



**CNC Z-DQ** Have Tool Auto-checking instrument  
Ball Screw

**VS** **CNC T-DJ** not have Tool Auto-checking instrument  
Trapezoidal Screw

Web site: [www.lybga.cn](http://www.lybga.cn)

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## Three-axis CNC engraving machine

# USER GUIDE

(FOR: 3020Z-DQ / 3040Z-DQ)



Before installing and using this machine, you must read carefully about this manual.  
Please properly preserve this manual for reference in the future.

**Congratulations! You already have your own numerical control engraving machine, but you need to carefully know it and master it, in order to make it your good assistant as soon as possible.**

**■ Read before using:**

- This machine is only designed for the surface engraving of plastics, bamboo and timber, and non-ferrous soft metal, so the application with other purposes may damage it;
- Before using this machine, one must wear protective goggles, to avoid the damage from scrapping eruptions;
- Do not try to disassemble the machine or electric cabinet for reconstruction or fixing, otherwise it is not under warranty;
- Please pay attention to the electricity safety as other electric appliances, use ratified standard voltage, and make sure that its electrical grounding is safe;
- Do not place the machine in moist or dusty environment, and do not let children get close to or touch it;
- Timely cleaning and periodic maintenance can keep the engraving machine in good operating state, and also lengthen its service life;
- This engraving machine is a mechatronics processing tool, so operators should grasp relative professional knowledge to be proficient in using this machine;
  
- This manual only provides instructions to the application environment and operation requirements of this machine, while not involving other professional knowledge that relate to control computer, software, and materials. Please ask for help from your suppliers if you have any problems in these aspects.

**■ Basic workflow of engraving machine:**



- ① Install "control software Mach3" on the desktop computer, and setup parameters for the control software in accordance with the requirements of engraving machine;
- ② Design the content that needs to be engraved through design software, and output G code or nc, Tab files that can be recognized by Mach3;
- ③ Firmly clamp the materials need to be engraved on the operating platform of engraving machine;
- ④ Import engraving code to the control software Mach3, send out command to the engraving machine after passing through the code, and then the engraving machine will start to operate.

■ Requirements for the configuration of master control computer:

- ①The desktop computer must possess parallel ports; Notebook PC or USB parallel port cannot be used normally.
- ②Minimum configuration of the computer: CPU/1G, 512M memory, 20G hard disk, mainboard with parallel port, WIN-XP operating system.



■ Introduction to control software and design software:

- ①Control software: Mach3 is recommended (EMC2 and Kcam4 can also be applied, and consult software providers for detailed information);
- ②Design software: ARTCAM, PowerMill, and TYPE are commonly used, but there are also many kinds of other professional software.

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**Important statement:** we only sell engraving machine, but not including computer and relative software. The software mentioned in this manual is only for your convenience, so please understand, select, purchase, and use the software on official software website in accordance with your needs.

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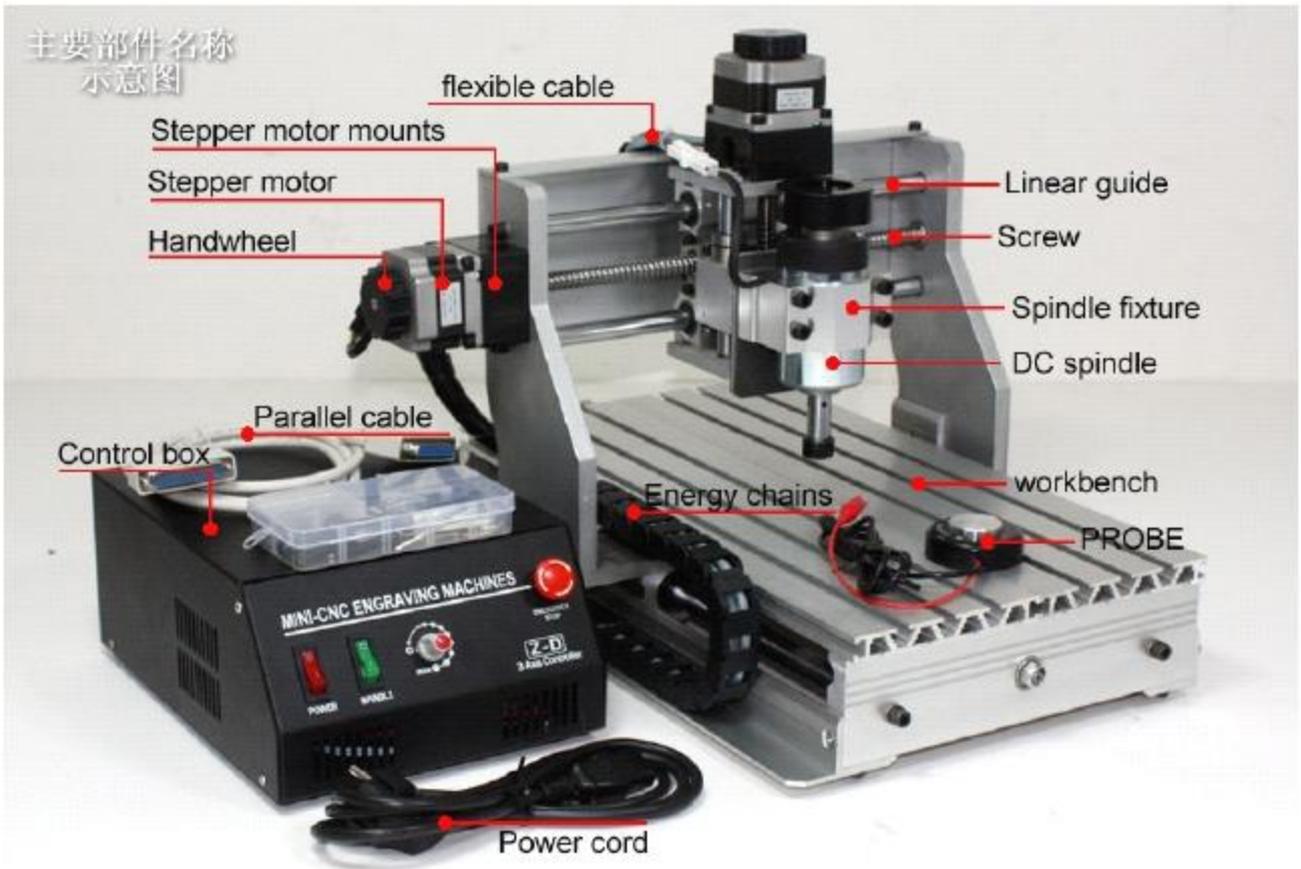
# 3020Z/3040Z-DQ CNC Engraving Machine

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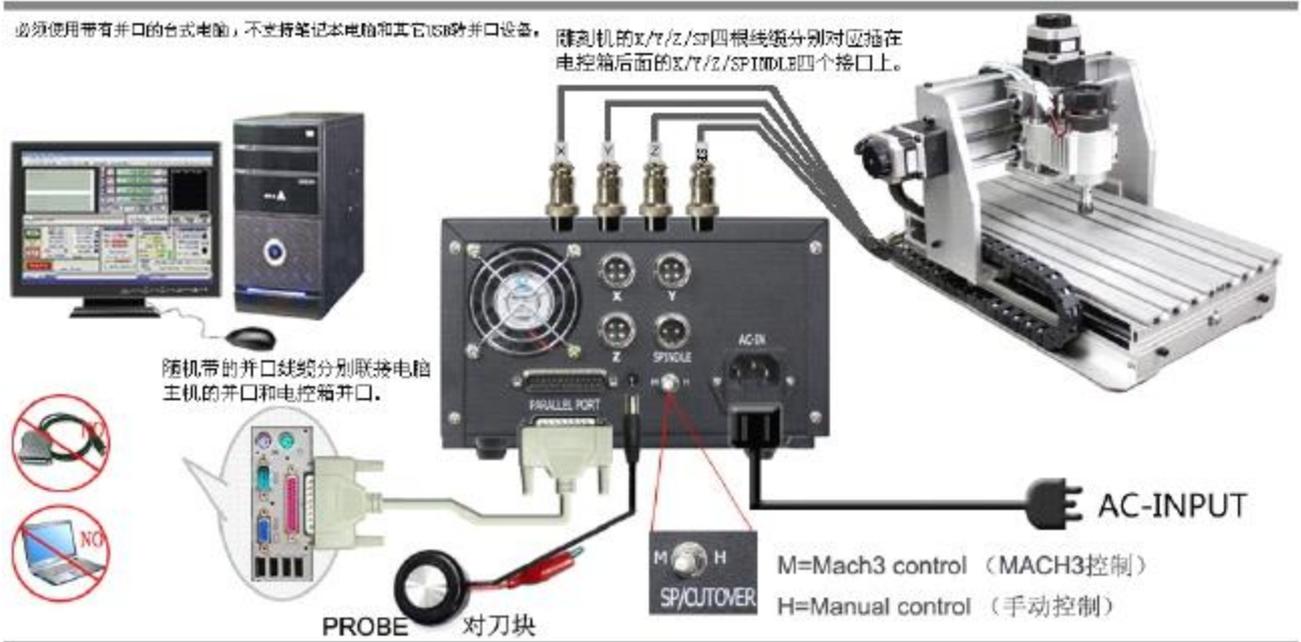
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## To know your engraving machine

### Composition name of the machine



### Sketch map of installation and wiring



## ■ To test your engraving machine

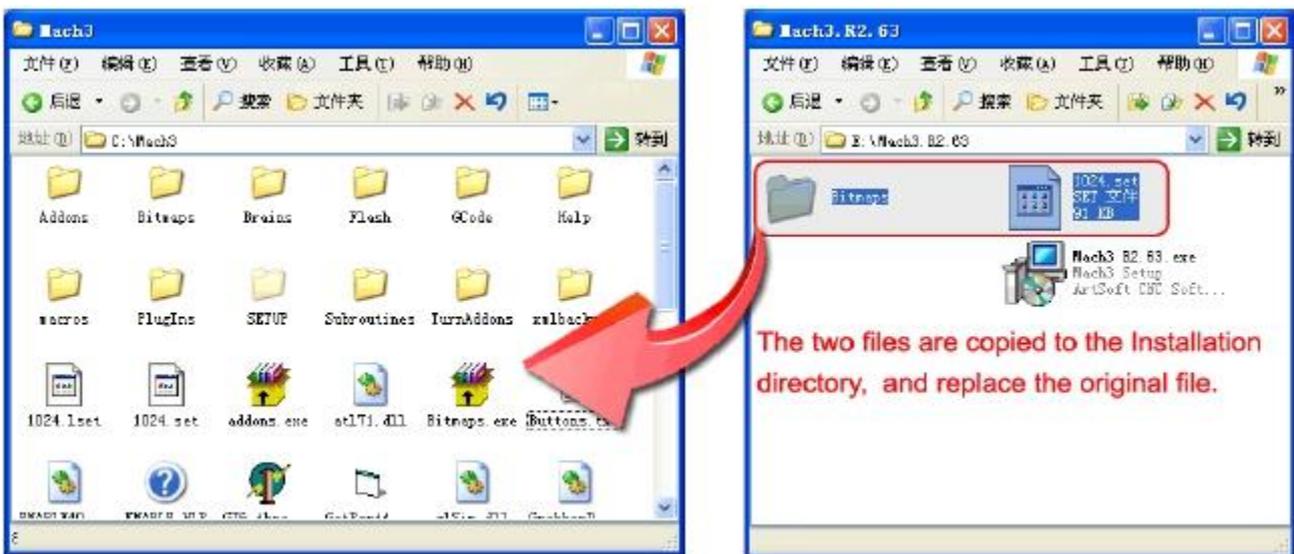
### ◆ Installing the control software

Software is not included in this machine, so please purchase appropriate software in line with your fondness; It is recommended to use Mach3 to control it;

Please carefully read the instructions about installation in the Mach3 software manual before installing the software.

**Attention: do not open it after installing the software. You must first reboot the computer immediately, and then open the software for settings.**

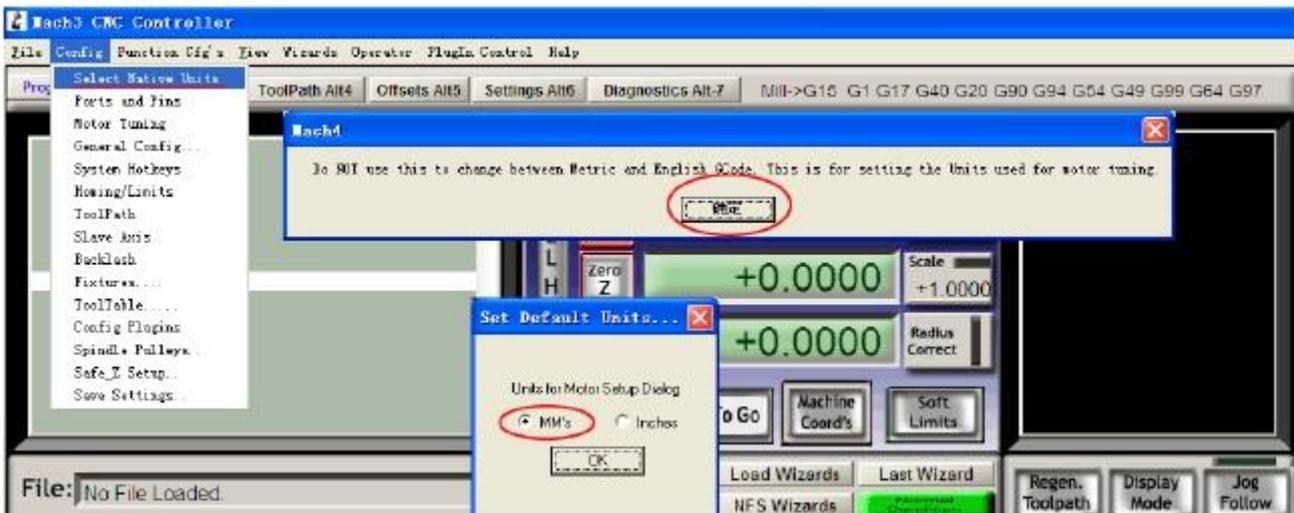
After restart the computer, The two files are copied to the installation directory, and replace the original file.



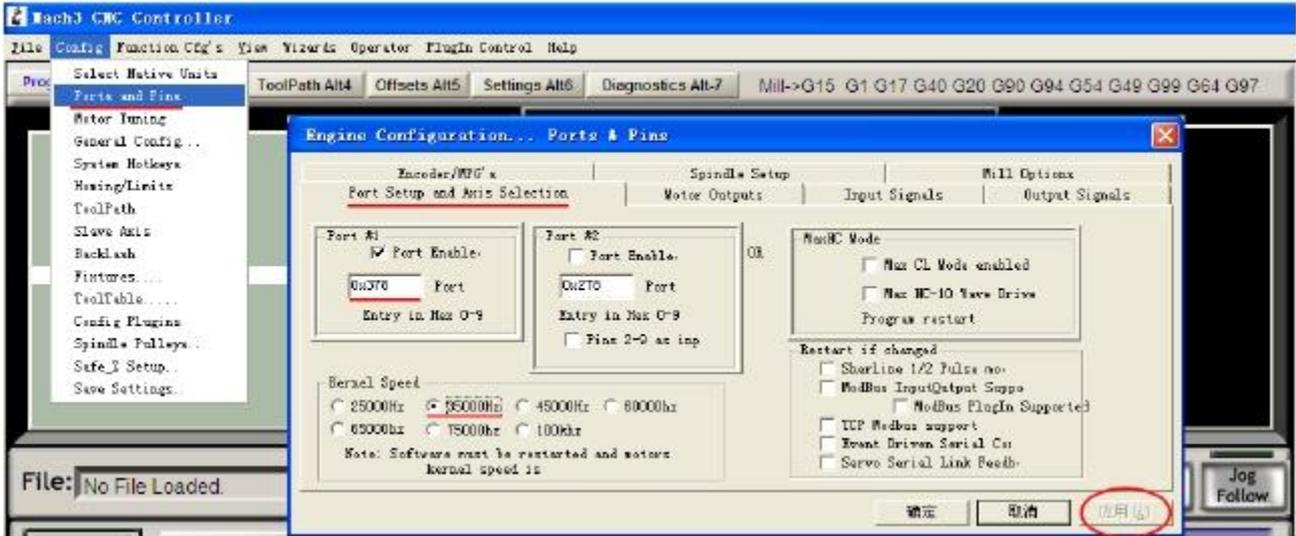
### ◆ software parameters settings

Please refer to the following pictures for software parameters setting:

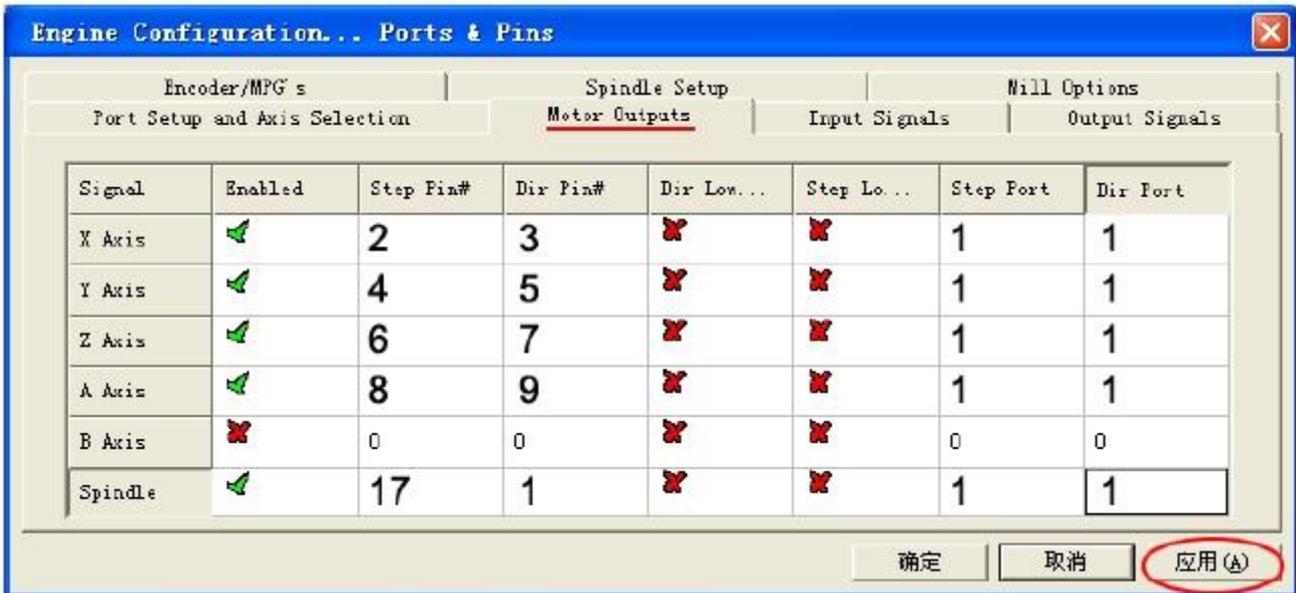
①



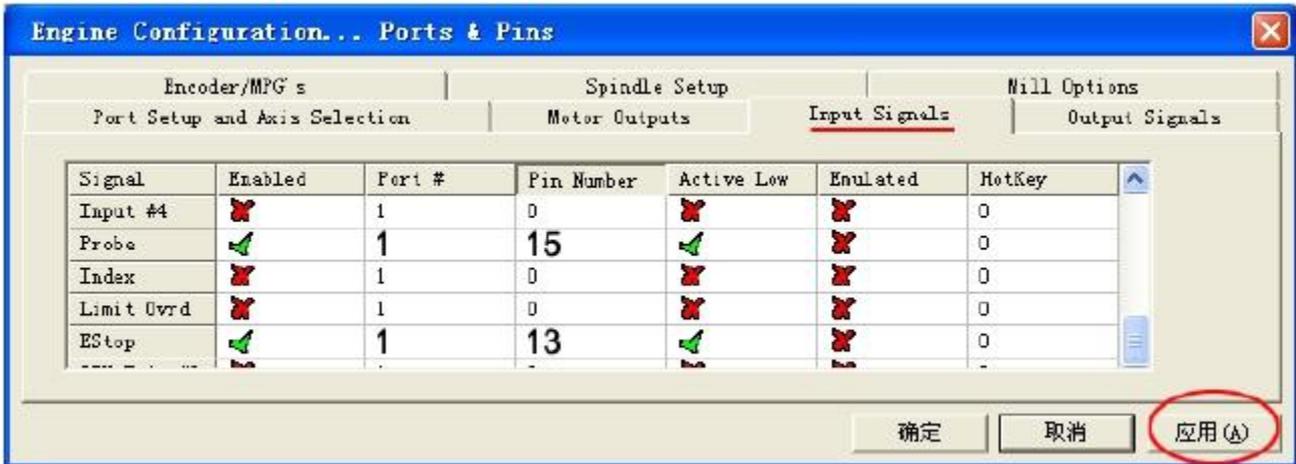
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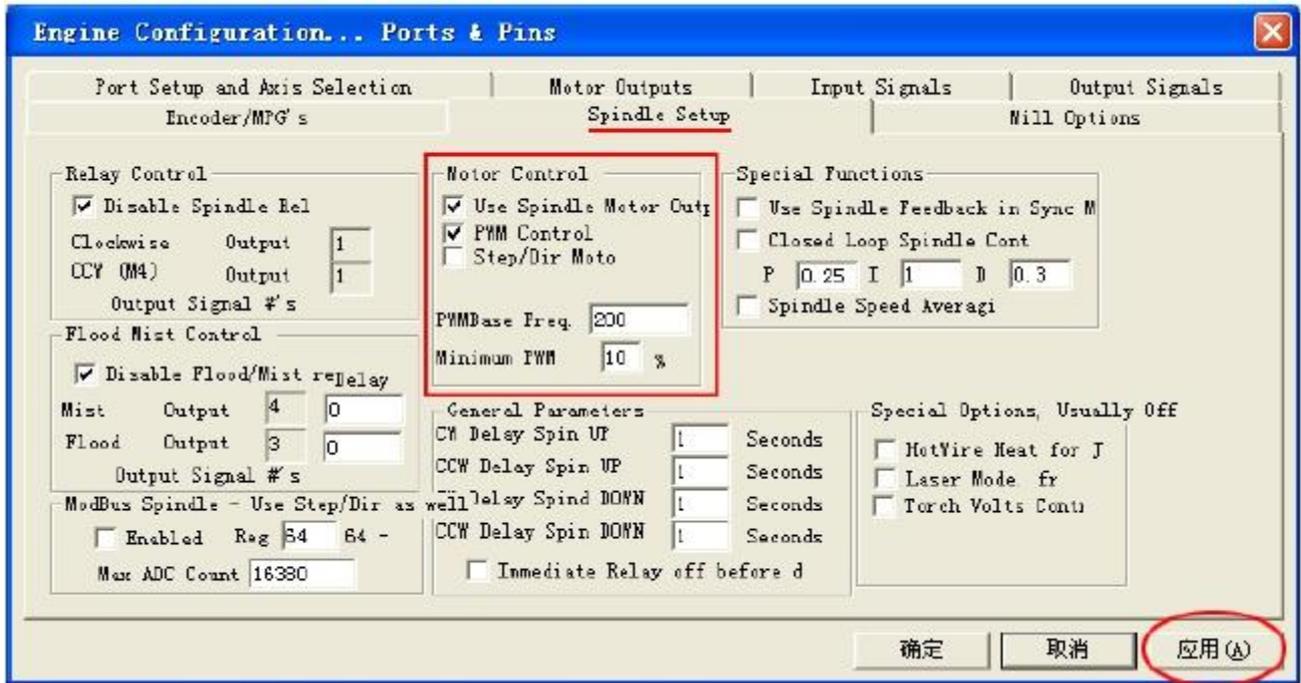
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④



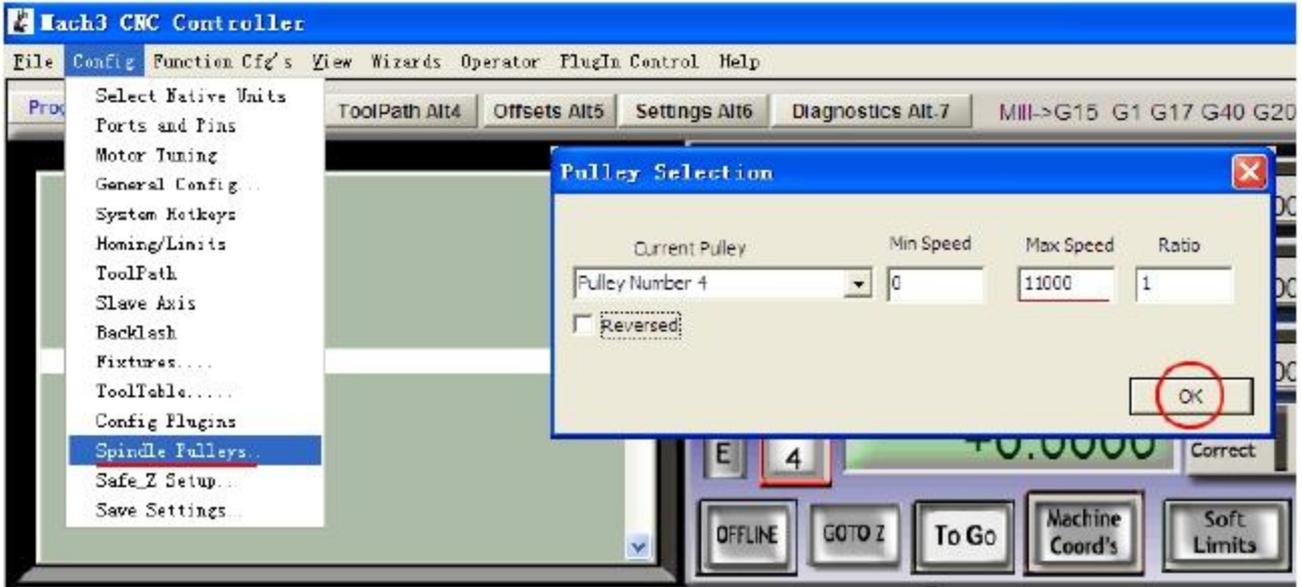
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⑥



⑦

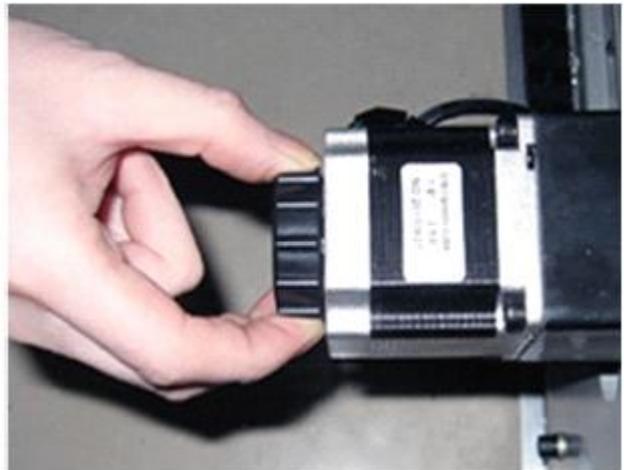


Please carefully read the above picture for setup, and the mistake of any number or option will lead to the failure of the engraving machine, or even lead to accident when operating the machine.

## ◆ Trial run and manual control test for the machine

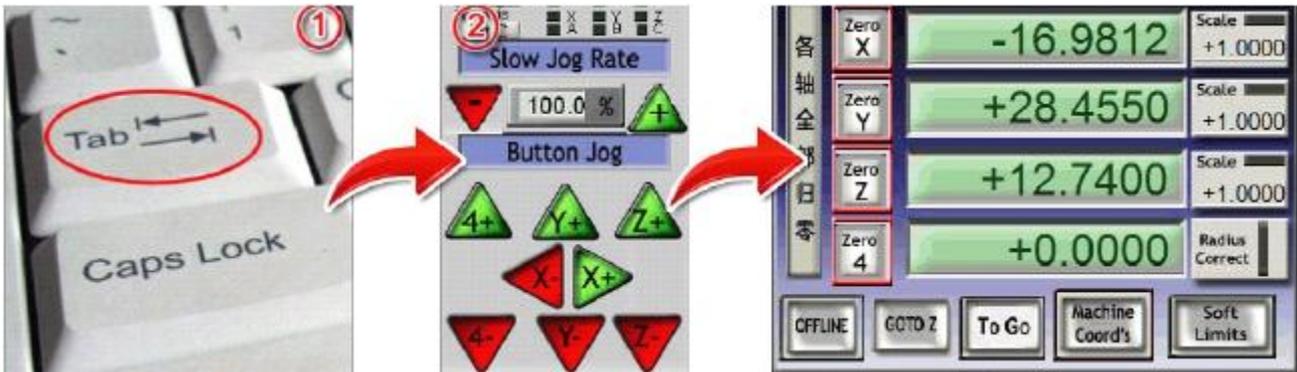
① Check and confirm: whether the connection among computer→control box→engraving machine is correct; whether the software installation and parameter setting are correct;

② First, do not electrify the control box, and turn the hand wheel of three step motors by hand now, you will feel that under the condition without electricity, they may be easily turned by hand; Then, plug in the electricity supply, and turn on the "POWER" switch, three step motors will be self locked at this time. Turn the hand wheel by hand again, you may feel that it is slightly tight than the moment without electricity. This states that the machine can be controlled now, and you can send out an order to control it now.



③ Start up MACH3 software. If the "RESET" button at the bottom left corner is flashing, then click it with mouse, and begin to operate when it is static and not flashing; (attention that for a part of the machine types, you must first turn on the "POWER" switch of the control box, and not press the "EMERGENCY STOP" button).

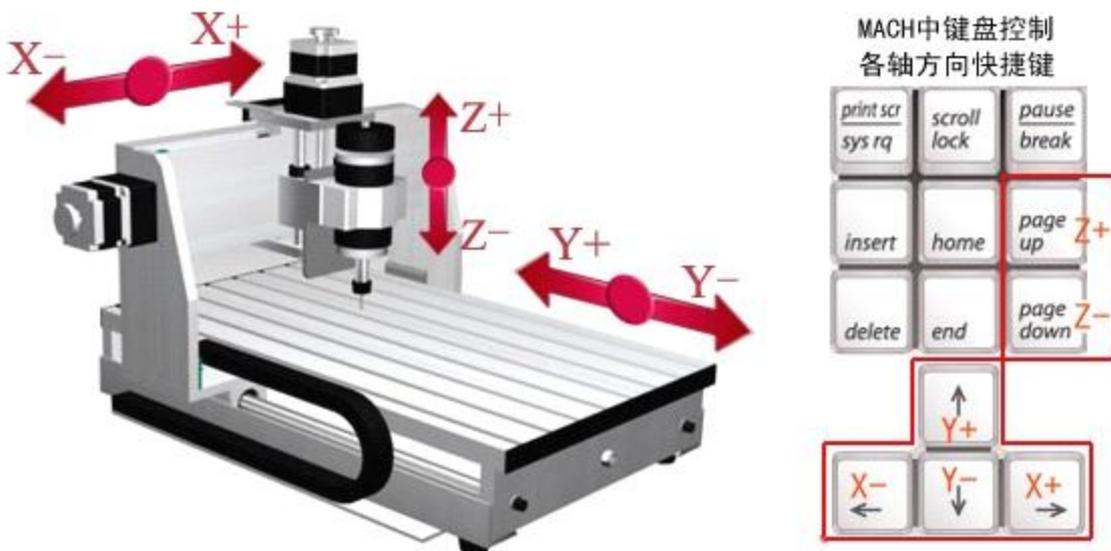
④ Now press the direction key on the keyboard, there may be some response actions from the X or Y axis, and the digital coordinate of corresponding axis on the screen may be changed. The left and right keys control the X axis, while the up and down keys control the Y axis, the Page-UP and Page-DOWN keys control the Z axis; We can also control the running of each axis by the control panel of MACH3; Press the "Tab" key on the keyboard, to call out the manual control panel of MACH3; Click the button of X, Y, and Z by mouse respectively, to see whether three axis of the engraving machine operate or not. (If it is abnormal, please contact with your dealer to deal with it.)



## ◆ Definition of triaxial coordinate

The following is the reference drawing of the triaxial coordinate definition provided by us. During the process of trial run, if we found the running direction of the axis is incorrect, we can change the "Dir LowActive" in the "Motor Outputs" of MACH3 to adjust it.

This coordinate definition is just a usual definition mode of us, which is for reference only; in practice, you can change the definition in accordance with your habit and the specific situation of design software.



Till now, the communication test of engraving machine and control software is finished. If your engraving machine still cannot be controlled regularly, please solve this problem by the following

methods:

- ①Uninstall MACH3 software, change the MACH3 of other version, and do installation test (because some main board parallel ports are not compatible with MACH);
- ②Check whether your parallel port is normal, and please change another set of qualified desktop computer and do test.
- ③After install MACH3, if you have opened the software without rebooting the computer first, you must completely uninstall the software and reinstall it.
- ④If three step motors cannot self-locking after the control box is electrified, please contact with your dealer in time.

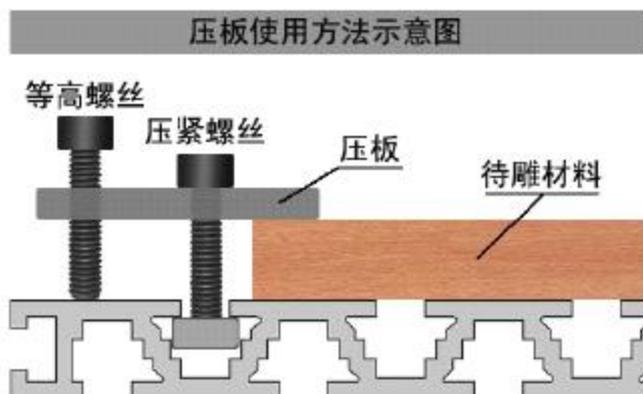
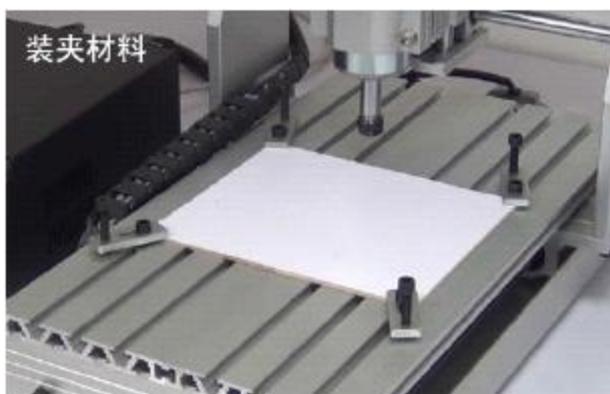
## ■ To use your engraving machine

### ◆ Primary engraving practice: Engraving of graphic pictures and texts

Let's do the primary engraving practice by taking the right picture as an example. This is a simple graphic engraving of pictures and texts, and it is also the main purpose of engraving machine.

#### ● Step one: Clamp materials

According to the picture below, fix the materials prepared for engraving on the operating platform of engraving machine;



#### ● Step two: Tool setting

"Tool setting" means that after clamping the materials, move the cutter to the initial position set by the program and the surface of the materials to be engraved; at the beginning of learning engraving, because we are not familiar with the concept of coordinate, we should set all the initial points of engraving at the center of the material. As the picture shows that the intersection of diagonal lines is the initial point.



①First, we operate the XY axis through manual control, and move the principal axis close to the initial point; Install a flat base pointed knife.

②Turn off the power switch of electric cabinet (the phase step motor will not be self-locked when the power is cut off), and then slowly wring the hand wheels for fine control on three stepping motor, to move the tool nose to the initial point.

### ●Step three: Lead in tool path code

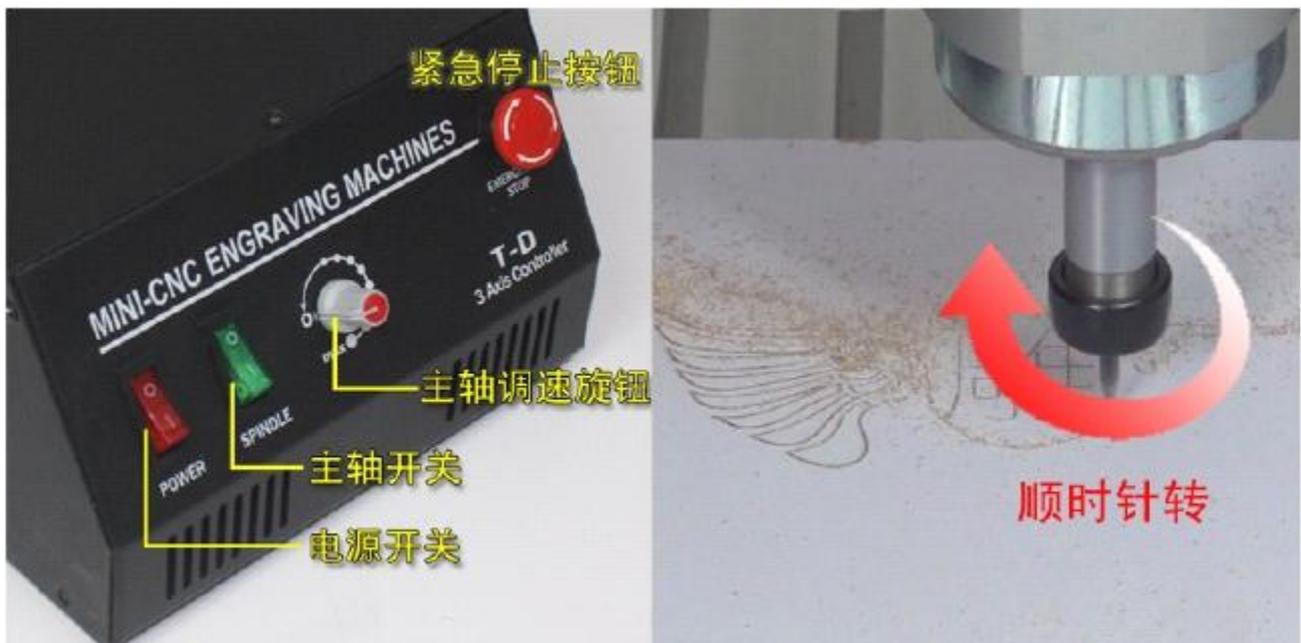
Import G code and the test file of "shidiao-1.cn" in the random CD to Mach3 software. Now we will do the first engraving practice with this file;

### ●Step four: Begin to engrave

①Click "Zero X, Zero Y, Zero Z" respectively, to reset the coordinate of X, Y, Z axial (important);

②Turn on the "POWER" switch on the electrical cabinet, and then turn on the "SPINDLE" switch, now the spindle motor may begin to move slowly; Pay attention that when the principal axis moves clockwise, it is correct (if not, please contact with the dealer). Then, slowly turn the speed adjustment button on the electrical cabinet in clockwise direction to the maximal speed, and now the spindle motor will run in the full speed (about 11000 cycles).

③Click the "Cycle Start" button in Mach3, and it will begin to engrave.



**Attention:** at the time engraving, prevent the hand from getting too close to the cutter with highly revolving speed, and do not observe it in close distance. After finishing the engraving, first turn down the revolving speed of the principal axis to the minimum; then rise Z axis in Mach3 through manual control, and move the spindle motor outside the engraving materials; and then turn off the power switch. Each time after finishing engraving, the scraps generated by engraving should be cleared in time.

**Summary** : You have finished a whole process of engraving practice through this example. Whatever you engrave in the future, it is of the same operation procedure as this. The key points are as follows:

- ①leave certain margin when clamping materials, so as to avoid the cutter from touching screws;
- ②remember to reset the triaxial coordinates after tool setting;
- ③remember to adjust the speed adjustment button of the principal axis to the zero position in anticlockwise direction.

## ◆ Install auxiliary operating platform for your engraving machine

### ● What is auxiliary operating platform?

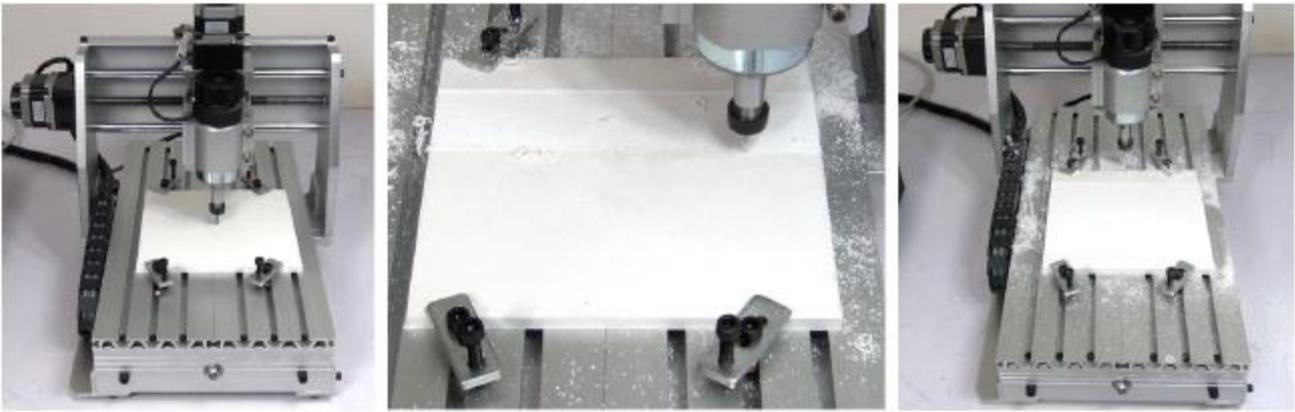
Auxiliary operating platform is a board installed on the original operating platform of the machine, and it can replace the original operating platform;

### ● Why it is necessary to install an auxiliary operating platform?

In order to not damage the original operating platform when doing cutting operation; We usually cut some boards with the engraving machine, but if without the auxiliary operating platform, it may cut the operating platform in the process of cutting the board, thus permanently damaging the operating platform. Therefore, we need an auxiliary platform, which is also called backing plate. In this way, we can cut the board and not damage to the original operating platform of the machine.

It is very easy to install the auxiliary operating platform, and it only needs to fix a soft board (e.g. PVC, PMMA, or wood board) on the original operating platform of the machine. Then, make an engraving file and let engraving machine mill the auxiliary operating platform, with the purpose of obtaining higher evenness. It is also the most efficient method to engrave double color plate, PCB or other materials that ask for higher demand of flatness.

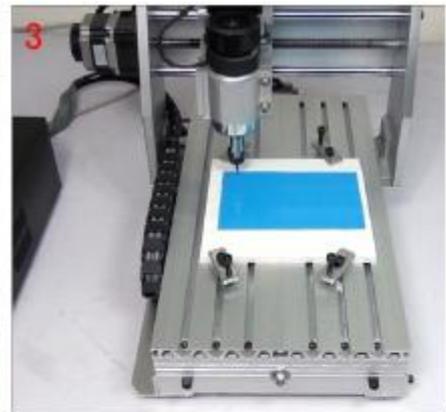
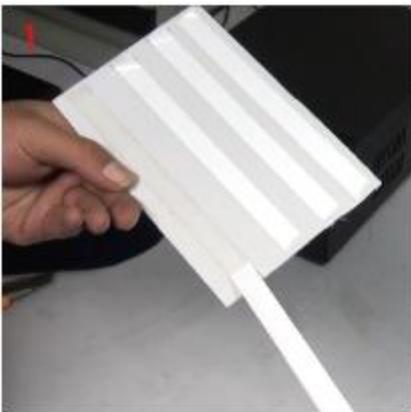
As shown in the picture: first, clam a PVC board with the thickness of 10mm on the original operating platform of the machine, then mill a plane, and obtain an auxiliary operating platform with high flatness at last. If the object you engrave is usually not large, then you only need to install it on the latter part of the machine, so that it can be applied for a long time and no need to be disassembled.



## ◆ Secondary engraving practice

Now, we can use the auxiliary operating platform. Double color plate is one of the most commonly used engraving materials, which is shown as the following picture:

- ① Stick double-faced adhesive tape on the back of the double color plate;
- ② Paste it on the milled plane of the auxiliary operating platform, and press it to make it stickfast;
- ③ Tool setting;
- ④ Begin to engrave;
- ⑤ Get engraved works;
- ⑥ Display the finished products;



There is a file in the "tool path for machine test" of the random CD, with the file name of "shuangseban.nc". The area of this engraving file is about 75\*85mm. Because the double color plate is

pasted on the auxiliary operating platform, the size of the material should within the scope of 90X90mm. Meanwhile, the initial point of this file is on the top left corner.

The application of engraving machine is easy, which can be summarized as: clamping materials, tool setting, and engraving. However, just as operating the computer, some people use computer just for entertainment, so it lacks of required skills; some people make design for creation, so they make great efforts for it. Therefore, the same computer may play different roles for people with different requirements. It is the same for the engraving machine, because it is only a tool, and if you want it to play a more important role and engrave better objects, you must have the ability to "send command" to it. The command that can be executed by the engraving machine is called "processing code", and in order to produce these "processing codes", you have to learn some software.

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## ◆ Application of tool setting gauge

Tool setting gauge is an auxiliary tool for Z axis when it is setting the tool, and this function is only restricted for the use of R2.63 version in Mach3. However, tests have not been conducted for other versions, so support is not provided.

Attention: before using the tool setting gauge, you must first measure its accurate thickness through vernier caliper, because this value will directly influence the accuracy of tool setting; as it is shown in the picture, input the value of the thickness to the character box of "PROBE-H" (such as inputting 20), and then you must press the "Enter" key to save this value.



Important: every time before applying the tool setting gauge, you should first touch the surface of the tool setting gauge through the clamp on the red cable, to check whether the indicator light on the tool setting interface is turned to red or not. If it is turned to red, it means that this function can be used normally. If not, you should check whether the cable of the tool setting gauge is connected well, or whether you forgot to make the setting but you have reinstalled this software.

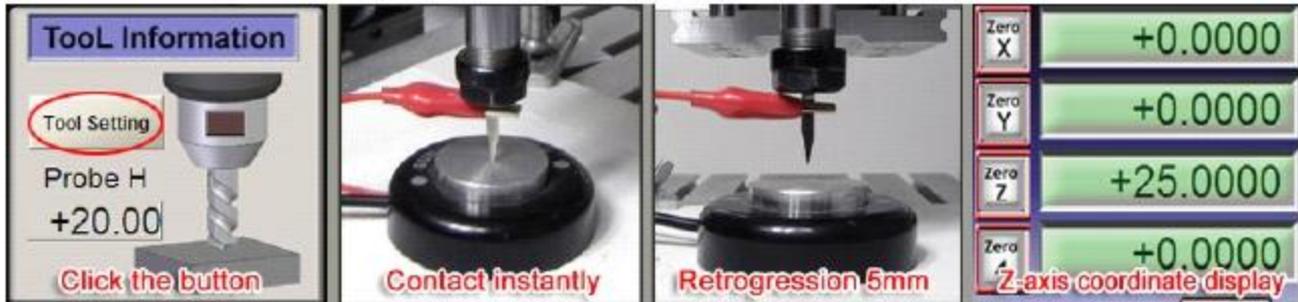


## Using method:

① Just shown in the picture, put the tool setting gauge on the materials to be engraved, and then adjust Z axis to an appropriate position manually. When the tool setting is triggered, Z axis may arise 5mm automatically; when it is executing the task of tool setting, the automatic bottom detection distance for Z axis is only 20mm. Therefore, at the time of making manual adjustment, the distance between the tool tip and the surface of the tool setting gauge should be no more than 20mm. After adjustment, the tool shank should be clipped by the clams on the red cable.



② Turning on the POWER switch on the control box, and clicking the "Tool Setting" button in the MACH3, Z axis may slowly decline. When the tool tip touches the surface of the tool setting gauge, it may immediately stop, and then automatically return upward 5mm.



③ Take away the tool setting gauge, and then the tool setting is completed. Attention that the coordinate data on the Z axis should not be zero at this time.

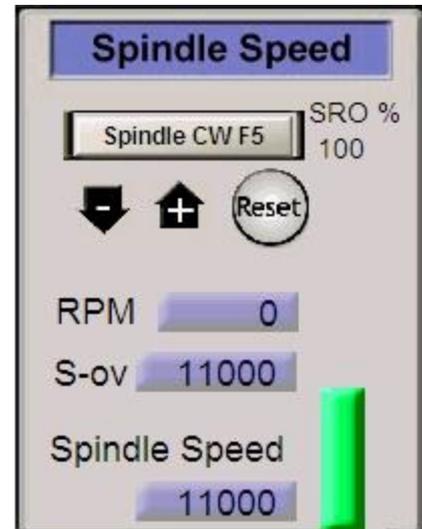
## ◆Control the spindle motor through software

This machine supports MACH3 software to control the start, stop, and speed regulation of the principal axis. Meanwhile, you may also directly add the code to start or close the principal axis in the engraving code, so as to make the principal axis starts automatically and reach to the preset rotational speed at the beginning of engraving. When the engraving is finished, the principal axis may be automatically closed (recover the minimal rotational speed). Now, let's learn the method of controlling the spindle motor by software.

① Move the control switch on the back of the control box to the M position.  
 (Attention: M position means that the spindle motor is controlled by MACH3 software; H position means that it is controlled by the electric control panel; no matter which method is used, you must first press the SPINDLE switch, and otherwise the principal axis is not electrified.)



② Turn on the SPINDLE switch on the control box, and then click the "Spindle Speed" character box in the "Spindle Speed" module of the MACH3 by mouse. Then, input the value of 11000, and press the Enter key.



③ Now, click the "Spindle CW F5" button, and the spindle motor should start to rotate with high speed. Dragging the green bar upward and downward through the mouse can change the rotational speed of the principal axis. Then, click the "Spindle CW F5" button, the principal axis may stop.

You may also add the M03 and M05 code in the program to make the principal axis start automatically at the time of engraving, and also make it stop automatically after finishing engraving. You can refer to the "SPINDLE.txt" file in the CD for detailed information, and also trial run it for experience.

M03=Spindle starting forward rotation

S10000=Spindle speed (Value can be set from 1000 to 11000)

M05=Spindle stop (Or restore the minimum speed)

<pre>G0 X0.000 Y0.000 F1500.000 N0 G0 X-8.10 Y-24.17 Z3.00 N1 G1 X-8.10 Y-24.17 Z0.00 N2 G1 X-8.10 Y-24.17 Z-0.60 N3 G1 X-2.75 Y-24.17 Z-0.60 N4 G1 X-2.70 Y-24.22 Z-0.60 N5 G1 X-2.70 Y-24.22 Z3.00 ..... N7159 G1 X-55.74 Y-44.88 Z-0.80 N7160 G1 X-55.49 Y-44.90 Z-0.80 N7161 G1 X-55.25 Y-44.90 Z-0.80 N7162 G1 X-55.00 Y-44.91 Z-0.80 N7163 G1 X-55.00 Y-44.91 Z3.00 G0 X0.000 Y0.000 Z0.000</pre>	<pre><b>M03 S10000</b> G0 X0.000 Y0.000 F1500.000 N0 G0 X-8.10 Y-24.17 Z3.00 N1 G1 X-8.10 Y-24.17 Z0.00 N2 G1 X-8.10 Y-24.17 Z-0.60 N3 G1 X-2.75 Y-24.17 Z-0.60 N4 G1 X-2.70 Y-24.22 Z-0.60 N5 G1 X-2.70 Y-24.22 Z3.00 ..... N7159 G1 X-55.74 Y-44.88 Z-0.80 N7160 G1 X-55.49 Y-44.90 Z-0.80 N7161 G1 X-55.25 Y-44.90 Z-0.80 N7162 G1 X-55.00 Y-44.91 Z-0.80 N7163 G1 X-55.00 Y-44.91 Z3.00 G0 X0.000 Y0.000 Z0.000 <b>M05</b></pre>
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If the control has not been realized, please first carefully check whether the setting of MACH3 is completely correct. If it is correct, but the control cannot be realized, please contact with your distributor.

## ◆Notice for maintenance of the machine:

- ①Each time after engraving, you should first close the principal axis and power switch, and then clean the scraps produced by engraving in time.
- ②Lubricate the guide way, bearing, and screw mandrel of the machine per time every month; Use clean cotton fabric with white oil (sewing-machine oil) to clean the guide way, smear some white lubricating grease on the screw mandrel, and then turn on the machine to operate for several times. Then, lubricate all these parts again. Please attention that consistent grease is avoided.
- ③Check the cable line of the drag chain at least one time per month, and loose the tight cable line in time, so as to ensure that each line in the drag chain is loose. At the time of engraving, these cable lines need to do flexure operations repeatedly, so if the line is tight, it may easily lead to the broken of internal copper wire, thus causing poor contact. In this way, it may further let the electric motor out of control.
- ④Check all the screws every month, and tight the screws in time if they are loose.
- ⑤The spindle motor belongs to consumable supply, and its application cost is very low, so that if any abnormal sound or foreign taste occurred during the process of using, it means you need to change for another one. The spindle motor also needs to be changed after 600 hours' regular use, so as to ensure good performance of engraving.
- ⑥If the machine remains not being used for a long time, you should oil it for maintenance, and then storage it in the dry place with the covering of plastic film.