



OMIOCNC Multi-Purpose CNC System Platform

# USER MANUAL



Dear user, you must carefully read this manual before installing and using this machine; Strictly follow the steps to test the machine and learn how to use the machine. Please keep this manual properly for future reference.

# 1. Read before use

MPC-125 is a gantry CNC engraving machine with small size but powerful functions. It can process various materials, such as various woods, plastics, non-ferrous metals (aluminum, copper), etc. CNC engraving machine is a mechatronic processing equipment, the operator must go through systematic study and master the relevant professional knowledge in order to use it correctly. Operators should pay attention to the following items during learning and use:

- 1. Please pay attention to the safety of electricity, you must use the approved standard voltage, and ensure that the machine is safely grounded. If your power supply voltage is unstable or there are high-power electrical equipment around, please configure a matching regulated power supply.
- 2. It is prohibited to use the machine in a humid, high temperature, extremely cold and closed environment. It is recommended to use the machine in a well ventilated environment with a temperature of 5~35 °C.
- During the machining process, you must <u>wear protective glasses</u> to prevent being injured by flying debris. It is forbidden to touch high-speed rotating bits with hands or other objects, and <u>children are not allowed to approach</u>.
- 4. It is prohibited to disassemble and reconstruct the machine, otherwise it will lose the warranty qualification.
- 5. Please clean the machine in time and maintain it regularly, so as to keep the machine in a better working condition and extend its service life. When you are not using the machine for a long time, the power must be cut off, and the machine must be covered with dust-proof cloth or plastic film.
- 6. This manual is only a guide to the operation of the machine itself, and does not involve relevant expertise in control computers, software, materials, etc. If there are problems in these areas, please ask your relevant suppliers for help.

# 2. Assemble and Connect

# 2.1. Assemble machine

① First of all, Please find a flat ground as much as possible and assemble the stand on it.



② According to the "connector principle", adjust the horizontal height of the four columns to be consistent. Prepare a transparent hose and inject blue (or other colors) water. First adjust the



height of the A-B pillar to the same value, and then adjust the C and D pillars with the B pillar as the standard. This step is very important. If the horizontal height is not adjusted uniformly, the Y-axis of the machine will not operate normally.

③ Install the front and rear cross members



④ Install the Y-axis assembly



⑤ Install the middle cross member (center installation).



(6) Install the X axis assembly, Z axis assembly and Spindle motor.



O  $% \ensuremath{\mathbb{C}}$  Install the XYZ Stepper motors.



(8) Install the workbench, and check and correct the four points of ABCD again to make their horizontal heights consistent.



(9) Install the drag chain and cable according to the corresponding positions and holes.



1 Reference drawing of working environment layout.



#### Important:

Horizontal adjustment of the machine is the key to assembly, and Y1 and Y2 must be at the same level. After the assembly is completed, two people are required to operate at the same time,Rotate the handwheel of the Y-axis stepping motor to synchronously move the X-axis to the back.

# 2.2. Connect cables

Refer to the figure below to insert the cable of the machine into the corresponding port on the back of the electric control box, and connect the water pipe to the water pump.



- ★ Cables must be connected to the rear USB of the computer case for desktop computers.
- ★ Laptops must be powered by a power adapter while the machine is running.
- ★ An electrical outlet with a ground connection must be used. It would be better if the machine is grounded independently.
- ★ Please completely flood the pump with cooling water. It would be better if the cooling water contains 1~3% anti-rust liquid.
- ★ You'd better NOT extend the cables privately, which may lead to signal weakening so that the machine can't run normally.

# 3. Installing and configuring Mach3 software

Before testing, you need to install the CNC Control Software Mach3 to you computer.

Please see "Mach3-Configuration.pdf" for details, follow the instuctions step by step.

# 4. Test Machine

After you have correctly completed the "assembling machine", "connecting cable" and "software installation", you can start to test the machine now.

Note: From this chapter on, please follow the steps strictly. If there is any problem, please tell clearly which step the problem exists, otherwise we may not be able to provide you with effective help.

# 4.1. Test the movement of the XYZ axes

#### 4.1.1. Move the gantry

As shown in the figure, do **NOT** power on. Two people turn the handwheel of the Y-axis stepping motor at the same time, and move the gantry to 30mm from the rear end of the Y-axis.



## 4.1.2. Self-locking of the Stepper Motor

At first, do not electrify the control box, but turn the hand wheel of the stepper motor by hand and you will feel it easy to turn.

Next, connect the power supply and press the "POWER" switch and then the stepper motor will selflock. By turning the handwheel with your hand this time, you will feel a significant increase in resistance, indicating that the stepper motor is now acceptable to control. (Caution: Don't turn the handwheel so hard after the stepper motor has self-locked.)



#### 4.1.3. Running the XYZ axis

Start MACH3 and click the "Emergency Reset" button to make it stop flashing. If the "Status Information" bar shows "USBMACH Connected", it means the software and the machine are normally connected.

Now, click the "X+" button and you will notice that the principal axis will move in the direction of X+ and the X-axis coordinate will change. The value shown is the distance the spindle runs. You can also try clicking the other orientation buttons to control the movement of the axis. (Note: The arrow keys on the keyboard can control the X, Y axes, and the PGUP and PGDN keys can control the Z axis.)



#### 4.1.4. Operation Mode

Click the "Mode" button to select "Continuous" or "Single Step".

In "single step" mode, the axis moves only one step at a time. Click the [Single step distance] button to select the distance of each movement, such as 1mm, 0.1mm, 0.01mm. You can also directly enter a value, such as 50mm.

#### 4.1.5. Define XYZ coordinates

In the process of testing , if the movement direction of the axis is found inconsistent, you can modify it in MACH3:

Click "Config"  $\rightarrow$  "Ports & Pins"  $\rightarrow$  "Motor Output", then change the item "Dir Lowactive".

You can also change the coordinate direction of the axis according to your own operation habits and the specific situation of the disign software.



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ignal	Enabled	Step Pin#	Dir Pin#	Dir LowAc	Step Low	Step Port	Dir Port
Axis	4	0	0	x	4	1	1
Axis	4	0	0	4	4	1	1
Axis	4	0	0	4	4	1	1
Axis	4	0	0	4	4	1	1
Axis	×	0	0	-	X	0	0
Axis	×	0	0	×	x	0	0
pindle	4	0	0	4	4	1	1

#### Important:

If the stepper motor cannot self-lock or each axis cannot be moved by software, please use the following methods to solve the problem.

- Carefully check whether the power cord, the stepper motor cable are properly connected and whether the power switch is turned on.
- If Status Information shows No UsbMachBoard, Please plug it in! Then check whether the USB cable is plugged in properly, loose or in bad contact, or you can try the other USB ports of the computer.
- If the problem still cannot be solved, please contact your dealer (need to provide the corresponding operation video).

# 4.2. Motor Home and Soft-Limits

# 4.2.1. Return to the Origin of Machine (HOME)

Step1: Check whether the microswitches on each axis are properly connected. Step2: Move each axis to near the microswitch and click the 【REF ALL HOME】 button. Then the Z axis will keep moving up until touching the microswitch, and then move back a little, followed by the X and Y axes. After that, each axis is at the origin position of the machine, that is, the coordinates of each axis are all 0.

# 4.2.2. Soft-Limits

Click the **[**Soft Limits**]** button and the green border will appear, indicating this function is activated, and then each axis will not exceed the travel range while running. If you click this button again, the border will turn gray, and this function is turned off.

Note: Before you activate this function, you need to perform 【REF ALL HOME】.

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	ZERO +0.0000	ZERO +0.0000
	A +0.0000	ZERO +0.0000
	REF ALL GOTO MACHINE SOFT HOME ZERO COORD'S LIMITS	REF ALL HOME ZERO MACHINE SOFT LIMIT



## Important:

- During testing, if the machine does not stop after touching the origin switch, please click the "Emergency Reset" button in time. Then carefully check whether the origin switch is properly inserted or has poor contact, and check the "Input Signals" item (Config→Ports & Pins) with reference to the following figure.
- Under the activation state of [Soft-Limits], if any axis can't stop automatically after moving to the end, please click the [Reset] button in time. And then restore the software and check the item "Home/ Softlimits (Config→Homing Limits)" according to the following picture, execute [REF ALL HOME] again, and then activate the software limit function again.
- If the problem still cannot be solved, please contact the dealer (need to provide the corresponding screenshot and operation video).

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# 4.3. Test Spindle Motor

Before testing, make sure the water pump, water pipe and water tank are connected as required. (If you choose the air-cooled spindle, no water pump and tank is required.)

#### 4.3.1. Test water pump

Plug in the power supply of the water pump, and observe whether the water pump can work normally and the cooling water can circulate normally.

## 4.3.2. Tighten the spindle chuck nut

Tighten the spindle chuck nut as shown on the right (do **NOT** mount cutting tool).



## 4.3.3. Test the Spindle Motor

We can control the spindle motor through the "Spindle Speed".

- ① At first, press the POWER and VFD(Variable-frequency Drive) switches on the control box, proceed to the next step only after certain number appears on the VFD panel.
- Click the "Max" character box in the "Spindle Speed", Enter 24000, and then press Enter.
  (24000 is the maximum rotation of the spindle and cannot be changed.)
- Click "Arrow +" or "Arrow -" to adjust the spindle speed, which will increase or decrease by 10% each time. Dragging the 'green bar' up or down can also adjust the speed.
  Now, set the RPM to 12000, then click the "Spindle CW" button and the spindle motor will start to rotate clockwise.
- ④ Click the "Spindle CW" button again, and the spindle motor will stop running.



#### Important:

- If the spindle cannot start and speed up normally, please shoot the corresponding operation video and send it to the dealer for help.
- If the rotation direction of the spindle is counterclockwise, cut off the power supply of the control box, wait for 10 minutes, then open the cover of the control box, and install the U and V wires of the frequency converter in alternate positions. (The spindle is only allowed to rotate clockwise while working).

#### Important Warning:

#### Start the pump first

For the machine with water-cooled spindle, the water pump must be started at first at any time, then the motor of the spindle can be started, ensuring the normal circulation cooling water.

Otherwise, the extremely high speed may cause a extremely high temperature inside the spindle in a short period of time and it will finally burn out.

#### About Spindle Speed

The minimum starting speed of the spindle should be  $\ge$  5000 RPM, the speed during processing should be  $\ge$  12000 RPM, When processing materials such as wood, density board and acrylic the speed should be  $\ge$  18000 RPM, and when processing the non-ferrous metals such as copper and aluminum the speed should be  $\ge$  20000 RPM.

This machine is an engraving machine and the spindle motor may be significantly different from the milling machine spindle. For this machine, the higher the spindle speed is, the greater the cutting force will be.

If the spindle speed is too low, it may cause spindle to stall or VFD to burn out. For most materials, please use 18,000 to 24,000 RPM. Materials with low melting points can be used to slow down the spinning speed or increase the speed of feed.

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#### Approximate RPM in Mach3

In MACH3, the RPM displayed is an approximation (not the actual speed) for reference purpose only. The frequency value displayed on the VFD panel is relatively accurate, whose conversion method is:  $1Hz \approx 60$ rpm,  $300Hz \approx 18000$ rpm,  $400Hz \approx 24000$ rpm. There is no significant difference in an increase of 1000rpm or a decrease of 1000rpm when processing. However, the "depth of layered cutting" and "feed rate" for machining different materials should be carefully practiced and summarized.

#### Forbidden to change VFD parameters

Do **NOT** try to change the VFD Settings, whose application parameters are specially set for this spindle motor and which have been rigorously checked and tested. VFD is widely used and its factory defaults are not set specifically for engraving machines. Incorrect setting will cause damage to the frequency converter or spindle motor, and will lose the warranty rights of the product.

# 4.4. Running the G-code

Now open a G code file in Mach3, test and observe the machine's performance.

Note: The engraving range is 150mm\*150mm\*1mm in the random test file "Test G.TXT". And while running, the spindle motor should not be equipped with tools. If there is any accident during running, you can click the "Reset" key in MACH3, or press the red "Emergency stop" button on the control box.

- ① Turn on the "Power Switch" and "VFD Switch"; Switch on the water pump.
- ② Move all the X, Y, Z axes to the middle, and then click the [ZERO] button of X, Y, Z to make all of the coordinates zero.



③ Click "Load G-code", find the "Test G.TXT" file in the pop-up window and open it (in a random file).



- ④ Click the "START" button, you can see that the G code is executed, the spindle starts automatically, and the engraving machine starts to work; After the execution of G-code is finished, the spindle axis will stop automatically and each axis will return to the initial position.
- (5) Finally, turn off the VFD switch and disconnect the water pump. And then This test is complete.

# 4.5. Tool Setting Gauge (See also 5.1.5.)

The Tool setting gauge is an auxiliary tool for the tool setting of Z axis. Its main function is to make the tip of the tool closer to the surface of the material that is going to be processed. Below is how to test it.

- First of all, measure the exact thickness with a vernier caliper, Enter the thickness value in the "Probe-H" character box, and press Enter on the keyboard to save the value.
- ② Move the Z axis to the middle.
- ③ Click the "Auto Tool Zero" button, and the Zaxis will move slowly downward.



④ Touch the surface of the feeler block with the metal clip, the Z axis will immediately stop, and then move upward for 10mm.



#### Important:

If your test results are inconsistent with those described in Step ③ ④ above,

please check as follows:

- Check whether the Tool setting gauge is inserted properly, Tool setting gauge itself is damaged or the wiring harness has fallen off.
- Refer to section 4 of "Mach3-ConfigurationV3.pdf" and repeat the operation of [setting up "Auto Tool Zero"] according to the instructions.
   If the problem still cannot be solved, please contact the dealer after shooting the corresponding video (including the hiddenscript.m1s page and the Tool setting gauge test operation).

So far, the testing work before the engraving machine is used has been completed. If all tests are normal, then you can start to learn how to use the engraving machine.

# 5. The Use of Engraving Machine

Usually there are 3 steps in one machining operation:

Step 1. Generate G code (use professional software to design G-code or programme by yourself).

Step 2. Clamping material. Fix the to-be-machined material on the worktable of the engraving machine.

Step 3. Load the G code in MACH3 and then it will output the instruction signal to the engraving machine to perform processing tasks.

Note: there are a lot of design software for carving processing, including commonly-used ArtCAM, JDPaint, Wenti Carving, UCANCAM, Artcut, Deskporto, ASPIRE, Cut2D/3D, Type3 and so on. This manual does not involve the knowledge of how to use design software, there are many kinds of software tutorials online, you can choose and learn by yourself.

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CAM software First use CAM software to design the processing conte Frequently used include ARTCAM,Cut2D/3D,Aspire,A Deskporto,Ucancam,Powermill,type3, CopperCAM etc Internet of the processing conte Deskporto,Ucancam,Powermill,type3, CopperCAM etc Internet of the processing conte Internet of the procesing conte Internet of the process	ent. ArtCut, 
G-COOE .nc / .ncc / .tab / .txt	G00 X0.000 Y0.000 Z3.000 F3000 G00 X0.118 Y0.892 Z3.000 G01 X0.118 Y0.892 Z0.000 F1500 G01 X0.118 Y0.892 Z-3.000 G02 X-0.097 Y0.894 R-0.900 F1800 G01 X-0.010 Y0.897 Z-3.000 G01 X0.118 Y0.892 Z-3.000
impo	prt



# 5.1. Simple Graphic & Literal Engraving

This is a simple graphic engraving operation as well as one of the main purposes of the engraving machine.

Materials	Wood, density board, PVC, etc
Material size	≥ 260mm * 260mm * 3mm
Types of cutting tool	Single blade Column cutter, Spiral milling cutter
Engraving size	220mm * 220mm
Sample tool-path (G-code) file	SUN6040.nc
Engraving depth	1.5mm

# 5.1.1. Clamping Material (Ensure to make it tight)



Materials must be clamped tightly

# 5.1.2. Open Mach3 and load the G-code (File name: SUN6040.nc).

## 5.1.3. Set cutting tool

"Set cutting tool" means moving the tool to the starting position where the machine starts processing (i.e. the origin of the workpiece), and make the gap between the tool tip and the material surface as small as possible.

Beginners who are not familiar with the concept of coordinates can place the origin of the workpiece in the center of the material.

 Install the cutter, insert the cutter gently into the ER chuck, tighten it by hand at first, then tighten it again with a wrench.



② Move the X, Y, Z axes to make the cutter move to the origin of the workpiece (the center of the material).

You can at first use the "continuous" mode to move it to the close position, and then use the "single step" mode to move it accurately.

You can also disconnect the power supply and then turn the hand wheel of the stepper motor by hand to adjust the position of the cutter.

③ Clear the coordinates of X, Y, Z axes to zero.

## 5.1.4. Start to engraving

Switch on the power supply of the water pump, turn on the POWER and VFD switches, click the "Start" button, and the machine will start to engraving.



# Important: If your test results are inconsistent with those described in Step ③ ④ above, please check as follows: You'd better NOT open any other software or connect to the Internet when MACH3 is running. Remember to switch on the water pump FIRST, ensure the cooling water circulate normally and turn on the VFD switch before starting to engrave. You'd better NOT put your hand close to the cutter or observe it in a close distance when engraving. After engraving, first raise the Z axis, move the spindle motor out of the material, and then turn off the VFD and POWER switch. After each process, the machine should be cleaned up promptly. You can use a vacuum cleaner to intermittently remove debris during engraving. However, NOTE that the vacuum cleaner is prohibited from using the same power plugboard as the engraving machine. About choice of cutting tool: The cutting tool has various types, processing different materials requires different cutters, so when you buy cutters please carefully read the introductions of different types or to consult the seller. In order to improve the concentricity of the cutter when it is doing high-speed rotation, the length of the blade would better be slightly greater than the engraving depth, for example, if the thickness of the material is 10mm, then a blade of 12mm would be OK.

Through this example, you may have understood the whole process of the operation of this machine.

When you do other similar processing, the processes are basically the same.

# **Special instructions 1:**

#### 5.1.5. Perform Z-axis tool setting with feeler block



- ① Move the X, Y, Z axes until the cutter moves above the origin of the workpiece.
- ② Return the coordinate of each axis to zero.
- ③ Place the Tool setting gauge on the material and then clamp the cutter.
- ④ Click the "Auto tool Zero" button, and the Z-axis will slowly move downward. When the cutter touches the surface of the Tool setting gauge, the Z-axis will stop immediately and then go upward by 10mm.
- (5) Remove the Tool setting gauge. Note: At this moment, the value of the Z-axis coordinate is the thickness of the feeler block plus 10mm, which should be retained and don't reset.
- (6) Tool setting is finished, you can begin processing.

# **Special instructions 2:**

#### 5.1.6. Perform Z-axis tool setting with feeler block

In the case above, after clicking the "START" button, the spindle motor will automatically start, and each axis will begin to move only after the rpm reaches the set value; Moreover, when the processing is finished, the spindle will stop automatically, which is very convenient.

But G-codes generated by some software are without spindle control instructions, then you can add on your own, which is as shown below:

Note the code in RED. If your processing path code does not possess these commands, you can add them by yourself.

M03 S15000 G04 P5	[M03=Spindle start, S15000=Rotating speed 15000] [Pause the program 5 seconds then continues to run, so that let spindle has time to accelerate to the set speed, and then start to carving.]
G0 X0.000 Y0.000 F1000.000 N0 G0 X-0.17 Y15.49 Z3.00 N1 G1 X-0.17 Y15.49 Z0.00 N2 G1 X-0.17 Y15.49 Z-1.00 N3 G1 X9.78 Y31.92 Z-1.00	[F1000= Feed rate 1000mm/min, 'F' value can be set according to need]
N1053 G1 X73.99 Y-0.91 Z-1.00 N1054 G1 X74.00 Y-0.00 Z-1.00 N1055 G1 X74.00 Y-0.00 Z3.00 G0 X0.000 Y0.000 Z3.000 M05	【Back to toolpath origin point】 【M05=Spindle Stop】

The M05 instruction must be followed by pressing the Enter key.

# **Special instructions 3:**

## 5.1.7. To Install the Auxiliary Workbench for the Engraving Machine

Backing plate mentioned above is actually the auxiliary workbench, whose role is not only to protect the worktable, but is also to improve the accuracy in many cases.

Usually, the engraving depth of sheet material is less than 1mm, or even less than 0.5mm. Processing this kind of material not only requires high flatness of the plate, but also requires high flatness of the worktable. Therefore, we need a backing plate as the auxiliary workbench. Fix a piece of cheap and easy-to-mill wood or PVC board on the worktable and then use the engraving machine to mill its surface, and then a flat datum plane can be obtained.

If your engraving machine is often used to do cutting processing, then it is recommended that you use PVC board (or other cheap plate with moderate hardness) as the auxiliary workbench. The universal glue can be used for pasting, and the bottom-clearing cutter is recommended for milling plate. It is recommended to use PVC board with thickness of 10~15mm, for it can be reused for many times.



# 5.2. Simple Graphic & Literal Cutting

Engraving machine can also be used to cut and drill hole.

Note: When performing any cutting or hole-drilling operation, please put a backing plate under the material, otherwise the working table of the machine may be damaged during processing. If the material is kind of thin, you can fix it on the backing plate with double-sided tape.



## Sample: Two-color Board Logo

Materials	Sheet such as two-color board, PVC, acrylic
Material size	≥ 120mm * 120mm * 1.5mm
Types of cutting tool	PJ3 (3.175mm) Flat V Shape tool - 3002
Engraving size	80mm * 80mm
Sample tool-path (G-code) file	HZ8080X1.5_PJ3002.nc
Engraving depth	1.5mm





# 5.3. Processing of Common Materials

# 5.3.1. Processing of wood and density board

Engraving machine is widely used in the field of woodworking, which is one of the indispensable processing equipment, so is in advertising, furniture, decoration, handicrafts and many other industries.

There is a wide variety of cutters used in wood processing. When buying cutters, it is important to match them with the material, in order to achieve the highest processing quality and efficiency. When processing materials such as thick wood or density boards, please engrave in layers as much as possible to prevent chips from breaking the cutter. If you often engrave such materials, be sure to equip a woodworking vacuum cleaner.

Suggestions for processing the materials mentioned above: Use single-blade milling cutter or double-blade milling cutter, set rpm as S18000~S24000 and depth of each layer as 2mm~5mm, F1500~F600.

Basic principle: The smaller the layer depth is, the faster the feed speed will be.

Before the formal processing of different materials, start from a low speed, if the processing noise or machine vibration is obvious, it indicates the need to slow down or reduce the depth of each layer.

Usually when the depth of processing is above 2mm, the woodworking vacuum cleaner should be applied to remove the chips.



# 5.3.2. Processing Commonly-used Plastic Materials

The vast majority of plastic materials can be processed by engraving machine, the most commonly used of which are PVC, ABS, nylon, acrylic, two-color board, polytetrafluoroethylene, polyformaldehyde, glass fiber board, carbon fiber board, epoxy board, polyether ether ketone, polyamine ester, electric board, polyethylene and so on.

Suggestions for processing this kind of material: different plastic materials have different physical properties, cutting performance and melting point, so the spindle speed should be set differently during processing. For materials with low hardness and melting point, the recommended rotation speed is S12000~S18000, and the depth of each layer is 2mm~5mm, F3000~F1000; For materials with high hardness and melting point, the recommended rotation speed is S20000~S24000, and the depth of each layer is 2mm~5mm, F2000~F600. Single-edge spiral milling cutter is often used to process plastic materials.



## 5.3.3. Processing of Aluminium Alloy

There are also many kinds of aluminum alloy materials. In the field of engraving machine processing, the most common series are 6061 and 6063, which are widely used and easy to milling.

Processing Suggestions: Use special single-edge milling cutter for aluminum alloy. The recommended rpm is S18000~24000 and the depth of each layer is 0.3mm~1mm, F1500~F500. When processing, a certain amount of aluminum alloy cutting fluid or kerosene can be sprayed to extend the life of the cutter and improve the quality of processing.





# 6. Maintenance

- 1. After each processing, turn off the VFD switch, power switch and water pump power supply in turn, and clean up the chips and dust generated by engraving in time. (especially the chips in the guide rail and lead screw)
- 2. For machines using water-cooled spindles, the cooling water should be kept clean and replaced regularly. When processing, the water temperature should be lower than 40 degrees. When the water temperature is too high, cold water should be added in time. If it is found the spindle is hot to touch, it is necessary to stop the machine immediately to check the cooling water and water pump. If the working environment temperature is too low in winter, it is necessary to replace the cooling water with antifreeze. If the spindle motor will not be used for a long time, you must use compressed air to clean the water in the spindle in the very last use.
- 3. According to the frequency of the use of machine, the guide rail and lead screw of which should be lubricated at least once a week or once a month. It is recommended to use special grease. If the special grease is not convenient to buy, you can use a clean cotton cloth dipped in white oil (sewing machine oil) to wipe the guide rail, smear certain snow oil (a kind of advanced white grease) on the lead rod, and then start the engraving machine to move back and forth for several times. Butter or other sticky oils should never be used.
- 4. Check the cables in the towing chain at least once a month and loosen it in time if any tight cable is found. When engraving, these cables will frequently do repeated bending action, if the cable is too tight, it is easy to cause the internal copper wire to fracture and lead to poor contact, eventually make the machine out of control.
- 5. Prevent chips and dust from entering the control box and computer. Regularly clean the dust inside the electric control box and the computer host to prevent electrical short circuit. (Note: Be sure to cut off the power for 30 minutes before cleaning)
- 6. Check all the screws of the machine every month. If any loose screws are found, tighten them in time.
- 7. During daily processing, if the machine is found to have abnormal sound, stop it immediately.

After the power is turned off, rotate each axis by hand to find the source of abnormal sound, and then contact the dealer to deal with it.

8. Spindle motor and screw are important parts of the engraving machine, but also easy-to-wear accessories. If the noise is abnormal when the spindle is running, you need to find a professional maintenance agency to replace the bearing (you can not replace it by yourself), or buy a new

spindle. For users in most areas, the cost of purchasing a new spindle may be lower and the performance may be better than maintaining the old spindle.

If you find that processing accuracy is getting worse and worse, that dislocation frequently happens when engraving, and gaps between screw and nuts on it, you need to replace it with a new screw.

- 9. If the machine will be not used for a long time, then a thorough examination and maintenance should be done, and then wrap the machine in plastic film and put it at a dry place.
- 10. Users would be better be equipped with a multimeter and electric soldering iron and be familiar with its basic use methods, which will benefit the simple maintenance and troubleshooting of the machine much in the future.

# 7. Introduction to Commonly-used Cutters

For the use of CNC engraving machine, types of cutters are rich and specifications are complete, professional cutter manufacturers and dealers would have detailed introductions on the use of various cutters and their using parameters.

Users should pay attention that even the same type of cutting tools would differ in quality, accuracy, use effect and price because of the different material and grinding process.

However, it is not necessarily the more expensive the better the cutter will be, but to make selection according to your own processing needs to choose the most cost-effective one.

Here is only a brief introduction to some common cutters.

(Continued on next page)



#### Flat bottom engraving bits

Good for: Wood,ABS, Acrylic, PVC, Nylon and Majority of plastics.



## Flat bottom bits (metal)

Good for: Copper, aluminum alloy and other soft metal materials.



Single Flute Spiral End Mills Good for: Wood, MDF, Acrylic, PVC, Nylon and Majority of plastics.



Single Flute Spiral End Mills

Good for: Aluminium alloy material.



Straight Flute Cutting Bit Good for: Two-color plate,ABS,Acrylic cutting and engraving.



Three edged sharp knife Good for: Copper, aluminum, iron, jade, Hardwood,marble, etc



Two flutes end mills Good for: MDF, hardwood, acrylic, PVC, etc.



Two flutes ball nose end mills Good for: Acrylic, PVC, MDF, Hard wood, Aluminum alloy.



Two Flutes Straight Router Bits Good for: Multilayer board, Plywood, MDF, Foam.



Corn Teeth End Mill

Good for: Electric board, epoxy board, Pcb,carbon fiber board, etc.



Carbide drill bits Good for: Wood, Aluminum,PCB,lastic Acrylic,etc.



Good for: Acrylic, PVC, MDF, Hard wood, ABS, etc.

**Cleaning bottom bits**