DIY CNC 3 Axis Engraver Machine PCB Milling Wood Carving Router Kit Arduino Grbl

Contents

Introduction

The mini CNC engraving machine laser engraving machine is suit for make non- metal processing such as plastic , wood , acrylic , pvc, pcb, wood or the similar material , etc.And airframe adopt profiles + plastic， small size, light weight , USB interface , open source GRBL control.

The repeat positioning accuracy is with in 0.1mm under no-load, usually is about 0.05mm. Laser is considered no-load. If you use graver, the precision is depending on the hardness of the material

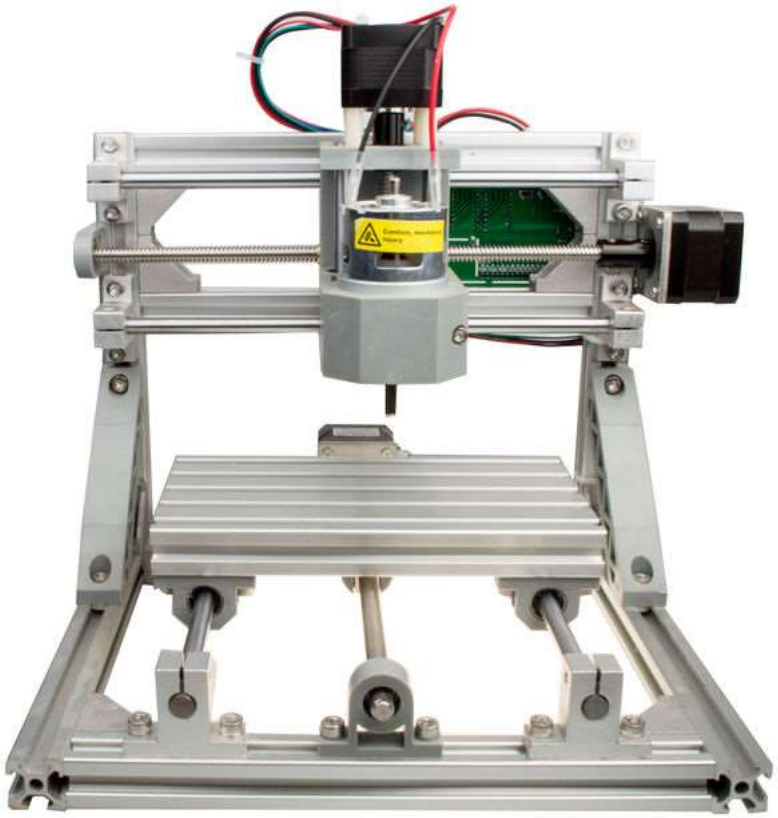
Grbl is a no-compromise, high performance, low cost alternative to parallel-port-based motion control for CNC milling. It will run on a vanilla Arduino (Duemillanove/Uno) as long as it sports an Atmega 328.

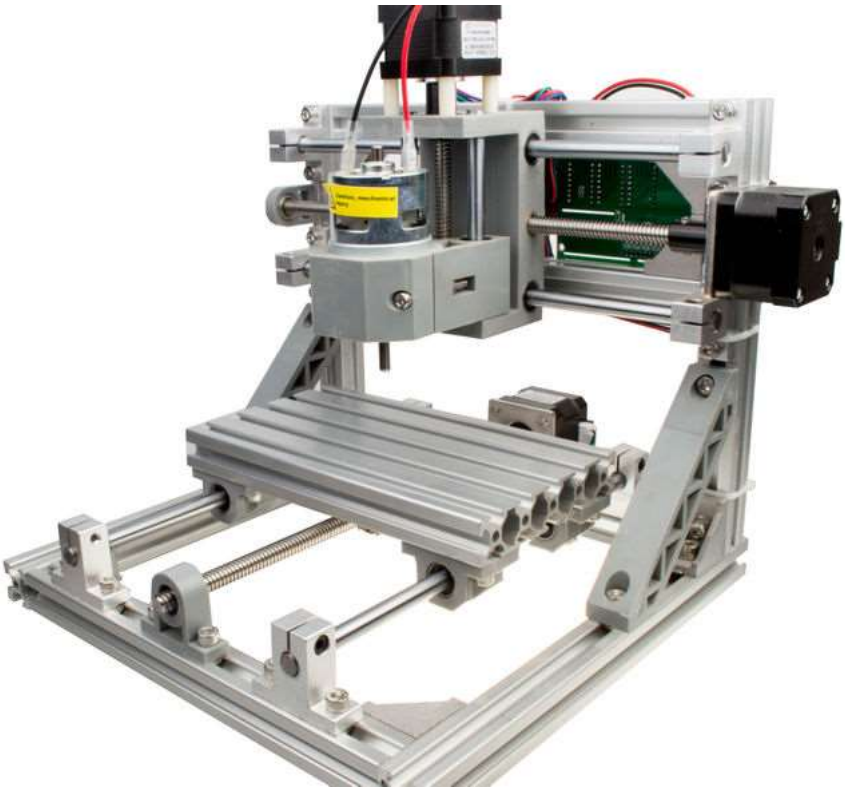
The controller is written in highly optimized C utilizing every clever feature of the AVR-chips to achieve precise timing and asynchronous operation. It is able to maintain up to 30kHz of stable, jitter free control pulses.

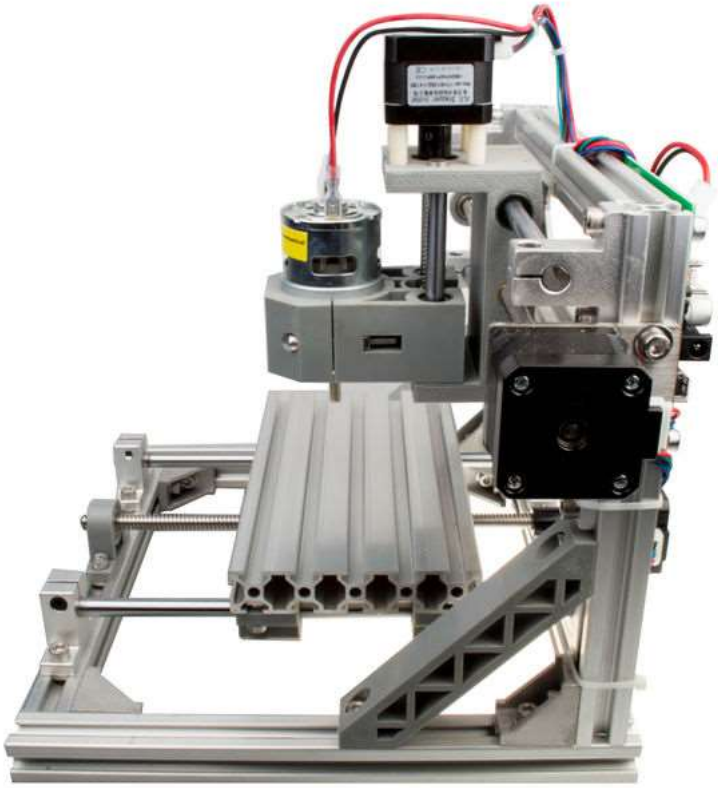
It accepts standards-compliant g-code and has been tested with the output of several CAM tools with no problems. Arcs, circles and helical motion are fully supported, as well as, all other primary g-code commands. Macro functions, variables, and most canned cycles are not supported, but we think GUIs can do a much better job at translating them into straight g-code anyhow.

Grbl includes full acceleration management with look ahead. That means the controller will look up to 18 motions into the future and plan its velocities ahead to deliver smooth acceleration and jerk-free cornering.

Note： The engraver machine couldn't carve 3 dimensional objects. The different hardness of the material, the different thickness of the carving, and the maximum carving thickness is 30mm. The kit includes xyz stepping motors. You don't need purchase any parts separately, it is enough for working.

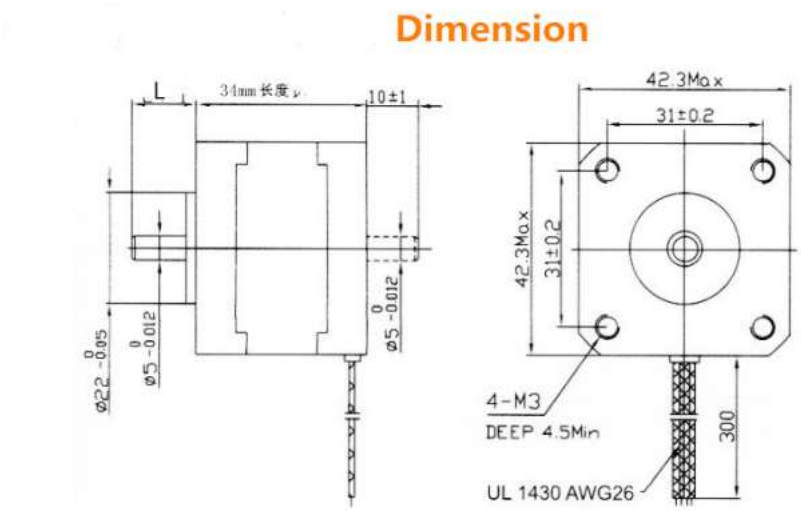






Motor Specification

Stepper Motor



- motor model no.: L42BYGH34-1334A
- voltage: 12V-24V
- current/phase: 1.33 A
- resistor/phase: 2.1 Ω
- inductance/phase: 2.5 mH
- static moment: 2.2 kg-cm
- motor outlet: 4#
- rotary inertia: 35 g-cm^2
- motor weight: 0.22kg
- Positioning torque: 120kg-cm
- Body length: 34mm

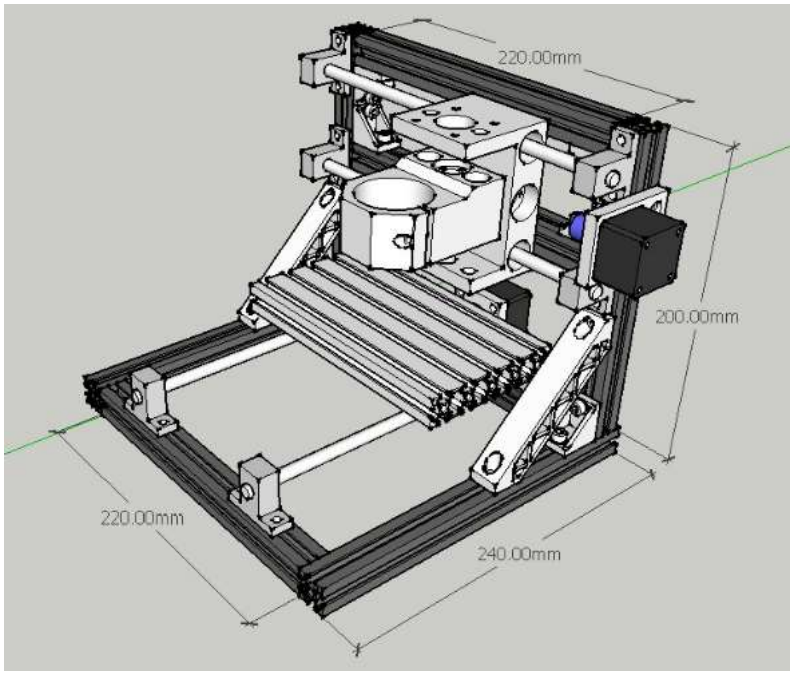
Spindle motor

- Model no.: 775
- Weight:350g
- Condition: New
- Shaft Diameter: 5MM
- Shaft length: 17
- Body length: 66.7
- Front step diameter: 17.4
- Front step height: 4.7
- Body diameter: 42
- Motor Total length: 98
- Diagonal assembly hole distance: 28.8
- Long assembly hole distance: None
- Assembly hole size: M4
- Assembly fix hole: 2
- Radiator fan: Yes

Motor Performance Parameter(without load)			
	Voltage (Rated voltage 24V)	Current (Rated current 0.31 Ampere)	Rotation speed (Rated rotation speed 7000 circle/minute)
Parameter under different voltage	direct current 12V	0.26	3500
	direct current 18V	0.29	4900
	direct current 24V	0.31	7000
	direct current 30V	0.32	8100
	direct current 36V	0.35	9000

Usage

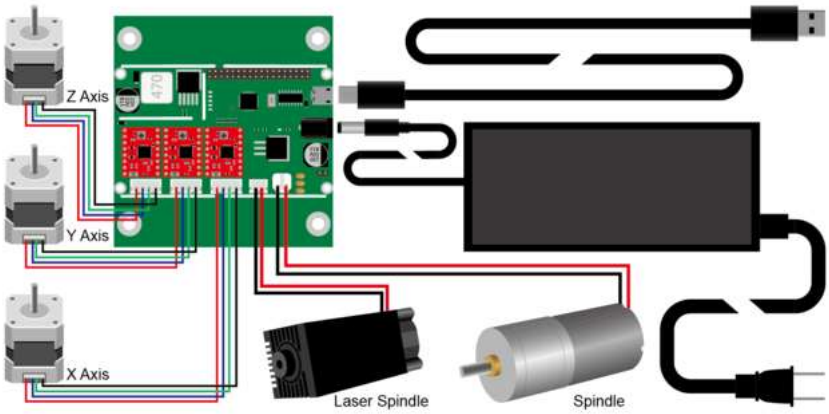
Model profile size

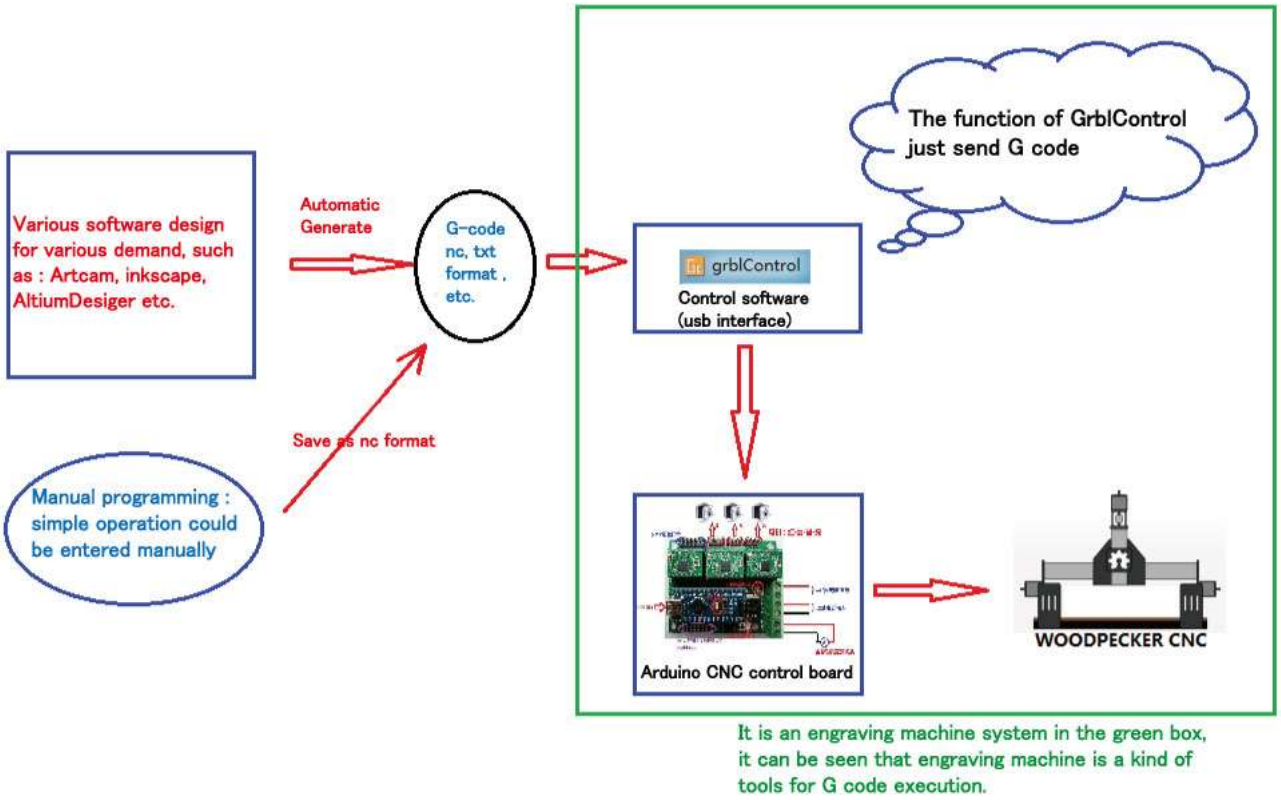


And the head travel dimensions of the mini CNC engraving machine laser engraving machine as follow:

X: 16cm Y: 10cm Z:4.5cm

Engraver Machine base and Assembly instructions





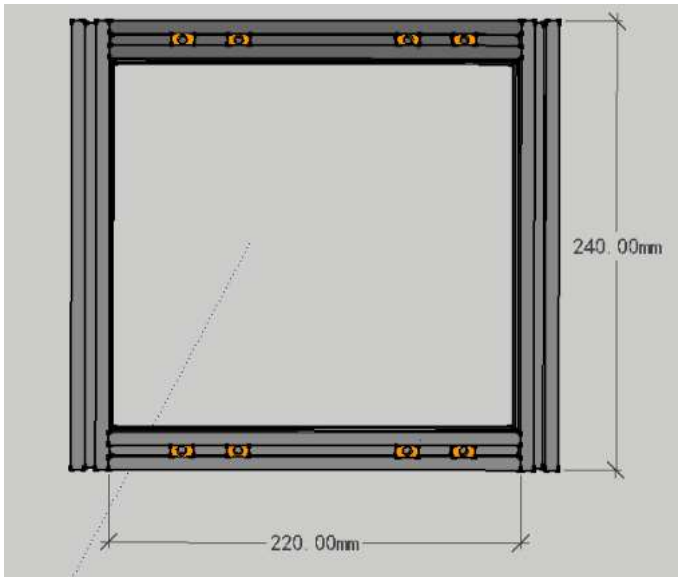
Assemble instruction

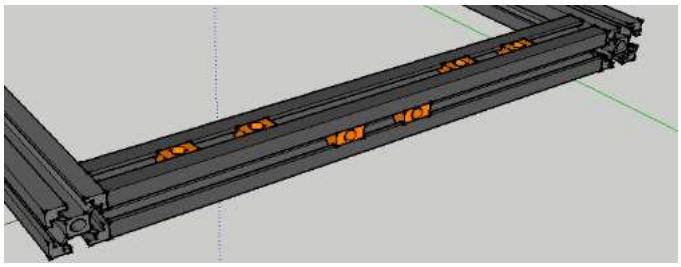
1.Pedestal Assemble

a)Part:

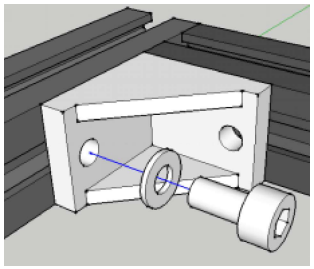
Part	Spec	Quantity	Part no.	Note
Aluminum profile	240mm	2		
Aluminum profile	220mm	2		
screw	M5x10	8		
pad	M5	8		
slide nut	M5	18		
corner fitting	2020	4		

b)Assemble: Please note to reserve the nut previously, and kindly refer to below instruction view:

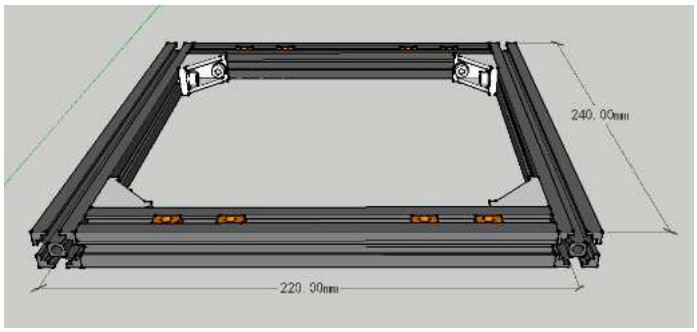




c)The aluminum profile are connected as below:



d)Final effect: If feel the assembling is smooth, please tighten the screw as possible, so as to keep it fix and stable.



e)Notice:

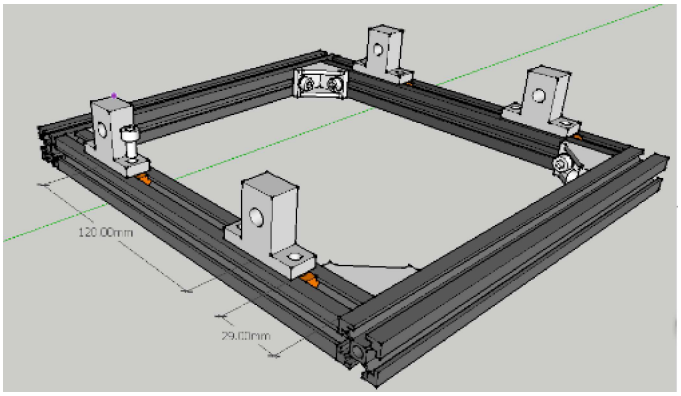
Try to assemble on flat place, working table is preferred.

2. Y Axis assemble

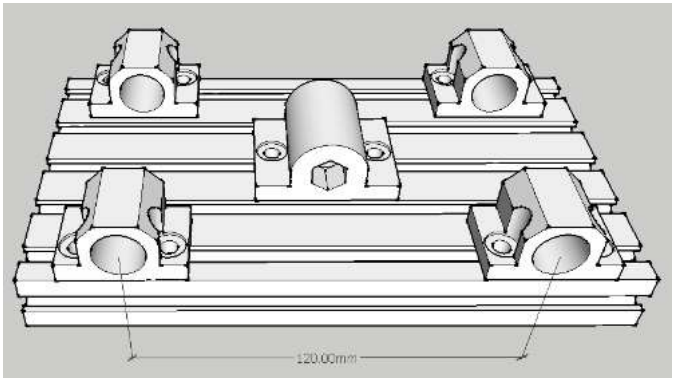
a)Part

Part	Spec.	Quantity	Part No	Note
optic axis support pedestal	SK8	4		
direct optic axis	240mm	2		
slide block		4		
nut seat assembly		1		
table	20100	1		
screw	M5x10	18		
slide nut	M5	10		

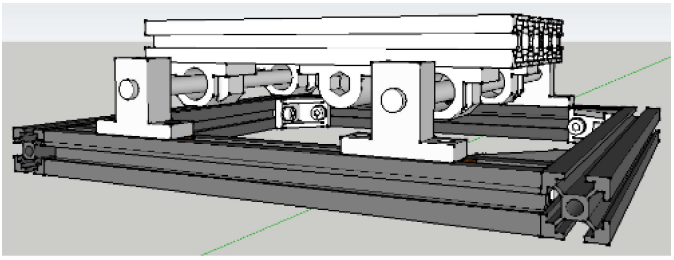
b)Direct optic axis pedestal assemble instruction: axis separation distance 120mm, which also could be adjusted as user's mind. No need to tighten the screw too much, as it has to be adjusted slightly later.



e)Table assemble instruction view: No need to tighten the screw too much. The nut seat direction could be random. For slide block direction, please refer to below view.



f)Final effect: The axis distance could be adjusted according to actual situation.



3.Y axis motor and lead screw assembly

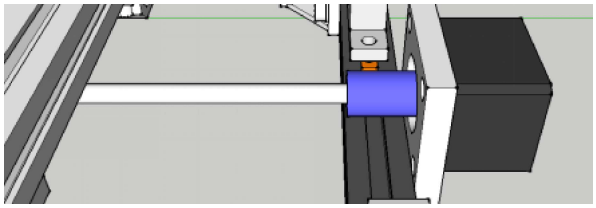
a)Part list

Part	Spec	Quantity	Part no.	Note
Motor assemble board		1		
stepping motor	42	1		
coupling		1		
fastening screw	M4	4		
lead screw	218mm	1		
copper nut		1		
spring		1		
screw	M5x10	2		
screw	M3x6	4		

b)Motor assembly instruction: Please fix the coupling with the motor, as the motor shaft entering coupling for 12.5mm, then fix by the fastening screw. Fix the motor on motor assemble board, and fix the motor assemble board to the machine. Please note that no need to tighten the screw too much, for convenient adjust later.

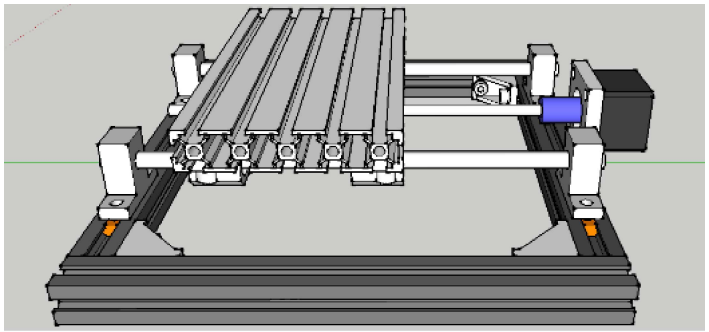
c)Screw assemble instruction:

d)Assemble screw and coupling



The screw and coupling connecting should be concentric, as the fastening screw should be side by side, and be tightened alternatively. After fix it, manually turn the screw with even speed, and try to feel if the resistance is even.

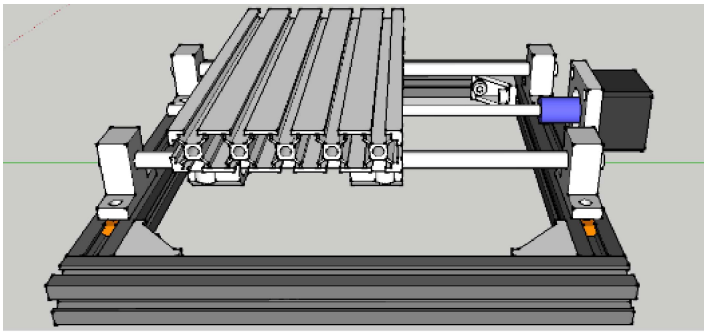
e)Please refer to final effect as below:



Portal frame assemble: a)Part

Part	Specification	Quantity	Part no.	Note
Aluminum profile	220mm	2		
Aluminum profile	200mm	2		
screw	M5x10	8		
pad	M 5	8		
slide nut	M5	9		
corner fitting		4		

b)Final effect: Reserve one nut on the back, for the purpose to assemble the control board, please refer to below view.

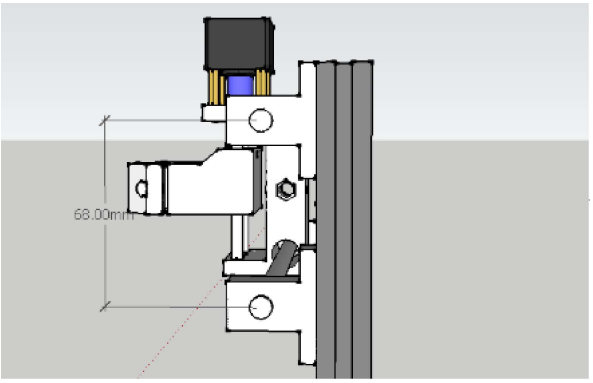


4.X axis assemble

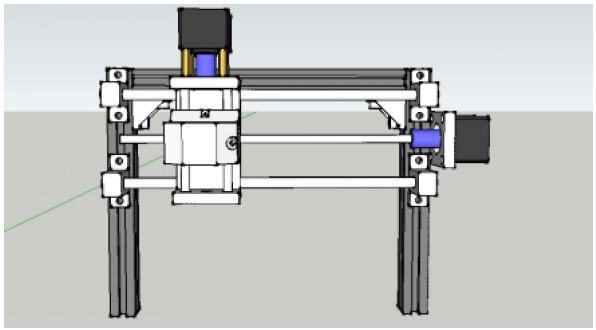
a)Part

Part	Spec	Quantity	Part no	Note
XZ assembly		1		
motor assemble board		1		
stepping motor	42	1		
coupling		1		
fastening screw	M4	4		
screw	238mm	1		
copper nut	M6	1		
spring		1		
screw	M5x10	10		
screw	M3x6	4		

b)Install XZ assembly. Please refer to below view. Align the edge of optic axis supporting pedestal with top side of aluminum profile, with axis distance 68mm. The assembly requirement is the X axis could move evenly left and right.



c)Please refer to final effect as below view.

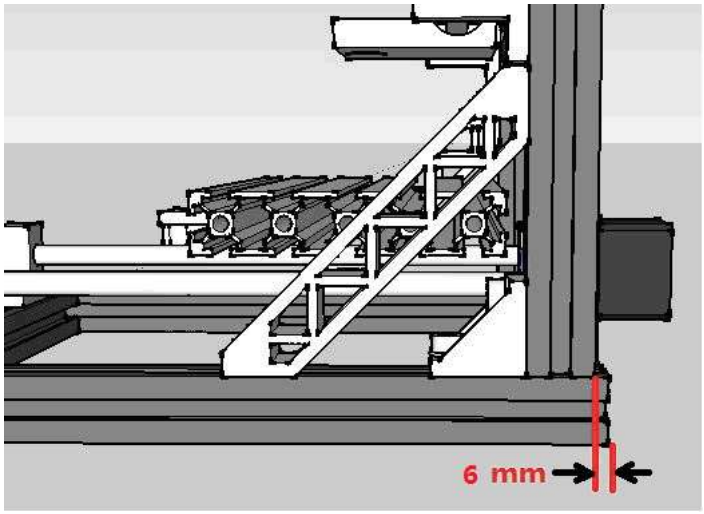


5.Assembly

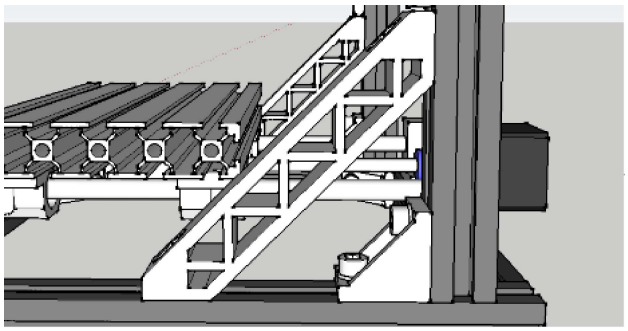
a)Part

Part	Spec	Quantity	Part no.	Note
Screw	M5x10	8		
pad	M5	4		
slide nut	M5	8		
corner fitting		2		
The oblique support		2		

b) Please refer to below view for assembly: The distance between portal frame and pedestal tail should be 6mm, the reason for which is the spindle axis and Y axis could coincide.



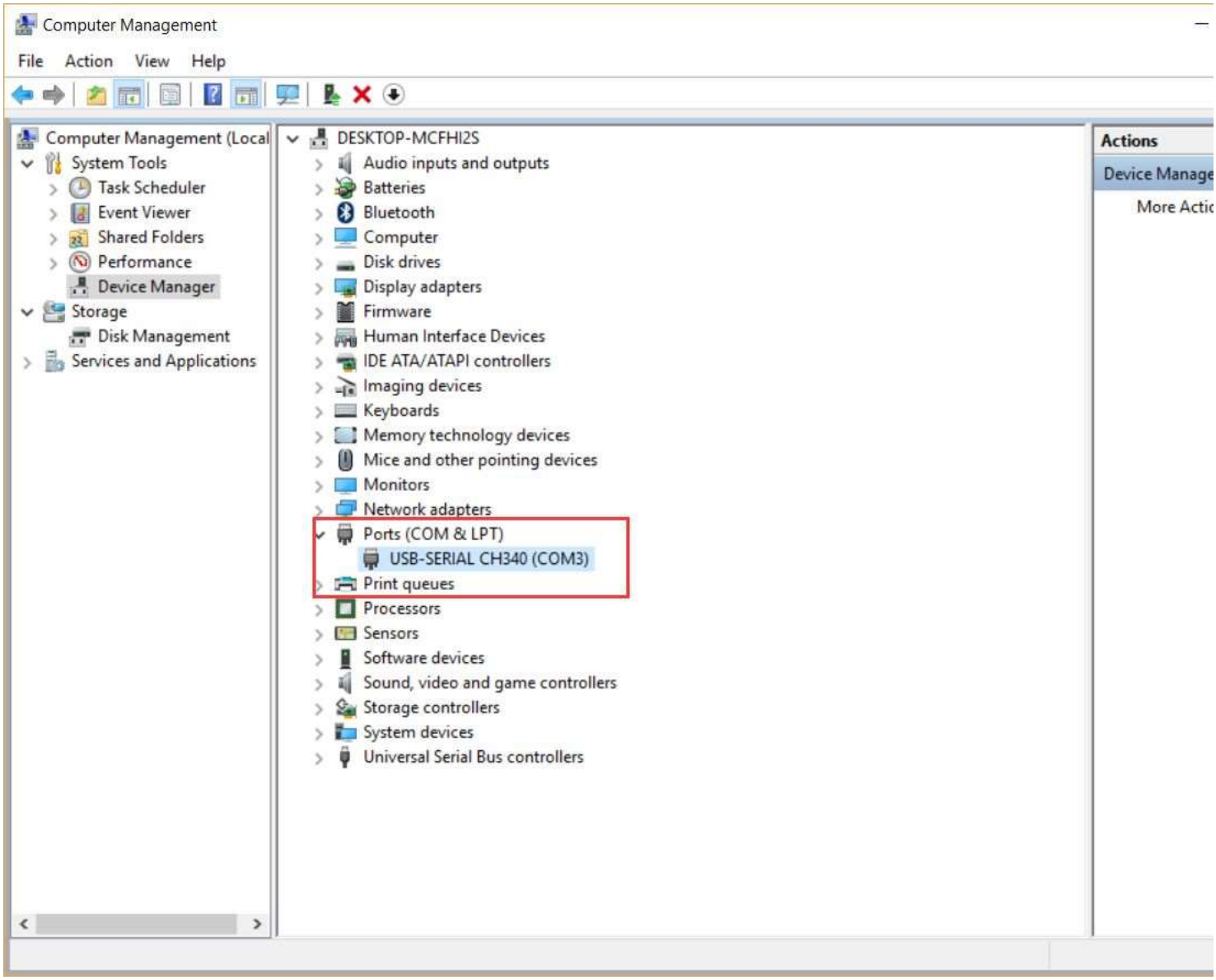
c)Assemble support



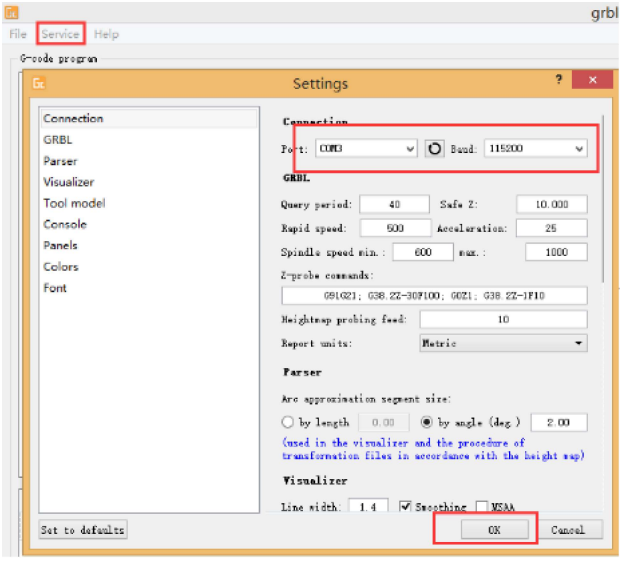
d)Install the assemble board of control board

How to use

- 1. Open the Device Manager to view the CNC port number: My computer assign is COM3.



- 2.Open the control software grbl Control, click the "Service -> Settings" to set: "COM3, 115200" and then click OK:



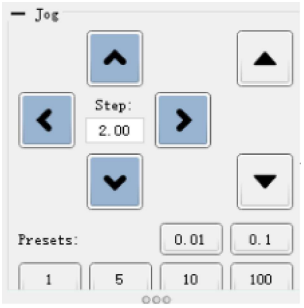
Console print out the message indicate that the "CNC" is connected successfully.

- 3.Test whether the X, Y, Z axis movement is normal or not by clicking the control panel on the right side.

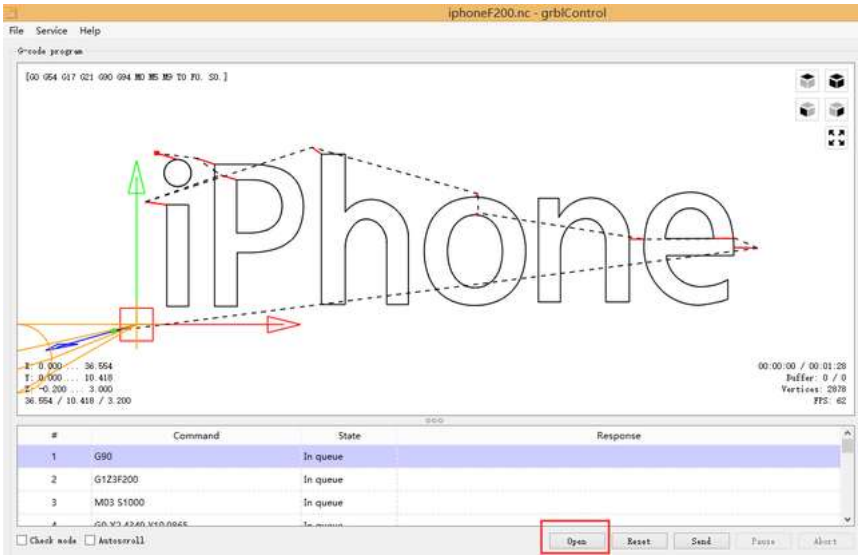
Note: (1) Please don't set the "step" too high, otherwise it will be over travel.

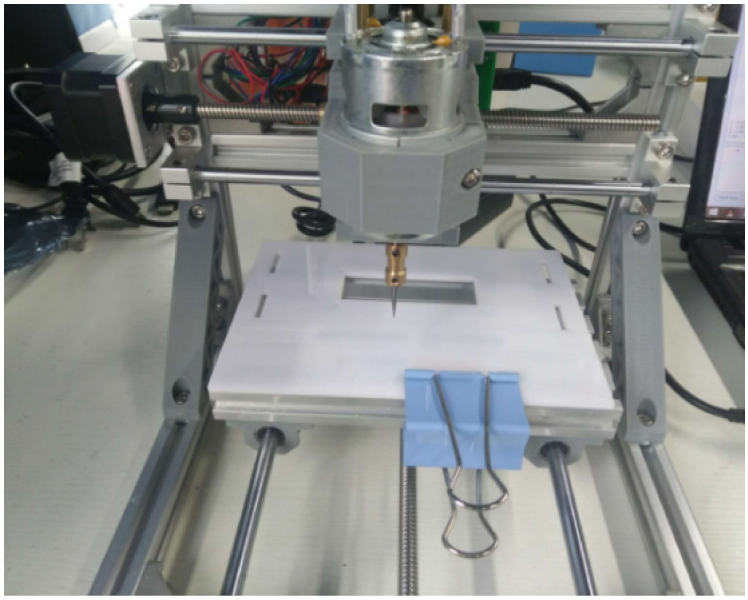
(2) Please run the program in the machine without engraving knife to get familiar with the operation procedures before installing it. Don't install the engraving knife at first.

The engraving knife installation will be explained in following instruction.



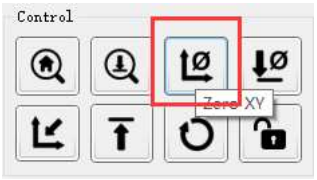
- 4. Open one engraving file for test, and place an acrylic plate on the CNC platform for engraving, which should be fixed well.

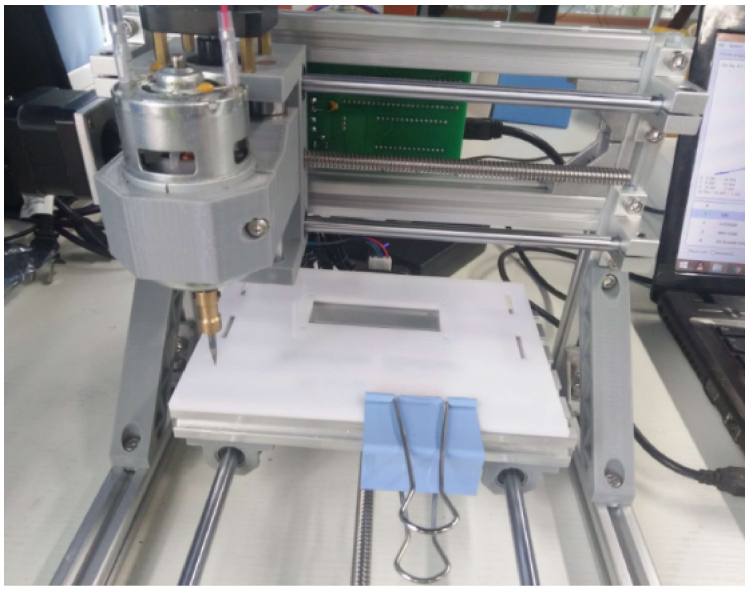




- 5.Move X, Y axis to set the original coordinates point by control panel (Z-axis does not move at present) , click the control panel on the right side , set the X, Y axis as zero:

Click “Zero XY” to set the X, Y axis to be zero.

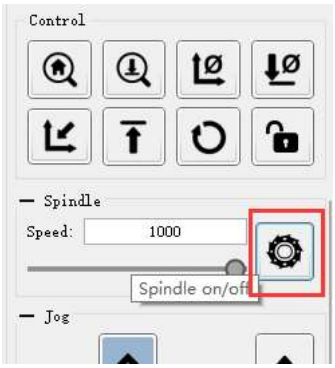


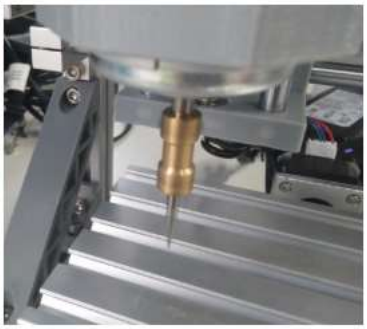


- 6.Start the Spindle of motor, adjust Z axis down, the Step value could be a little higher at the moment. When the engraving knife is going to touch the engraving object, must decrease “step” （Step≤ 0.1）, when engraving knife just touch the object surface, set Z axis to be 0.

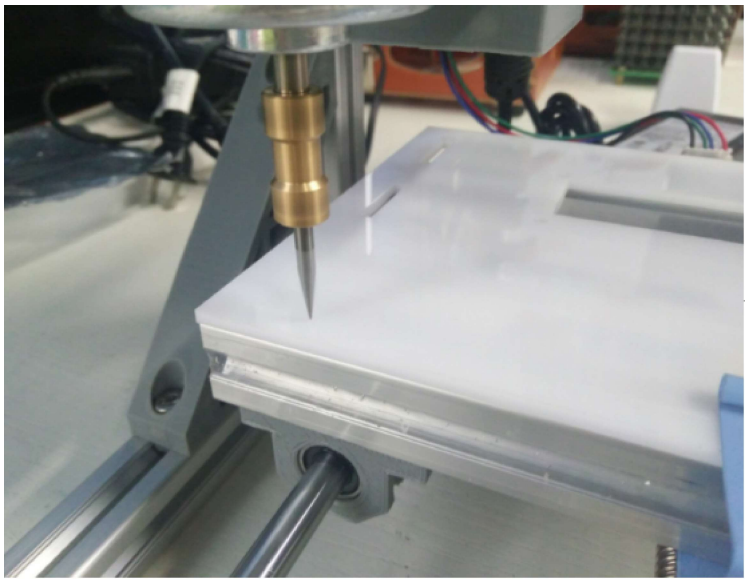
Note: The Spindle must be started before the knife down, otherwise the engraving knife is easily to be broken.

Click Spindle button, the motor start to turn.

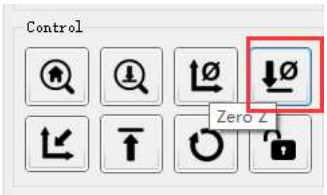




At the moment just touch the surface of acrylic, Stop the knife.

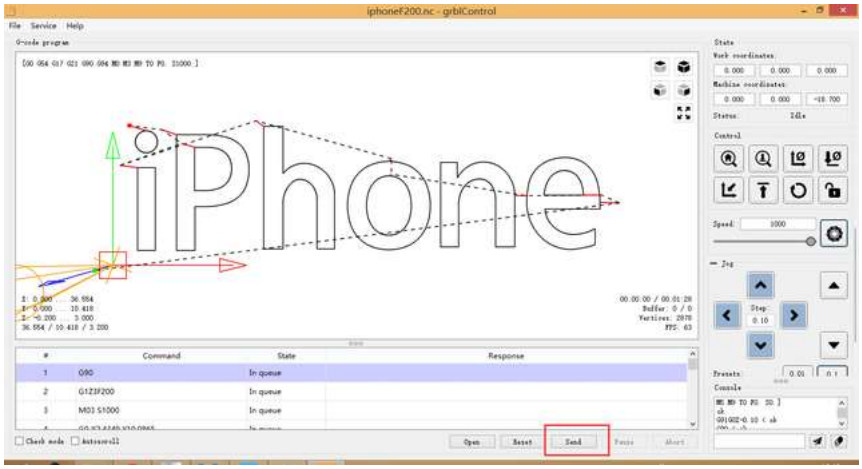


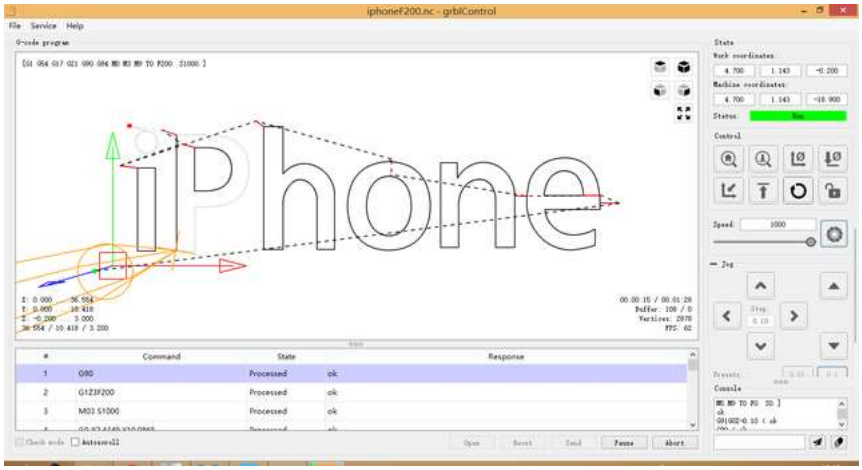
Click “Zero Z” to set the Z axis to be 0.



- 7.The work about knife is almost finished.

Next, click “send” button, start the engraving.





The engraving is finished.

The effect after color is added.

Example Project

samples and guidelines (https://s3.amazonaws.com/linksprite/Mini+CNC+engraving+machine/samples+and+guidelines+iphoneF200.nc)

Assemble Video

- Assemble base I (https://www.youtube.com/watch?v=HiDhb1mfxnM&feature=youtu.be)
- Assemble base 2 (https://www.youtube.com/watch?v=ut5FN5tJK_M&feature=youtu.be)
- Assemble front 1 (https://www.youtube.com/watch?v=lEbFm_25ZqE&feature=youtu.be)
- Assemble front 2 (https://www.youtube.com/watch?v=YvTGyO3YdgM&feature=youtu.be)

Resources

- Control Software for Windows
  - Control Software (https://s3.amazonaws.com/linksprite/Mini+CNC+engraving+machine/grblControl0.8.zip)
  - Firmware Download (https://s3.amazonaws.com/linksprite/Mini+CNC+engraving+machine/Firmware+Download.zip)
    - GRBL Introduction (https://s3.amazonaws.com/linksprite/cnc/GRBL+Introduction.doc)
- Control Software for MAC
  - Control Software (https://s3.amazonaws.com/linksprite/cnc/grblControl_0.8.4+for+MAC.tar.gz)

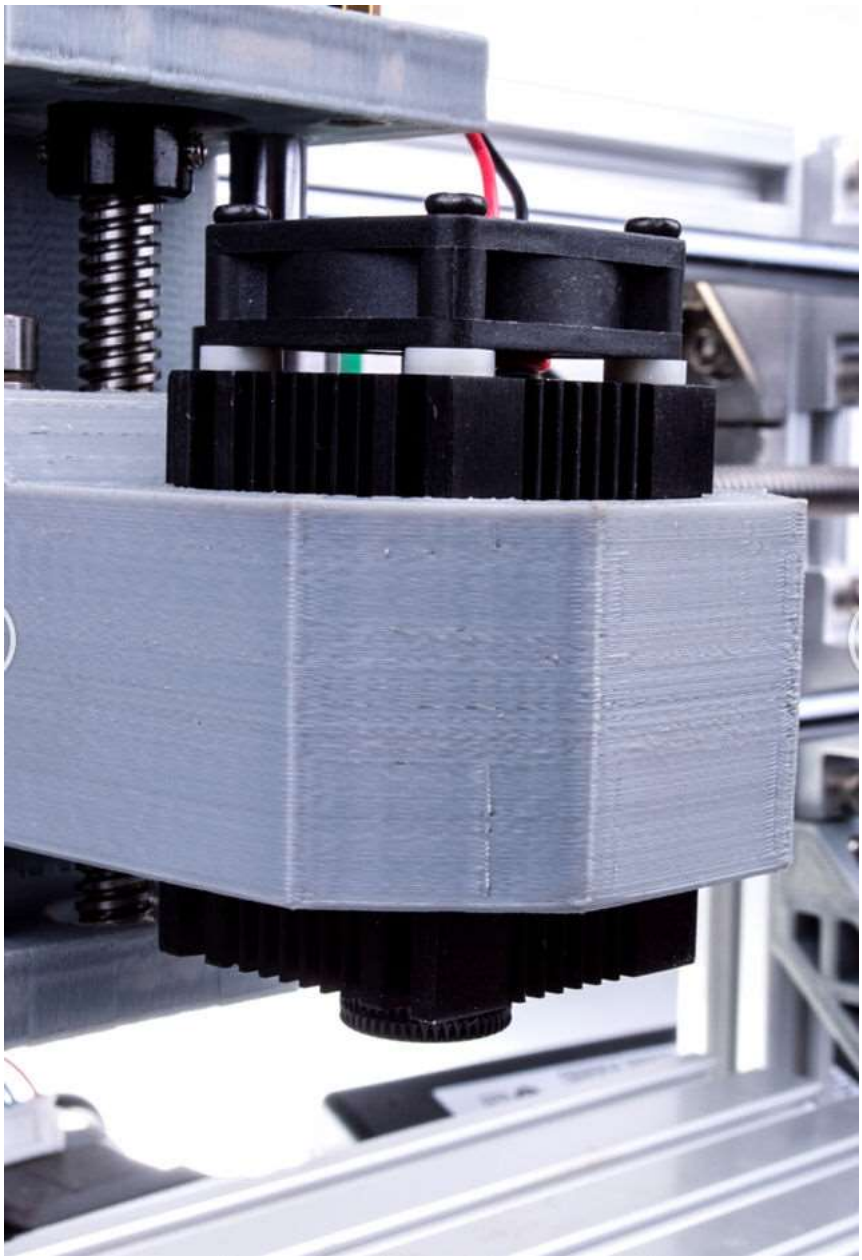
Package List

Standard Package List

Packing list					
No.	Name	model	main parameters	Quantity	Remark
1	Aluminum	2020	240	2	
			220	4	
			200	2	
2	90-degree angle	2020		10	
3	Slide nut	2020	Slide nut	58	
4	Linear axis	8mm	260	2	
		8mm	240	2	
		8mm	90	2	
5	Linear Bearings	LM8UU		8	
		LM8L		2	
6	Support base	SK8		8	
7	mesa	20100	180	1	
8	Stepper motor mounting plate			2	
9	Couplings	5--8	14x25	3	
10	Lead screw	T8	90	1	
			210	1	
			230	1	
		Copper nut		6	
11	Stepper motor			3	
12	Spindle motor			1	
13	Drill chuck	Chuck		1	
14	burin			2	
15	4P motor line			3	
16	Switching Power Supply			1	
17	ntrol System(arduino nano)			1	
18	Z axis			1	
19	X axis			1	
20	Y-axis slide			4	
21	Y-axis nut seat			1	
22	Stayed bracket			2	
23	spring			3	
24	Socket head cap screws	M5x10		58	frame
		M3x8		4	Z axis motor
		M3x6		8	XY axis motor
		M4x25		1	Spindle lock
25	Gasket	M5		24	Corner pieces, XY axis motor mounting plate
26	inner hexagon wrench	1.5		1	
		2		1	
		2.5		1	
		3		1	
		4		1	
27	top Lead screw	M4x5		12	XYZ axis Couplings
28	Pillars	M3x18		4	Z axis motor
29	package			1	

Alternative Additional Item

- Laser Head for DIY CNC 3 Axis Engraver Machine[KIT_CNC_LASHA]



Video

DIY CNC 3 Axis Engraver Machine installation tutorial (https://www.youtube.com/watch?v=vlQVIJYZK8Y)

DIY CNC 3 Axis Engraver Machine Working (https://www.youtube.com/watch?v=-dh7yoj5zn0)

Document

schematic 1.pdf (https://s3.amazonaws.com/linksprite/cnc/schematic+1.pdf)

schematic 2.pdf (https://s3.amazonaws.com/linksprite/cnc/schematic+2.pdf)

FAQ (https://s3.amazonaws.com/linksprite/cnc/F+A+Q.pdf)