# Carving machine 5 axis of the MACH3 interface board



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## **Product Features**

full support for MACH3, KCAM4, EMC2, and support parallel port to

control the host computer software;

leads to all the parallel port output pins of all 12 data transmission, which can control the five stepper motor driver;

with 5-way input interface, you can access the limit switches and emergency stop switch, reset the knife;

5 input LED indicates the status of the input;

with the way 10A relay control, normally open, normally closed are leads, which can be accessed spindle start, or other equipment;

The supply 5V USB power supply or an external 5V power supply to facilitate the access of external power;

external drive enable signal amplification, filtering, enhancement processing;

pulse and direction signal shaping, enhanced with a carrying capacity, data transfer speeds reach 10 MBit / S;

drive interface in two ways leads, of 4PIN XH seat with OUR 6560 driver board for easy connection terminal interface can be used with other brands of drives;

## **Interface Description**



### **Pin Definitions**

### 1.DB25 pin to pin definitions:

Р	power	Explain	PI	power	Explain
1	EN	Enable control signal	10	IN1	Signal input port 1
2	STEPX	A(first axis) pulse signal	11	IN2	Signal input port 2
3	DIRX	A(first axis) direction of the signal	12	IN3	Signal input port 3
4	STEPY	B(second axis) pulse signal	13	IN4	Signal input port 4
5	DIRY	B(second axis) direction of the signal	14	RLY	Relay control signal
6	STEPZ	C(third axis) pulse signal	15	LIMIT5	Input interface 5

7	DIRZ	C(third axis) direction of the signal	16	STEPB	E (fifth axis) pulse signal
8	STEPA	D(fourth axis) pulse signal	17	DIRB	E (fifth axis) direction of the signal
9	DIRA	D(fourth axis) direction of the signal	18	GND	Ground signal

### 2. Interface Terminal Description

Name	Explain	Remarks
Parallel	Then the computer	With the computer communication interface
port	DB25 pin connector	
USB 口	Then the computer USB	Interface board 5V power supply interface
	port	
+5V	An external power	
	source +5 V input	
	interface	
GND	External power ground	USB power port
IN5	External signal input	Light signal input
IN4	External signal input	Light signal input
IN3	External signal input	Light signal input
IN2	External signal input	Light signal input
IN1	External signal input	Light signal input
NO	Normally open relay	When the parallel port P14 is low, this pin is connected
	contact	with COM
СОМ	Relay commons	
NC	Relay normally closed	When the parallel port P14 is low this pin is not connected
	contact	with COM
+5V	+5V output pin	Access drive signal input + 5V
EN	Enable output pin	Enable effective hair pulse motor to be able to respond to
DIR	Direction output pins	
STEP	Pulse output pin	

## **Electrical Characteristics**

	Minimum	Rated	largest	Unit	Remarks
Supply voltage	4.5	5	5.5	V	
Enter high VIH	2			V	IN1~IN5
Input low VIL			0.8	V	IN1~IN5
Output high VOh		5		V	EN, DIR, STEP
Outputs low voltage VOL		0.1		V	EN, DIR, STEP
Output high current IOH			20	mA	EN, DIR, STEP
Input low current IOL			24	mA	EN, DIR, STEP

## **Typical wiring diagram:**

Interface board to connect a typical wiring diagram of the controller and drive:



### **Mounting dimensions:**



### Mach3 Software to set up and use:

Description: here will be to explain the mach3 of basic settings, we introduced here mainly for interface plate board, so you can make the motor rotate properly, some settings please refer to mach3 manual, there are very detailed and professional explanation.

#### 1.Mach3's start:

MACH3 software is installed on the desktop, there are three icons, restart



your computer, click on Mach3Mill the icon, open the interface as shown below:

West in the function of a particular state			
运行程序 Alt-1 人工数据输入 Alt2 刀路 Alt4 编4	移 Altő   设置 Altő   诊断	Alt-7 模式	
	** +0	.0000 +1.0000	Tool:0 Job Display
	设 林 +0	.0000	
	· 矛 ■ 字 ■ +0	0000	
		·····································	
	脱机  国原点	机械全称 软件压住	
文件: No File Loaded.	the second secon	(向导 最近向导 【话	利新刀路 显示模式 主动原族
新雄G代码     董运行 CuLW     最近的文件     关闭G代码     倒转运行     黄闭合代码     倒转运行	7月 6 章	进给速率 FRO 6.00	主轴转送 王敏方向F5 合
並刀智仔 ≪Spc→ 役置下一行 伊止 行: 日本的はたち 日本のはたち	直径 +0.0000 日 +0.0000 刀具自动回零	F 6.00 2/1 100% 单位/分 0.00 早	RPM_0 S_0 增量 10
▲区里达行         开水冷 Cul.F           暂停         CV 模式           意待止 F4         ode Active           G.代码         M.代码	记忆 返回 Elapsed 00:00:00	単位/W 0.00 <u> </u>	_(Loop)+O时间在M30 日 R制为_+0.0000之前通过
16 # 2.# 清除伏态: Driver Successfully initialised		项目:项目 taoba	10 ID:20913272

Mach3 software is not open after the direct use, you are using the parallel port of the drive plate pin definitions and driver board features, set to be able to control the motor normal operation.



2.Mach3 Software port settings:

MACH3 open interface as shown above, with the control button, where we first MACH3 software the basic set.

🐉 Machine (NN) Frontine Appellantion			(0 0 <b>- 2</b> -
文件E 112 春春 成身 控制 帮助			
运行 放振输入 Alt2 刀路 Alt4 偏	移 Alt5 设置 Alt6 诊断	Alt.7 模式	
軟件行程深刻		Luci I	
	x +0	.0000 +1 0000	Tool:0 Job Display
5.10 mat # 50	20.		
	÷ 10	.0000	
	<u> </u>	+10000	
···· 建硫	原 作 +0	0000	
植果		+1.0000	
Mtt	NF 10	0000 #2	
主编校准		.0000 调整	
王朝(UII) **** 規則			
···· 校准 MPG v	脱机 回原点	机碱坐标 软件限住	
ModBust的创造置 第CD ext			
中日面代 → 州 GPex 设置…	<u>http:</u>	自导 最近向导	A DESCRIPTION OF THE PARTY OF T
<b>平</b> (5	<u></u>	hia L	THE REAL PROPERTY LANDAUG
编辑G代码 重运行 Cul.W	刀具住身	讲公读业	* ****
开始运行 最近的文件 单步 Alt-N	1 77 97 10 mg	ME-GAC-T	1 .T. 4m 45 TC
ALC-RD 关闭G代码 倒转运行	刀具 0 👛	FRO 6.00	2905015
进刀轻体 加载G代码	直径 +0.0000	E 600	
<spc>Block Delete</spc>	H +0.0000	100 % (2/2)	[ KPM (2位)
<u>收置下→打</u> M1任选停止	11_+0.0000		s0
休止 1T: Altr.So 11 Manutation	刀具自动回零	单位/分 0.00 0	増量 10 🎔
从这里运行 开水冷 CulF	记忆 返回	单位/转0.00	
■ 1000 1000 1000 1000 1000 1000 1000 10	Elapsed 00:00:00	重义 重复变换	(Loop) +① 时间在 M30
Mode Active	■ 古世开关 ChilAB-J	Z限制	
G.代码 M.代码 运行程序		降低 Z 限	制为 _+0.0000 之前通过
RADA BINLD + -		THE DUCTOR	
WIER IN MALK 部 Driver Successfully initialised		坝目:项目 taobad	> 10:小專哥272

Click the units are set to appear as shown below:

				].	+0.00	000	+ 企 调整	
Mac	h4			•			X	
j. Di	o NOT use ning.	this to change be	etween Metric and	d English GCode 确定	e. This is for set	ting the U	nits used for motor	听2
章G代,, f的文件 闭G代码 崀G代码		单步 Alt-N 倒转运行	■ 刀具 直径	· 共信息 0 d +0.0000	A刀 FR	¥Ľ≯ Qaohao	6.00 00 7	

Click OK, and the below:



Mm, and click OK.

### 3.Port and pin settings:

Construction application 文件E 記載 数看 向导 投制 希助			
运行 · · · · · · · · · · · · · · · · · · ·	移 Alt5   设置 Alt6   诊断	Alt.7 模式	
软件行程限制 	×+0	.0000 +1.0000	Fool:0 Job Display
**** 电机参数 ***	谈 💱 +0	.0000 +1.0000	
···· 次和4002 逻辑 状态	为 原言 之 十0	.0000 +1.0000	
····	4 +0	.0000	
主编设置 	脱机 国原点	机械坐标 秋井压住	
ModButhO配置 奉口監視 文相 Geer 设置。		自导 最近向导	
	X		The second second
	□ 刀具信息 刀具 0 单□ 	进给速率 FRO 6.00 <b>企</b>	主轴转送
近方若存 Spc> 設置下一行 MI 任选停止  「行: 0	且役_+0.0000 H_+0.0000	F 6.00 (2/4) 100 % (2/4) 单位/分 0.00 日	RPM0 (24) S0
Alt-S 从这里运行 开水冷 Cul-F	记忆 返回	单位/转 0.00	增量 10
	A 女开关 Cut Alt-J	<u> </u>	(Loop) <u>+0</u> 时间在 M30 ■ 制为 <u>+0.0000</u> 之韵通过
Mt 2.4 清除状态:Driver Successfully initialised		项目:项目 taoba	o 10日2月9月日272

As shown above, open the Settings menu under the port and pin menu, the pin is set, click the red circle as shown in the project, click the interface shown below:

端□ #1 「	地址 )-9 A-F	模式 「 Max CL 激活 「 Max NC-10 指示驱动 Program restart therlinel/2脉冲模式 . ModBus 输入与输出支持 事件驱动串行控制 同服串联反馈	
------------	---------------	---	--

Figure ring a place where you can set the fundamental frequency, this parameter of the motor rotation speed, stepper motor, then, we generally use the default 25000HZ it. Select circle place, set the following diagram of the interface, and following our directions and pulse pin settings:

Signal	Enabled	Step Pin#	Dir Pin#	Dir Low	Step Lo	Step Port	Dir Port	1
X Axis	4	2	3	4	4	1	1	
Y Axis	4	4	5	4	4	1	1	1
Z Axis	4	6	7	4	4	1	1	
A Axis	4	8	9	4	4	1	1	
B Axis	4	16	17	4	4	1	1	
C Axis	×	0	0	×	×	0	0	
Spindle	×	0	0	×	×	0	0	

Note: Be sure to click Apply to save your data set is completed.

Direction and pulse settings, click on the output signal of the figure below,

and relay control pin settings:

Ri 2	P-11-1					
Signal	Enabled	Fort #	Fin Number	Active Low		
Digit Irig		0	0		_	
Enablel	4	1	1		<u>=</u>	
Enable2	a di	0	0		_	
Enable3	X	0	0	X		
Enable4	X	0	0	X		
Enable5	X	0	0	×		
Enable6	X	0	0	X		
Output #1	-	1	14	$(\mathbf{X})$ 2		
Output #2	X	0	0	X		
Output #3	X	0	0	×		
Output #4	X	0	0	X	~	
31	脚 2 - 9 , 1, 14,	16, 和17 是输出信	号. 其它没有用到.			

1 foot control enabled pins, if the motor is not locked, the switch one position can be, only the motor lock, send the pulse of the drive response. 14-pin relay control pin, the relay does not pull to control the relay by the following set.

輸出信号 # s 1-6     1	<ul> <li>( 清轮比率 #</li> <li>( 清轮比率 #</li> <li>( 清轮比率 #</li> <li>( 清轮比率 #</li> </ul>	2  0 3  0 4]  0 特殊功能 厂 激光模式 频	最大速率 1000 2000 \$000 \$000 \$000 \$000 \$000	
輸出 #'s 1-6     正轴模式 - 使用脉冲/方向     □ 激活 值 [64 64 -     最大 ADC 控制 16380     □ 延迟后再换向     □ 延迟后再换向	환 환 환	<ul> <li>□ 使用主轴反馈</li> <li>□ 闭环控制主轴</li> <li>P 0.25 I</li> <li>□ 平滑主轴速度</li> <li>□ Laobao</li> </ul>	同步模式 「1 D D D	3 哥272

Spindle relay can control the pull or release through the code M3 relay

together, M5, relay release.

#### 4.Mach3 of the limit switch settings:

Click on the input signal, set the parameters as shown below:

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey	*
X ++	4	1	10	4	X	0	E
Х	4	1	10	4	X	0	
X Home	X	0	0	×	X	0	
Y ++	4	1	11	4	X	0	
Y	4	1	11	4	X	0	
Y Home	X	0	0	×	X	0	
Z ++	4	1	12	4	X	0	
Z		1	12	4	X	0	
7 Home	X	0	n	X	X	0	×

The emergency stop switch settings: in case of emergency is in need of emergency to stop the machine, the parallel port pin 13 as an emergency stop input pin, mach3 set corresponding to the following diagram:

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey	*
Input #2	×	0	0	×	X	0	
Input #3	×	0	0	×	×	0	
Input #4	×	0	0	×	×	0	-
Probe	×	0	0	×	×	0	E
Index	×	0	0	×	×	0	
Limit Ovrd	×	0	0	X	X	0	
EStop	4	1	13	4	X	0	
THC On	X	0	0	X	X	0	
THC Un	X	n	n	X	×	n	v

Three-axis systems, the five input interface can set the limit switches, emergency stop switch, reset switch, there are many ways to set, I only listed one of them, you can refer to your actual needs mach3 The user's manual on mach3 settings.

#### 5.Motor debugging:

Motor debugging refers to debugging software on the state of motion of the motor here need to do the work of three, a) calculation tool or table moves one millimeter of the desired number of pulses, (b) set the maximum motor speed, (c) Set the acceleration of the motor.

Motor debug menu to open the steps as shown below:

😺 Medica CMC Frontinol Apodic	alim			.a¦0 <b>=3</b> *
文件E 11 查看 件号 拉特 运行 单位设置 第四和引用	e fean) 收据输入 Ali2 / 刀路 Ali4 / 偏i	移 Alifs   设置 Alifs   诊断	Alt.7 模式	
软件行程限制 从服轴 ———————————————————————————————————		** +0	.0000 +1.0000	Tool:0 Job Display
		设 禁 +0	.0000 +1.0000	
····· 送稿 状态		カ康 之 +0	.0000 +1.0000	
···· 解映 王确校理		** ** +0	.0000 清空	
主输设置 … 规则 … 校准 MPG		脱机 回原点	机械坐标 软件现位	اــــــــــــــــــــــــــــــــــــ
ModBust時以起置 市口監視 <b> </b>		But	(向导 最近向导	
<b>~</b> □ 字傳		2		A STATE
开始运行 ≪Alt-R> 差印	沈码 重送行 Cut.W 算文件 単歩 Alt.N ■ 御林浸行 ■	刀具信息	进给速率	主轴转速
进力暂停 加载(	代码 Black Delete	直径_+0.0000	FRO 6.00 日 F 6.00 (乳油)	
· · · · · · · · · · · · · · · · · · ·	○ 行 III 任选停止 ■ 0	H +0.0000 刀具自动回季	#位/分 0.00	S0 ₩₩ 10
—————————————————————————————————————	运行 开水冷 Cut.F □ 暂停 ■CV 模式	记忆 返回 Elaosed 00:00:00	单位/转 0.00	
紧急停止 F4	G.代码 M.代码 -运行程序	直支折关 Chi-All-J		(LOOP) + U 时间任 M30 Ш 制为+0.0000 之前通过
5428 清除伏态:	No GRex hardware detected		项目:项目	

Click the following figure:



Here we Figure Each item is explained as follows:



The number of pulses required for the calculation of the tool or worktable move one millimeter, according to your machine, the screw pitch, the number of segments drives, stepper motor step angle is calculated.

The maximum motor speed will be limited by the the Mach3 maximum pulse rate, if the configured Mach3 frequency of 25000Hz, the unit impulse is 2000, you can get the maximum motor speed of 750 units per minute. Set the maximum motor speed of motor-driven device or machine is not safe, the Mach3 may be tired running, you need to calculate or test to determine the maximum speed if it is safe.

Is a very important part of the motor acceleration settings, the maximum speed of the motor from rest to an accelerated process, we set the value to the motor does not lose steps, the normal operation of the subject. The pulse width of the optocoupler interface board and the drive is set up, we regard it is set to 3us.

The above data is only indicative, not the data you want to set, depending on your equipment, computing and debugging.

Appendix: the number of pulses table go 1mm calculated as follows: The formula = (motor rotating a circle of the standard number of pulses \* drive number of segments) / screw pitch

For example: the stepper motor step angle of 1.8 ° (the most common motor), turn a circle the number of pulses is 360 °/ 1.8 °= 200 pulses, the drive segments 16 segments, screw pitch 4mm. Steps per =  $200 \times 16/4 = 800$ .

Note: be sure to click save axis option to save the data set is completed, each axis must be kept separate!

#### 6.G-code is run:

G-code instructions in the NC program of mach3 software comes for customers to test the G code, you can easily call when customers test machine. Load the G-Code, click on the File menu bar, as shown below:

🛃 Mach3 CNC Controller			- 8
Elle Config Function Cfg's View Wizards Operator PlugIn Control Help			
LazyCam 1 MDI Alt2 ToolPath Alt4 Offsets Alt5 Settings	Alt6 Diagnostics Alt-7 Mill	->G15 G80 G17 G40 G20 G90	G94 G54 G49 G99 G64 G97
Close File(s) Exit F60.000000 G0 X0.000000 V0.000000 Z0.200000 M3 S60.000000 G43H5 G0 X0.000000 V0.000000 Z0.200000 G0 X1.179950 Y4.004260 Z0.200000 G1 X1.179950 Y4.004260 Z.0.100000 G1 X1.179950 Y4.004260 Z.0.100000	R     Zero     +0       F     Zero     +0       L     Zero     +0       V     Zero     +0       Zero     +0       OFFLINE     GOTO Z     To Go	.0000         Scale         +1.0000           .0000         Scale         +1.0000           .0000         Scale         +1.0000           .00000         Scale         +1.0000           .00000         Radius         Correct           .00000         Radius         East Wizard	egen. Display Jog
Cycle Start       Edit G-Code       Rewind Ctrl-W         Recent File       Single BLK AR-N       Reverse Run         Close G-Code       Reverse Run       Reverse Run         Feed Hold       Stop       Block Delete       Mt Optional Stop         Stop       Line       Flood Ctrl-F       Dwell       CV Mode         Run From Here       Dwell       CV Mode         Reset        Zinhibit       Zinhibit         G-Codes       M-Codes       +0.000	Tool Information Tool O Change Tool O Change Tool Dia. +0.0000 H +0.0000 Auto Tool Zero Remember Return Elapsed 00:00:01 Jog ONIOFF CtrI-Alt-J	FRO 6.00 Feedrate 6.00 Units/Min 0.00 Units/Rev 0.00	Spindle Speed Spindle CWF5 SRO % 100 SRO % RPM 0 S-ov 0 Spindle Speed 0
History Clear Status:		Profile: Mach3Mill	

Open the folder that contains the mach3 software,  $\square Mach3$  open include testing of the G code  $\square GCode$  and click open and select a G-code interface as shown below:

C Mach3 CNC Controller	_ # X
Program Run Alt-1 MDI Alt2 ToolPath Alt4 Offsets Alt5 Settings Alt6	Diagnostics Alt-7 Mill->G15 G80 G17 G40 G20 G90 G94 G54 G49 G99 G64 G97
T开 T开	Zero         +0.0000         Scale         +1.0000           Zero
查找范围 Q: Gode             求最近的文档 家面 求最近的文档 家面 文件名 (g): 字 at 文件名 (g): 字 at 文性名 (g): 字 at 文t 文性名 (g): 字 at 文t	・ ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●
History Clear Status: ReConfiguration Estop.	Profile: Mach3Mill

Click to run G-code the following figure:

G0 Z1.0000       State         S333       M5         G0 Z-0.1       G0 Z0.0845 Y0.0341         F5000M3       F5000G1 X0.0936 Y-0.0037         G1 X0.1031 Y-0.0416       G1 X0.1130 Y-0.0795         G1 X0.1232 Y-0.1175       G0 Z0 To Go         File:       C:Mach3/GC ode/Cross.tap         File:       C:Mach3/GC ode/Cross.tap         File:       C:Mach3/GC ode/Cross.tap         File:       State         File:       State         State       Block Delete         M1 Optional Stop       From Hara         File:       State         Stop       State         Stop       State         Stop       Line         Stop       Flood Chi-F         Divell       Cit Mode         Elites of 00:00:01       MitoPass	7 G40 G20 G90 G94 G54 G49 G9	MII->G15 G1 G17 0	6 Diagnostics AR-7	Settings Alt6	Offsets Alt5	ToolPath A84	I-1 MDI ANZ	Program Run Al
File: C:Wach3/GCode/Cross.tap  File: C:Wach3/GCode/Cross.tap  Edit G-Code  Revealed Ctrl-W Siegle RLK AR-N Reverse Run Load G-Code Block Delete M1 Optional Stop Auto Tool Zero Remember Return Elacsed 00:00:01 MultiPass	Tool:0 Job Display	0.0845 Scale 0.0340 Scale +1.0000 0.1000 Scale +1.0000 0.0000 Scale 0.0000 Scale Correct Scale Scale Scale Elemits Soft Scale Soft Scale Sca	Zero         +(           Zero         +(           Zero         +(           Zero         -(           Zero         -(           Zero         +(           Zero         +(	RWF ALL HORE		341 3 Y-0.0037 1416 795 175	845 Y0.03 3 1 X0.0936 031 Y-0.0 130 Y-0.0 232 Y-0.1	G0 Z1.0 S333 M5 G0 Z-0.1 G0 X0.0 F5000M F5000G G1 X0.1 G1 X0.1 G1 X0.1
Edit G-Code     Rewind Ctrl.W     Tool Information       Recent File     Single BLK AR-M     Tool O     Charae       Feed Hold     Load G-Code     Block Delete     Dia. ±0.0000       Stop     Set Next Line     M1 optional Stop     Dia. ±0.0000       Alt-S     Rune From Hara     Dwell     Cv Mode	Regen. Display Jog Toolpath Mode Follow	Wizards Last Wizard	Load			Cross.tap	ch3\GCode\/	File: C.Wa
Reset G.Codes M.Codes M.Codes Lower Z Inhu	Spindle Speed Spindle CWFS RPM 0 Former S 333 Increment 10 L (Loop) +0 Times on M30 Inhthit by +0.0000 on each pas	Feed Rate FRO 5000.00 100 F 5000.00 100 % Units/Min 0.00 Units/Rev 0.00 Desoft MultiPass 1 2 millat +0.000 Lower 2 Int	Tool Information Ool O Charge Tool Dia. +0.0000 H +0.0000 Auto Tool Zere Remember Return Elacsed 00:00:01 Jog OllOFF CtriJAR-J		Rowind Ctrl-W Single BLK AL-J Reverse Run Block Delete M1 Optional Sto Flood Otrl-F Dwell [CV M ades	Sede File Code Code I Line 8 N Here G-Codes M-C	Edit G-C Recent Close G- Load G-I Set Next Line Run From	Cycle Start «AltR- Feed Hold «Spc» Stop «AltS- Res

You can see the red emergency stop button RESET (circle one location) in a flash, use the mouse to click this button to stop flashing, and then click circle the location CYCLESTART run.

If you want to run their own G-code for processing, the same way, find the folder to store your G-code, G code to import to run.

#### 7.how to use the MACH3 the manual interface:

Test, with hand control, you can press the TAB key, the keyboard, you can open the manual control panel as shown below:



Software configuration, click the stop switch reset allowed not to flash the mouse to click on the appropriate channel button, you can make the corresponding channel of the stepper motor rotates, the figure below is the manual control panel:

