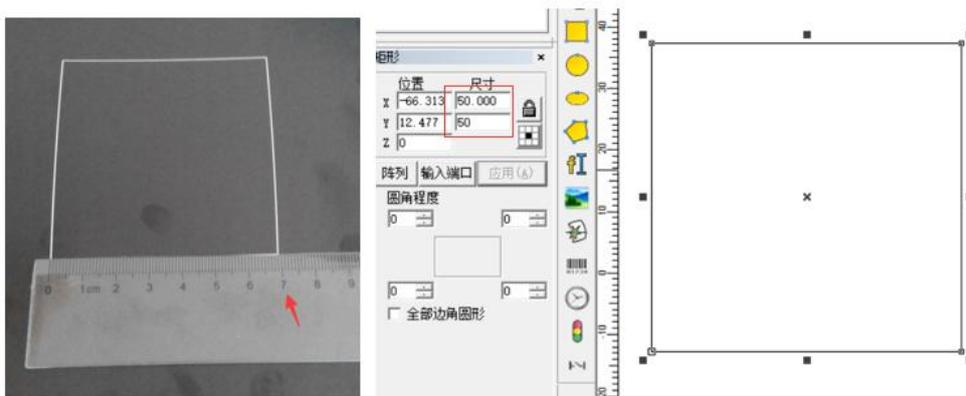
1.3.4

Adjustment method: firstly, open the laser marking software and mark a rectangle/square with size

100mmX100mm on black paper(we will send black paper with machine during delivery of machine) or other flat materials. After marking, don't move the paper. Press F3(parameters setting), and click 'Other', and then 'Red-light Pointer' as shown in 1.3.4, adjusting the values(the value number can be positive or negative) in 'Offset Pos X'(left/right), 'Offset Pos Y(up/down)', 'Size Scale X(larger/smaller scale)' and 'Size Scale Y(larger/small scale)', until the red-light indicating position can be exactly match the actual marking position.

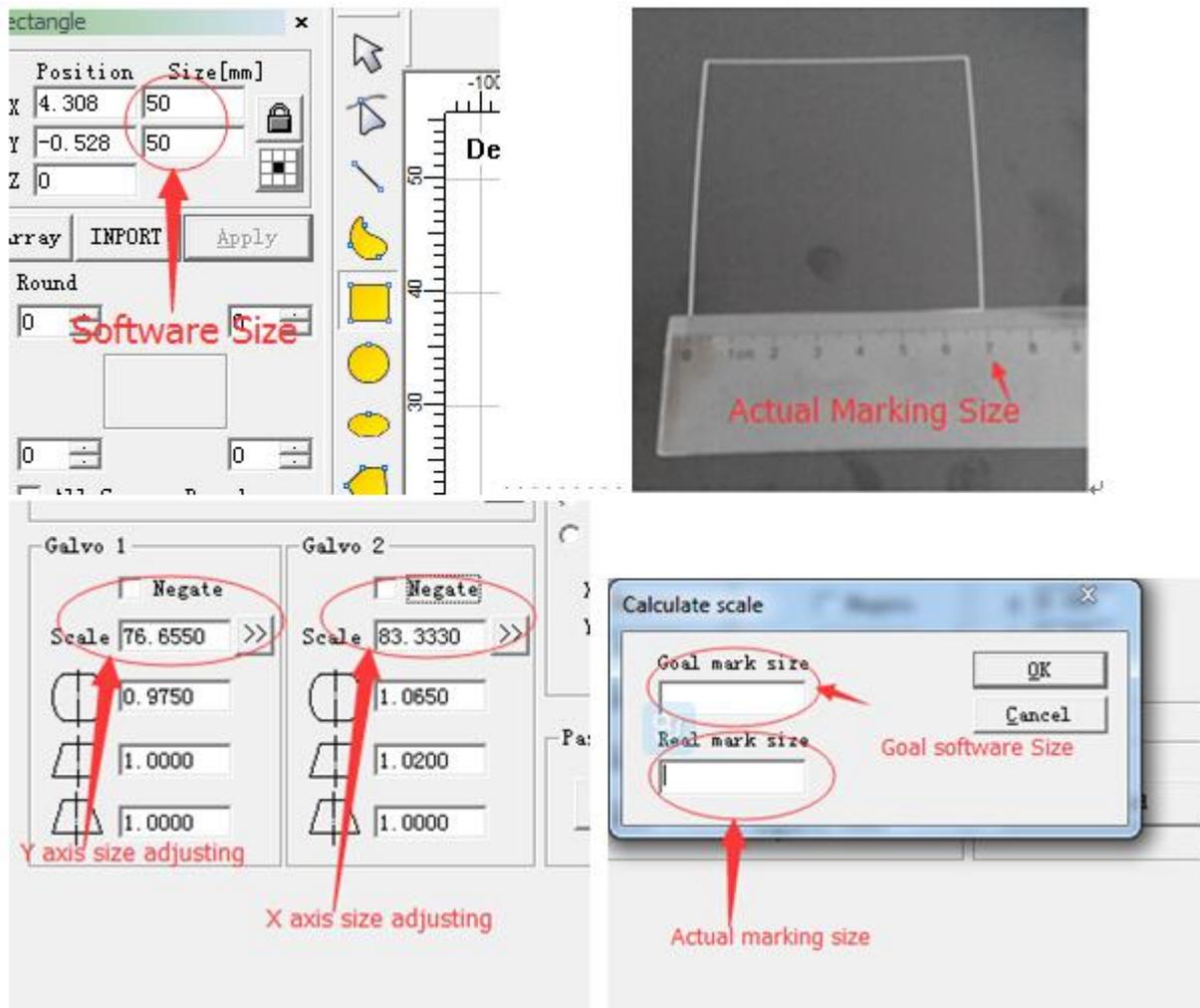
4.8.4 Adjustment of the Difference between Software Set Size and Actual Marking Size

During actual marking operation, some times the software set size is different with the actual marking size, as shown in 1-3.5(we set the size is 50mmX50mm, but after we mark we found the actual size is 70mmX70mm), in this situation we need adjust the parameters.



1-3.5

Adjustment method: edit a 50x50 square in software and mark it on workpiece. Use meter tap to check the real marking size. If the size is exactly same with the goal set size, then is ok, if two size is different, should adjust the parameters. Press F3(parameter setting), click 'Field', and then the new interface will be coming as shown bellowing. Click the arrow button **Scale 83.3330 >>** under galvo 2(not under galvo 1), then input goal size 50(X size) and actual measured size 70(X size), and 'OK', the X size has been adjusted. Then lick the arrow button **Scale 83.3330 >>** under galvo 1, input goal size 50(Y size) and actual measured size 70(Y size) and then press 'OK'. After adjustment, mark another 50X50 on workpiece, measure the size again, if there is still difference, adjust the size again as above mentioned, till the two size is exactly matching with each other. As shown in bellowing picture.



1-3.6

4.9 Setting of Laser Marking Parameters

After edit text in laser marking software, before marking, should set the marking parameters. When you first time use open the software, the marking parameter is in default parameters, Cancel 'Use Default Parameter' and then can modify the marking parameters. Generally, the marking speed will decide the marking time, marking depth, marking color. If set the marking speed and marking power accordingly with each other, will achieve the fine marking.

- a. **Mark Loop**: means the time of marking, 1 means mark one time only; 2 means mark twice; ...10 means mark 10 times. The higher the mark loop value, the deeper it will mark.
- b. **Speed(mm/s)**: means speed for marking. The higher the speed value, the faster for marking, the lower for scorching on certain point on workpiece, the more shallow of marking. If the speed value is too high, maybe can not mark very clear. The proper range for speed is 50-3000(mm/s).
- c. **Power(%)**: marking power decides the marking depth and efficiency. The higher the power, the deeper of marking and better of marking efficiency. The power should not more than 95%, otherwise it will damage the laser source or shorten the lifetime of laser source.
- d. **Frequency(KHz)**: decide the fineness of the marking. The higher the frequency, the finer it will mark and the more dispersed of laser beam ; the lower the frequency, the rougher it will mark. Normally, the frequency value should be set below 10 for nonmetal materials, and set below 20KHz for metal materials.

4.9.1 Laser power(%) will affects the life-time of the marking machine.

The laser power can be adjusted up to 100%. Considering the safety and the life-time of the machine, HBS recommend the power should not exceed 95% so that can prolong the service life of the laser.

4.9.2 Laser Frequency

Normally, the frequency value should be set below 10 for nonmetal materials, and set below 20KHz for metal materials.

5. Operation Method for Rotary Head/Accessory

5.1 Connection of Rotary Head/ Accessory

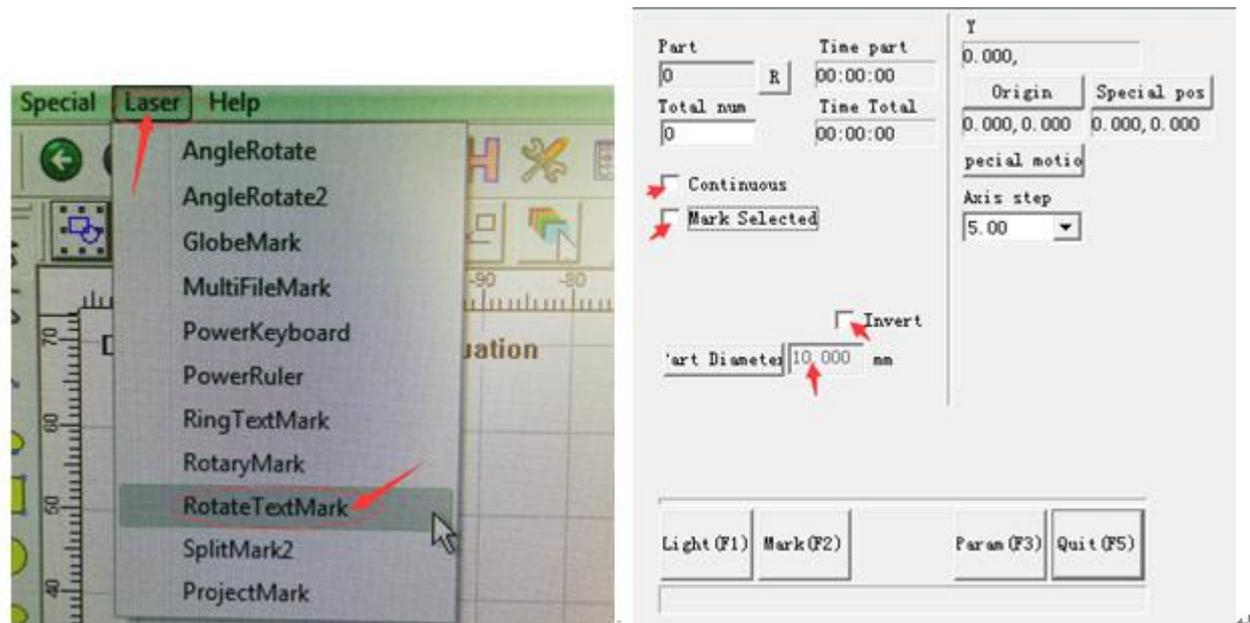
Connect the R axis signal cable with rotary head, the other end of the cable should be connected with R axis interface in machine controller.

5.2 Rotary Software Parameter Setting

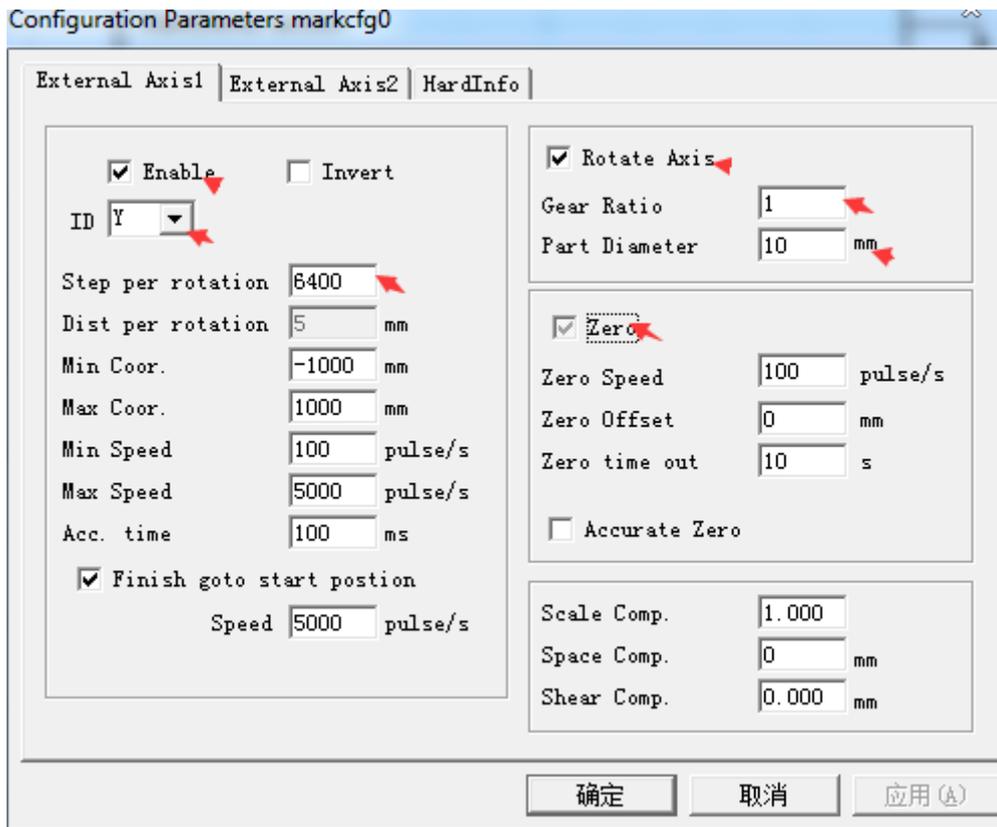
Sometimes, when marking round materials or marking on round surface, need to use the rotary clamp to hold the round materials for rotate marking.

Open the laser marking software, click 'Laser' and then choose 'Rotate Textmark', after new interface come out. As shown bellowing:

- If choose 'Continuous', laser marking will not stop and will repeat marking;
- If choose 'Mark Selected', the machine will mark the text that you have selected;
- If choose 'Invert', the rotate direction will be changed

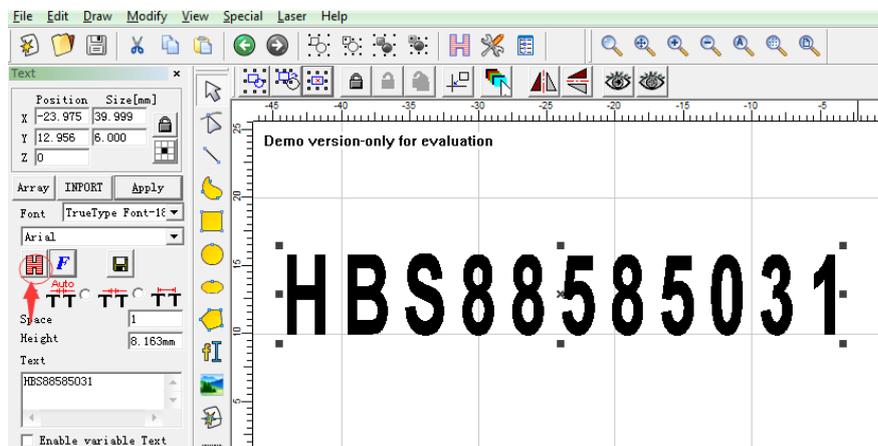


Click F3 or press F3 button(parameters setting), it will come out interface as shown bellowing. Set the parameters as below: Choose 'Enable', choose 'Y' for ID, set 6400 for 'step per rotation', choose 'Invert' for rotation direction(if choose 'Invert', the rotary head will rotate by clockwise, if not choose 'invert', the rotary head will rotate counter clock wise. It depend on user's requirements), set 1 for 'Gear Ratio', measure the diameter for actual round workpiece and fill the diameter in 'Part Diameter', click 'Zero'(grey color, not black color). For 'Scale Comp.', 'Space Comp.' and 'Shear Comp.', these parameters can be adjusted according to actual requirements during marking.



5.3 Operating Method

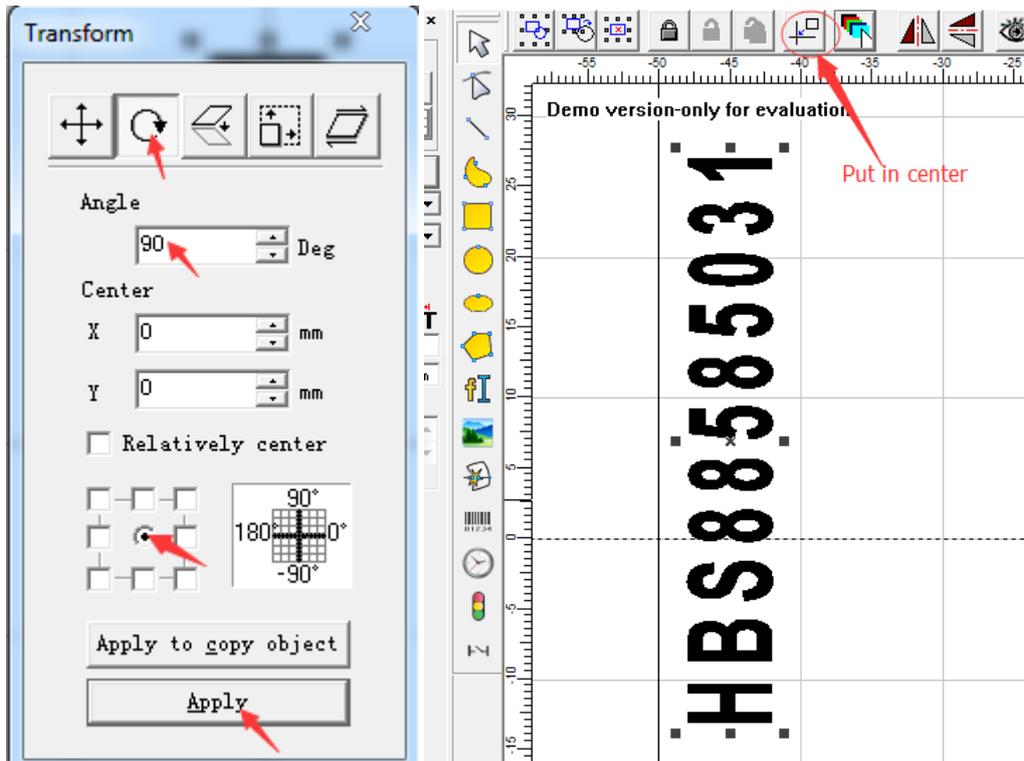
a, **Firstly, edit a text, for example 'HBS88585031'**, and then Hatch edit(if you need single line marking, no need Hatch edit). For Hatch edit, please refer to 4.7.4. As shown in bellowing. Clamp the round materials/parts on rotary head.



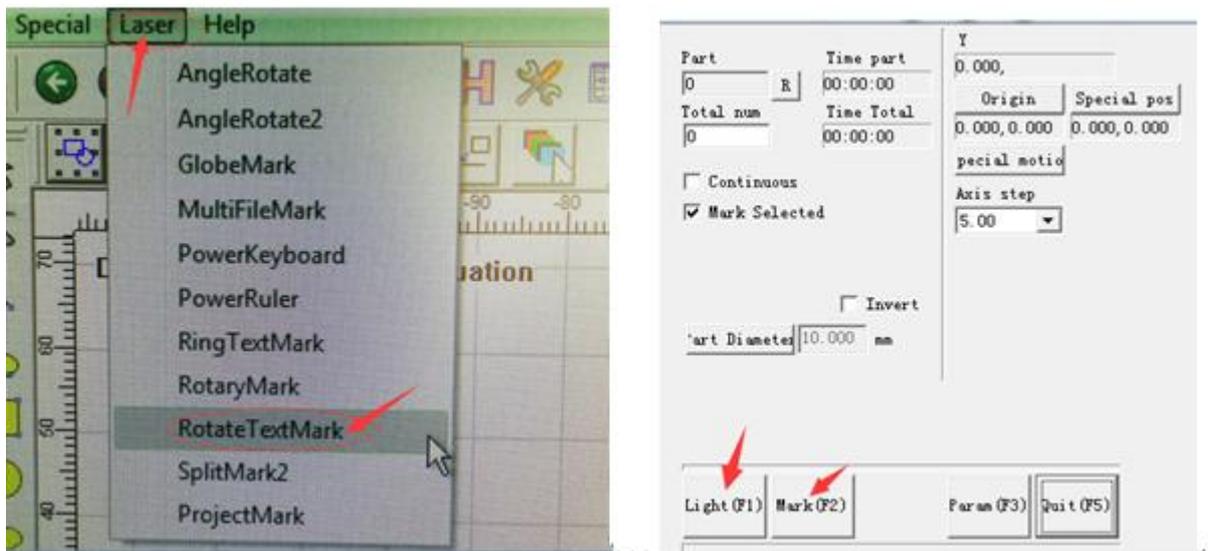
b. **Modify the direction:** click 'Modify', and then click 'Transform' then it will comes new interface as

shown in bellowing. Choose rotate icon , set the angle as 90, and set rotate by center , and then click 'Apply', the text will rotate as shown in bellowing, and then close the transform interface.

Then click center icon , the text will be in the center of software interface.



c. Click 'Rotate Textmark' in 'Laser' option, as shown in bellowing. Press F1, the red-light will be activated, in this situation, the red-light will only show the position for first character that will be marked. At the same time, the rotary head will rotate to the starting point where the first character will be marked. Move the rotary head, let the red-light point at the round workpiece where you want to mark. The red-light should point at the middle of the marking point upper surface. Press 'ESC' to cancel red-light, and then press F2 to start mark. If can not mark very well, please check the laser focus is correct or not.



The above explanation is the operation method for rotary head.

6. Failure Analysis and Solution

Failure	Analysis of reason	Troubleshooting Method	Remarks
No redlight output	<ol style="list-style-type: none"> 1. The red light is off in software; 2. Red light plug is loose 3. Red light base and machine body are conductive 4. Red light base is loose, red light is blocked 5. Red light device is damaged/out of work 	<ol style="list-style-type: none"> 1. Activate red light in software; 2. Connect red light plug again 3. Insulate red light and machine body 4. Adjust the red light base 5. Change the red light system 	
No laser output	<ol style="list-style-type: none"> 1. Wrong parameters setting in software; 2. Bad connection between laser source and marking controlling system; 3. Emergency stop is activated; 4. Laser source is out of work; 	<ol style="list-style-type: none"> 1. Modify the parameters setting in software 2. Check and reconnection 3. Release the emergency stop 4. Replace laser source with new one 	
Can not activate LMC1 driver	<ol style="list-style-type: none"> 1. Marking software is not proper installed. 2. Marking controlling system and computer USD are not proper connected or loose 3. Marking software get damaged. 	<ol style="list-style-type: none"> 1. Reinstall marking software; 2. Reconnect USB cable; 3. Change new marking software. 	Refer to software installation
Only mark vertical or horizontal line	<ol style="list-style-type: none"> 1. Connection of galvanometer is loose 2. Connection of marking controlling system COM1 port is loose 3. Check if the power supply of X/Y galvanometer driver is ok 4. X/Y galvanometer lens get damaged 	<ol style="list-style-type: none"> 1. Reconnect the galvanometer 2. Reconnect the marking controlling system COM1 port 3. Check the power supply 4. Replace the galvanometer 	Check power supply for galvanometer
Marking angle is different with the design	<ol style="list-style-type: none"> 1. In the F3 parameter setting, didn't choose galvanometer 2=X 	<ol style="list-style-type: none"> 1. Set the galvanometer 2=X in F3 parameters setting; 	
marking size is different with design	The X/Y galva ratio and deformation ratio is wrong	Adjust parameters setting for X/Y galva ratio and deformation ratio	Refer to 4.8
Position/size of red light is different with actual marking	<ol style="list-style-type: none"> 1. Red light base loose; 2. Red light parameters is not well adjusted 	<ol style="list-style-type: none"> 1. Adjust the red light base in comply with laser marking; 2. Adjust parameters in F3- other - red light indicator 	Refer to 4.8
No power supply for main equipment or other parts	<ol style="list-style-type: none"> 1. Main power supply is off or its fuse is broken. 2. Fuse for Marking controlling system is damaged; 3. Fuse for galvanometer is damaged; 4. Fuse for laser source is damaged; 	<ol style="list-style-type: none"> 1. Turn on the main power supply or replace the fuse; 2. Check the fuse and replace; 3. Check the fuse and replace; 4. Check the fuse and replace; 	
Rotary head is not rotate	<ol style="list-style-type: none"> 1. Parameter setting is wrong; 2. Electricity connection is loose; 	<ol style="list-style-type: none"> 1. Set parameter according to rotary head operation manual; 2. Check the connection and R driver and controlling systems 	

7. Marking Machine Maintenance

7.1 Maintenance of Galvanometer/Lens

7.1.1. Maintenance of Lens

- 1). Don't touch the surface of all optical Lens with hands directly, including reflecting mirror, galvanometer, scanning lens etc., or will damage the lens surface. If the lens is contaminated with oil stain or dirt, that will seriously affect the performance of lens, should clean the lens very carefully.
- 2). It's prohibited to clean the optical lens by water, detergent and other cleanse, because the surface of the lens is coated with a special film which will be damaged if use these materials to clean it.
- 3). Don't place the lens in a dark and moist environment, or the lens will be get fossilized.
- 4). The surface of the lens must be kept clean. If contaminated with oil stain, dirt, moisture etc., that will adsorb the laser beam easily and then damage the coating of lens. The contaminant will affect the quality of laser beam, or in the worse, it will seriously affect the generation of laser beam.
- 5). If the lens get damaged, send it to the supplier immediately for repairing, don't use damaged lens, otherwise it will cause completely damage of the lens which could be repaired.
- 6). Don't apply too much pressure during the fixing and replacing of reflecting/focusing mirror, or it will cause distortion of the lens, and then affecting the quality of laser beam.

7.1.2 Optical Lens Cleaning Procedures

The specified procedures for cleaning of optical lens are as follows:

With special cotton swab to clean the: Firstly, use air gun to blow off the dust on lens surface, and then use special cotton swab(stained with high purity alcohol or acetone) to scrub the surface along the circular motion from center of the lens, changing another clean cotton swab after each scrubbing and repeat the above operation, until the lens get cleaned. Secondly, use special soft cloth to clean the lens surface to remove the stains, avoiding damaging the surface. Thirdly, take the cleaned lens under bright light and check the reflection, if the reflection is good, means the lens have been well cleaned; if the reflection is still not good, clean it again with same procedure explained above. Fourthly, fix the cleaned lens on lens seat. It's prohibited to clean the lens with used cotton swab, or will damage the lens coating.

7.1.3 Installation and Replacing of Optical Lenses

- 1). Before installation of optical lens, the operator should wear clean clothes, clean hands with soap or detergents carefully, and then put on the light clean white gloves. It's strictly prohibited to touch lenses with any part of the hand.
- 2). Before installation, the lens should be placed on special lens paper on smooth & clean desktop. During assembly, don't blow the lens with mouth. When fetching the lens, hold it from side/edge of the lens, don't directly touch the coating on lens surface, don't apply any force on surface of the lens coating and avoid the lens from bumps, falls. The lens seat should be also well cleaned by using air gun to blow out the dirt or contaminant before installation. Then, place the lens gently into the lens seat.
- 3). Don't apply too much pressure during the fixing and replacing of reflecting/focusing mirror, or it will cause distortion of the lens, and then affecting the quality of laser beam.
- 4). Notice for replacing of optical lens: Don't apply any force when the lens is been wrapped, during taking out the lens from wrapper, should be very careful for avoiding any damage; when take the lens out of wrapper, should wear clean gloves, hold it from side/edge of the lens; when unwrap the lens, should avoid any contamination to the lens, use air gun to clean it and then place it on special optical

lens paper. Clean lens seat and its frame with air gun, avoid any contamination during installation. After the lens be fixed, don't apply excessive force or it will cause distortion of the lens, use air gun to clean the lens again to remove dust and contaminant etc.

7.1.4 Storage of Optical Lens

- 1). The optical lenses should be properly stored, can maintain it in perfect quality.
- 2). The best temperature for storing lens ranges 10 to 30°C. Don't store the optical lens in an freezing environment, otherwise the surface of the lens will be frosting and easy damage the surface coating. If the temperature is above 30°C, the surface coating also will be affected.
- 3). After the lens be wrapped, the wrapper should be placed in non-vibration environment, otherwise it's easy cause distortion of the lens, thereby affecting the performance of lens.

7.2 Maintenance against long-term non-operation

If non-operation for a long time, the equipment should be well protected, place it with a dry, non-dust, normal temperature environment. Check the equipment timely whether the components are rusted, clear the rust if necessary(if possible, can apply a dust cover on the machine). Regular cleaning and checking are needed during non-operation period.