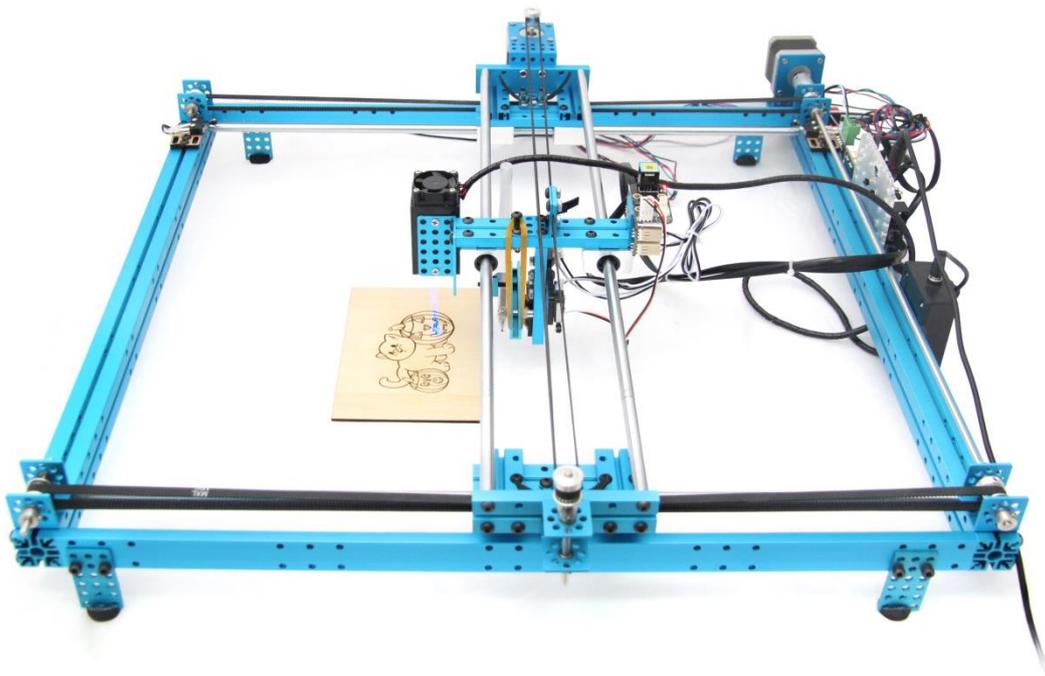


XY Plotter V2.0 Laser Engraver Upgrade Pack

User Guide – mDraw Version 1.0



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1. Before Get Start

1. Hardware:

XY Plotter V2.0 Kit

Laser Engraver Upgrade Pack (500mW) for XY-Plotter Robot Kit V2.0

2. Software:

a. Must have:

[mDraw](#) for Windows

[mDraw](#) for Mac

[Inksape](#)

b. Optional:

[Arduino IDE](#)

[Makeblock Windows Mainboard Driver](#) (PS: Please download driver for Mac OS system at our website)

Note:mDraw is best for Makeblock Orion mainboard, it also supports Arduino Leonardo/Uno mainboard, for which need to upload firmware by Arduino IDE firstly. Please download the firmware at [Here](#).

Tip 1

For the accuracy of your XY Plotter V2.0 and Laser upgrade pack, please strictly follow the assemble instruction, and carefully adjust your robot. Please pay attention to the position of axles, transmission parts, servo arm, and the levelness of robot. Laser unit must be perpendicular to the desktop.

Tip 2

Pictures in this article is only for reference. Specifications and software are subject to change without notice, please pay attention to our website <http://www.makeblock.cc>.

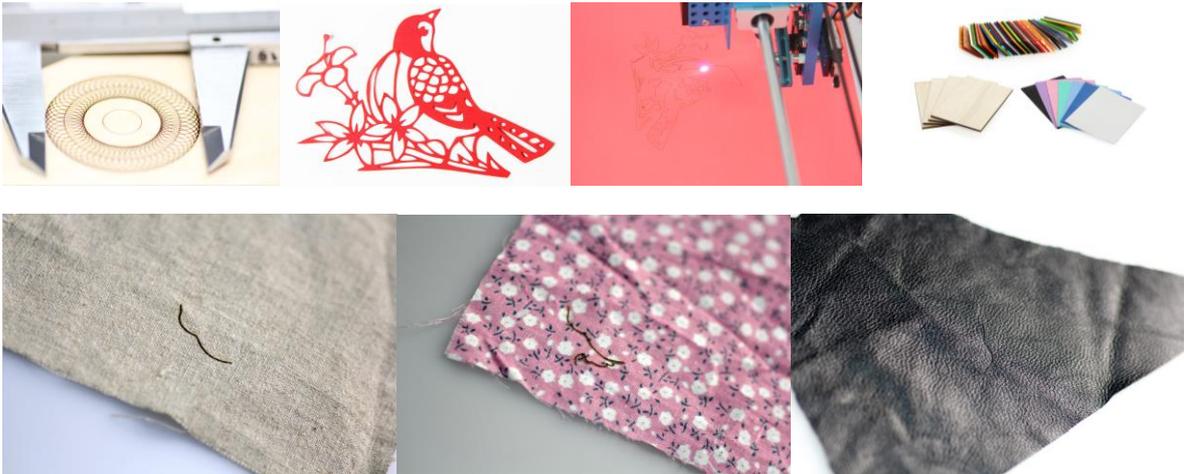
2. Safety Tips

Please wear appropriate eye protection while using Laser Engraver Upgrade Pack because of the high intensity of laser. Please avoid any direct contact to anybody's eyes or skin from laser beam.

Laser Engraver Upgrade Pack provides 405nm Blue-Violet Laser 450~500mW semiconductor diode lasers elements. Operating Voltage is DC 12V, frequency is 50/60Hz.

Suggested material:

(1) Suggested engrave/cut material: wood board, colorful paper cards, dark opaque acrylic, foam papers, dark cloth (jean, cotton fabric, and flax), leather, etc.



(2) Forbidden engrave material: metal like aluminum alloy and stainless steel, mirror, ceramics etc. Any material with high melt point, high reflectivity, and high transmissivity.



CAUTION:

Wavelength $\gamma = 405\text{nm}$ Blue-Violet Laser

No direct irradiation to eye or skin.

Please avoid any direct contact to your eyes or skin from the laser beam.

ATTENTION

Please wear appropriate eye protection when using Laser Engraver Upgrade Pack for XY-Plotter Robot Kit V2.0. The laser cutting process also produces fumes that may be toxic from certain materials. Make sure the air good enough around your working area. Keep it away from children and other people who are not familiar with using the laser.

3. Part List

XY Plotter V2.0 Part lists

1	Beam 0824-16	1	30	Wrench 7mm&5mm	1
2	Beam 0824-48	4	31	Screw M4x8	36
3	Beam 0824-80	1	32	Screw M4x14	30
4	Beam 0824-96	4	33	Screw M4x16	28
5	Beam 0824-112	2	34	Screw M4x22	12
6	Beam 0824-496	2	35	Screw M4x30	18
7	Beam 0808-072	1	36	Countersunk Screw M3x8	10
8	Beam2424-504	2	37	Headless Set Screw M3x5	26
9	Plate 3x6	5	38	Nut M4	50
10	Belt Connector	3	39	Plastic Rivet R4060	16
11	Cutable Linkage 3	6	40	Plastic Rivet R4100	6
12	Bracket 3x3	2	41	Plastic Ring 4x7x2mm	20
13	Bracket U1	5	42	Nylon Cable Ties	30
14	42BYG Stepper Motor Bracket	2	43	Rubber band	5
15	9g Micro Servo Pack	1	44	Gasket	4
16	42BYG Stepper Motor	2	45	Me Baseboard 1.0	1
17	Timing Pulley18T	6	46	Me Stepper Motor Driver	2
18	Open-end Timing Belt (1.3m)	3	47	Me Micro Switch B	4
19	Threaded Shaft 4x39mm	1	48	Me RJ25 Adapter	3
20	D Shaft 4x56mm	2	49	Wall Adapter Power Supply - 12VDC	1
21	Linear Motion Shaft D4x80mm	1	50	6P6C RJ25 cable-20cm	2
22	Linear Motion Shaft D4x512mm	1	51	6P6C RJ25 cable-35cm	1
23	Linear Motion Shaft D8X496mm	4	52	6P6C RJ25 cable-50cm	2
24	Shaft Collar 4mm	10	53	USB 2.0 A-Male to Micro B-Male Cable	1
25	Flexible coupling 4x4mm	1	54	Micro Switch Cable-90cm	1
26	Linear Motion Slide Unit 8mm	6	55	Base Bracket B	1
27	Flange Bearing 4x8x3mm	10	56	XY QR Code Card	1
28	Cross &2.5mm HEX Screwdriver	1	57	PacKing Case	1
29	HEX Allen Key 1.5mm	2			

Laser Engraver Upgrade Pack(500mW) Part lists

1	450-500mW Laser Components	1	7	Cross &2.5mm HEX Screwdriver	1
2	Bracket 3x6	1	8	Screw M4x8	4
3	DC power cord 5.5*2.1MM	1	9	Countersunk Screw M3x8	4
4	Motor Cable Jeck plug	1	10	Nylon Cable Ties	5
5	blue-violet laser goggles	1	11	Foot pads	4
6	colorful paper card	4			

4. Product Introduction

a) XY Plotter V2.0+ Laser Engraver Upgrade Pack

With the special designed Laser Engraver Upgrade Pack, XY Plotter V2.0 could upgrade to a laser engraver with maximum working area 300mm×350mm, precision 0.1mm. .

Compatibility: mDrawBot (mScara, mCar, mEggBot, mSpider), XY Plotter kit (servo mode, laser mode)

OS Environment: Windows, Mac, Linux

Supported File Type: *.svg, *.bmp (convert to *.svg)¹

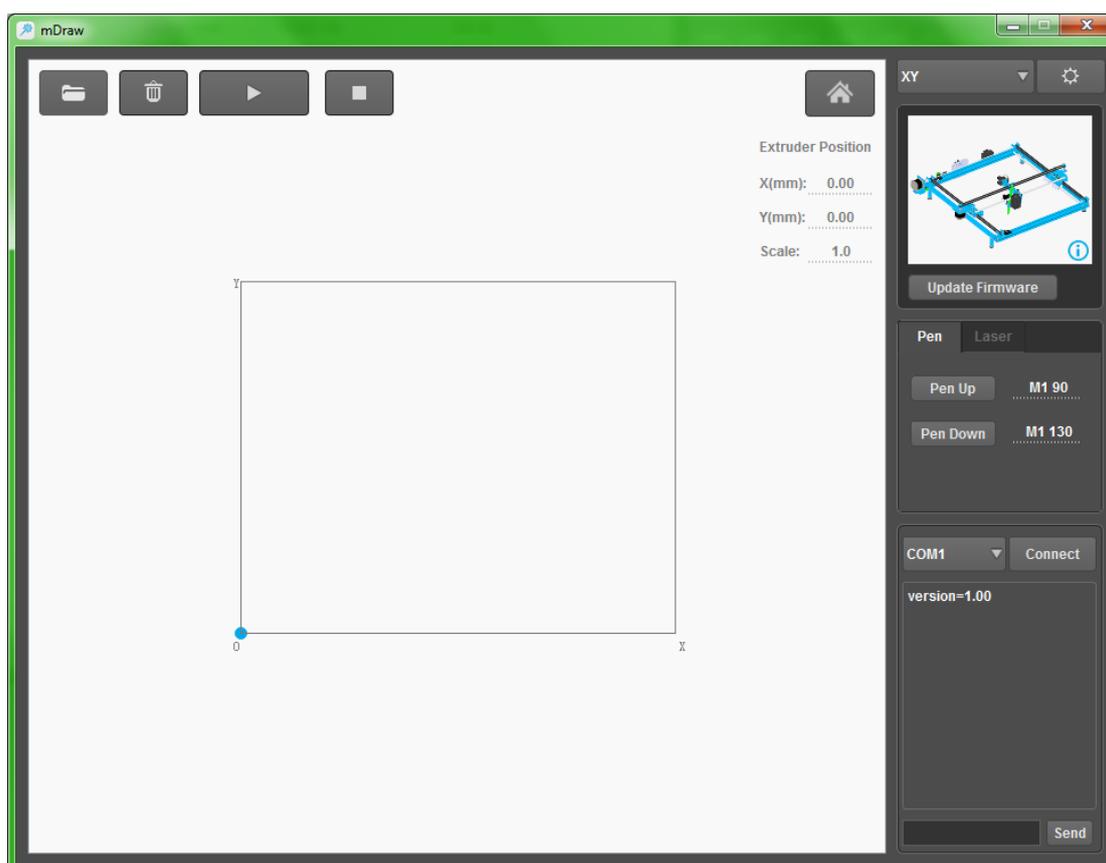
Supported Engrave Materials: Wood boards, colorful paper cards, dark opaque acrylic, foam papers, dark cloth, leather, etc.

Supported Cutting Materials: Colorful paper cards, foam papers, etc.

b) mDraw

mDraw is a host computer software originally designed for 4-in-1 drawing robot mDrawBot, we developed the compatibility with XY Plotter 2.0 Servo mode and Laser mode.

mDraw Main UI



¹ All file must be named in English.

5. How to Assemble XY Plotter V2.0+ Laser Engraver Upgrade Pack

Step 1

2×Beam 0824-496

2×Beam 2424-504

2×Linear Motion Shaft D8X496mm

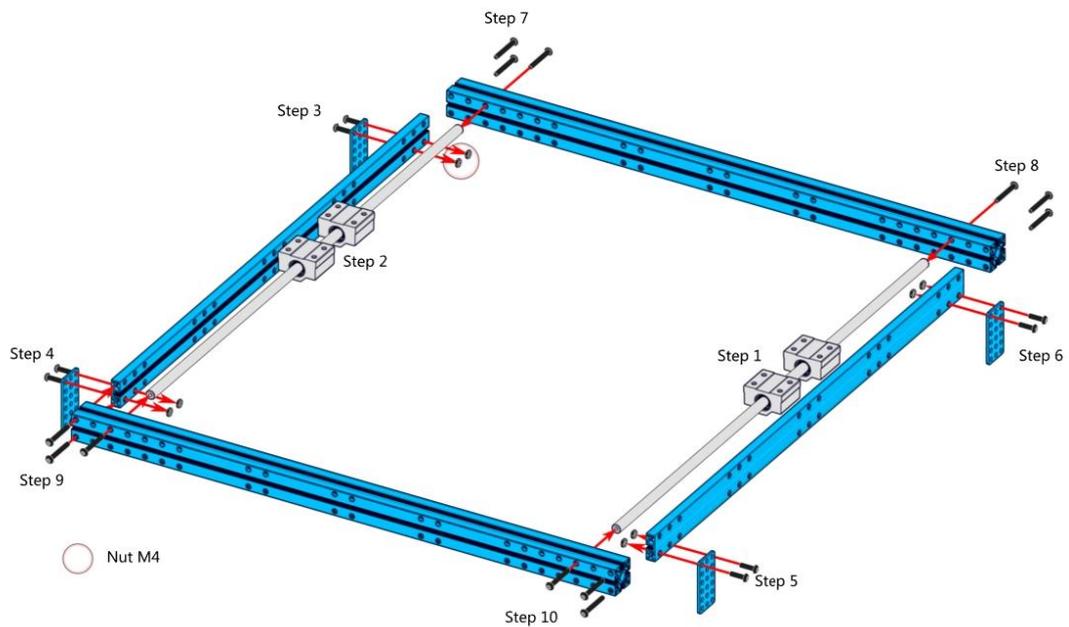
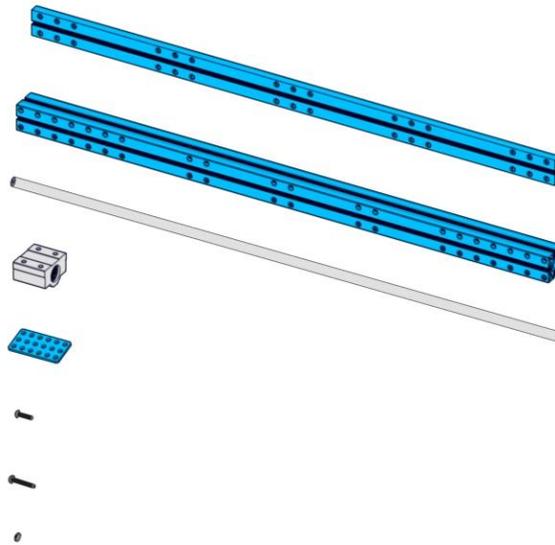
4×Linear Motion Slide Unit 8mm

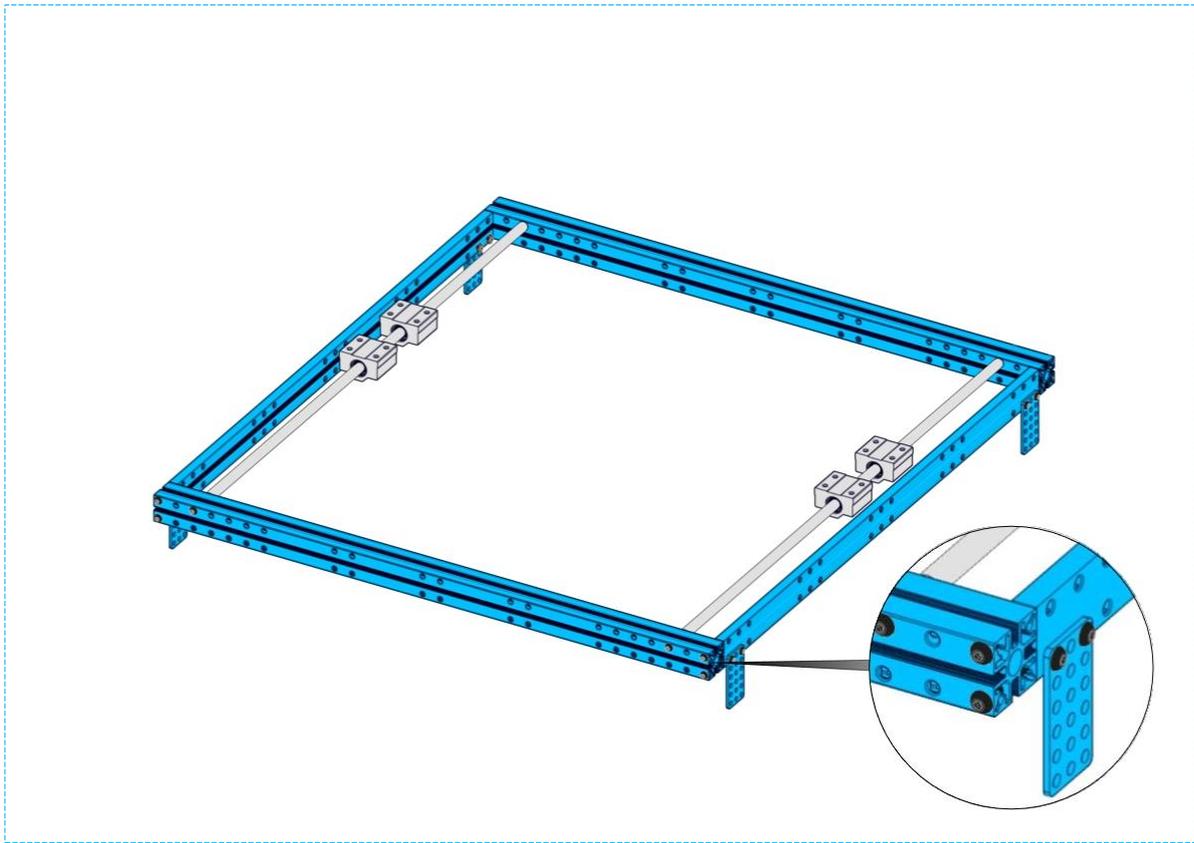
4×Plate 3×6

8×Screw M4×14

12×Screw M4×30

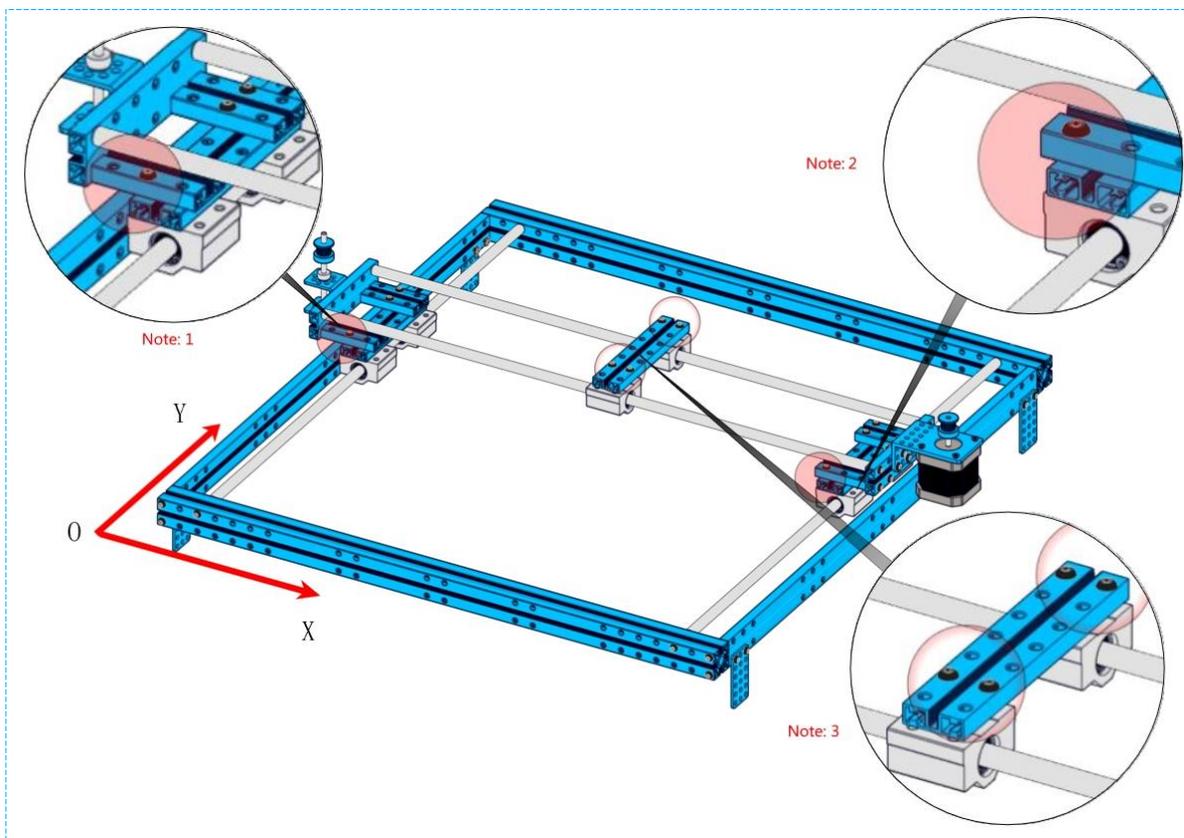
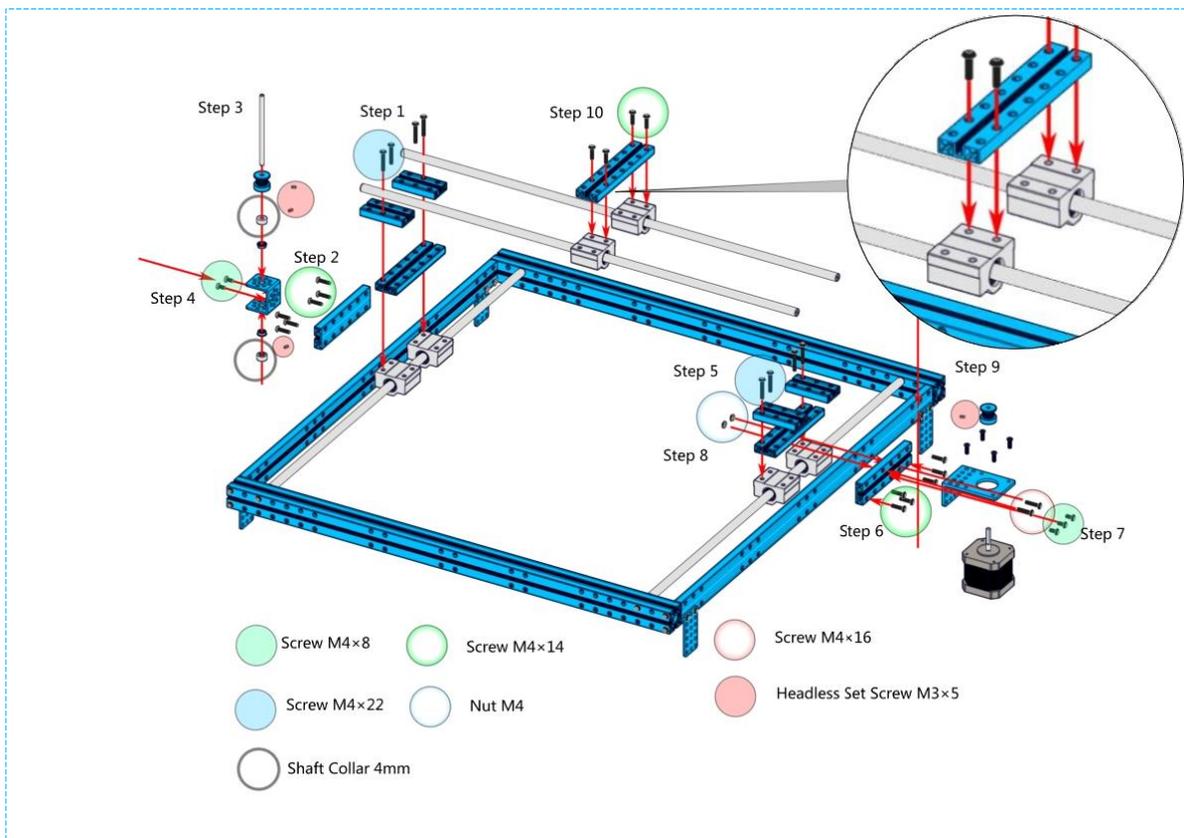
8×Nut M4





Step 2

- | | | | |
|------------------------------------|--|--------------------------|--|
| 2×Linear Motion Shaft D8X496mm | | 5×Screw M4×8 | |
| 1×Linear Motion Shaft D4x80mm | | 16×Screw M4×14 | |
| 1×42BYG Stepper Motor Bracket V2.1 | | 2×Screw M4×16 | |
| 1×42BYG Stepper Motor | | 8×Screw M4×22 | |
| 4×Beam 0824 48 | | 4×Countersunk Screw M3x8 | |
| 4×Beam 0824 96 | | 2×Shaft Collar 4mm | |
| 1×Beam 0824 112 | | 2×Timing Pulley 18T | |
| 2×Linear Motion Slide Unit 8mm | | 1×Bracket U1 | |
| 2×Flange Bearing 4x8x3mm | | | |
| 4×Headless Set Screw M3x5 | | | |
| 2×Nut M4 | | | |

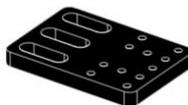


Step 3

1×Micro Switch Button



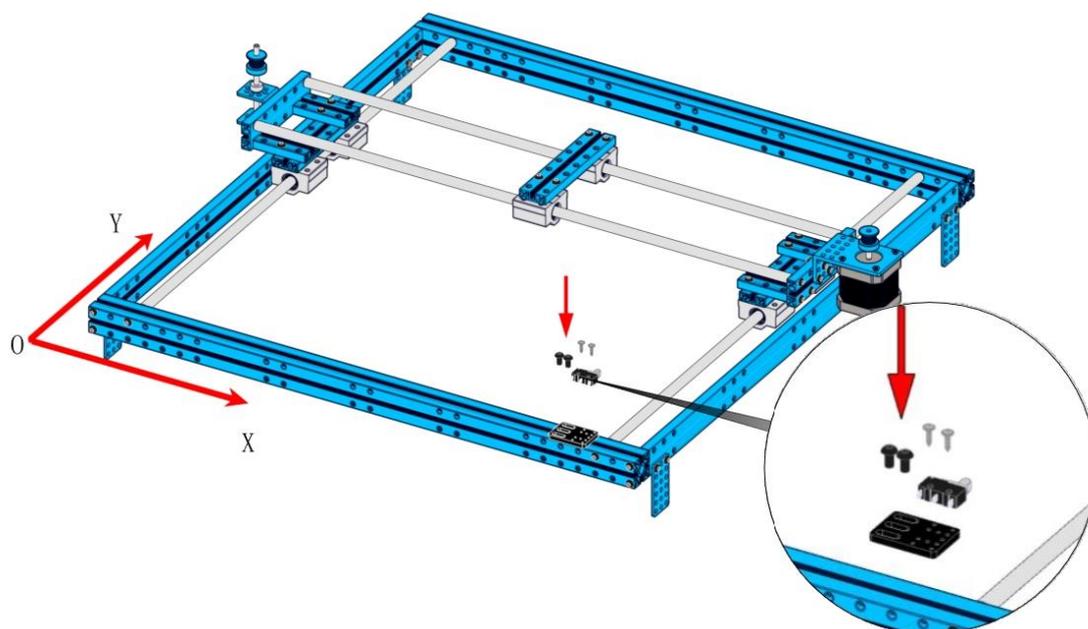
1×LS Bracket

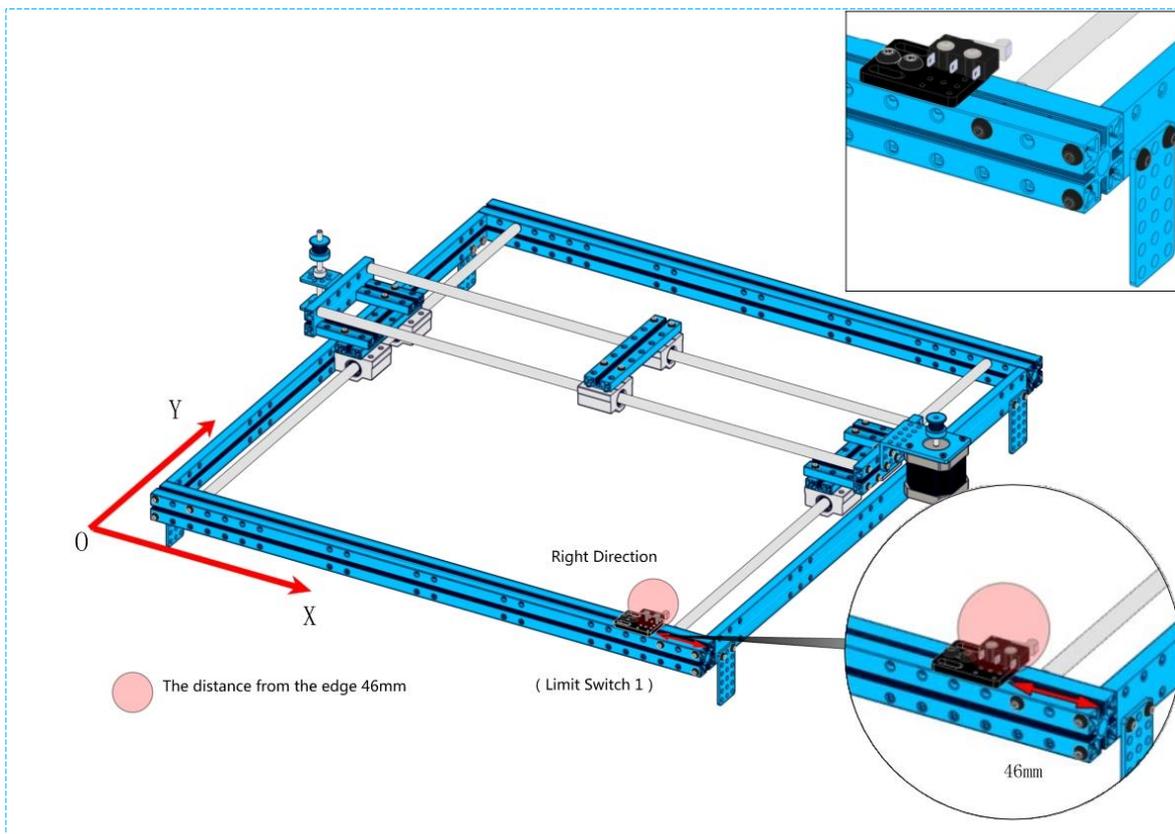


2×Cross Recessed Pan Head
Tapping Screws ST2.2×9.5



2×Screw M4×8





Step 4

1×Linear Motion Shaft D4x512mm

2×D Shaft 4x56mm

4×Bracket U1

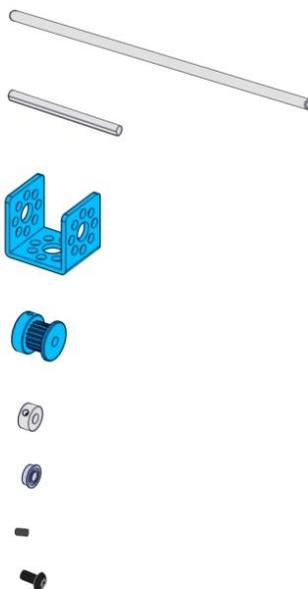
4×Timing Pulley18T

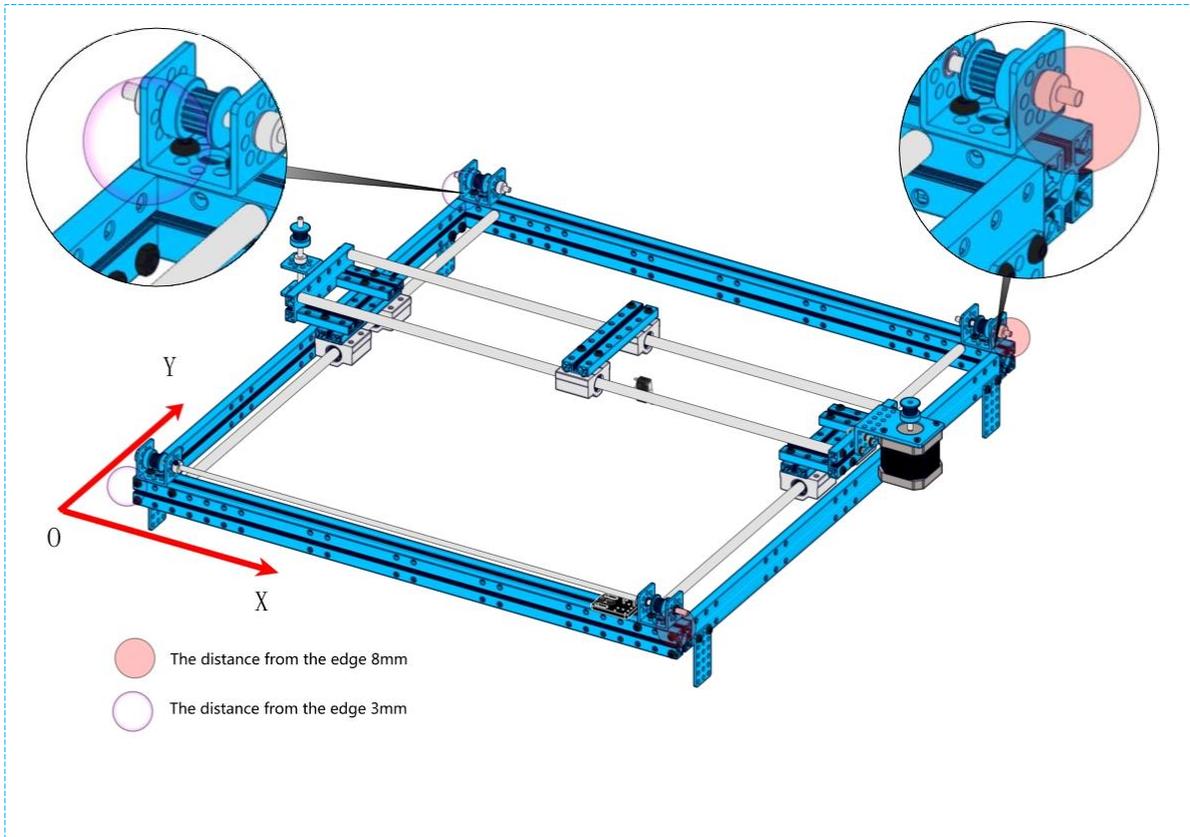
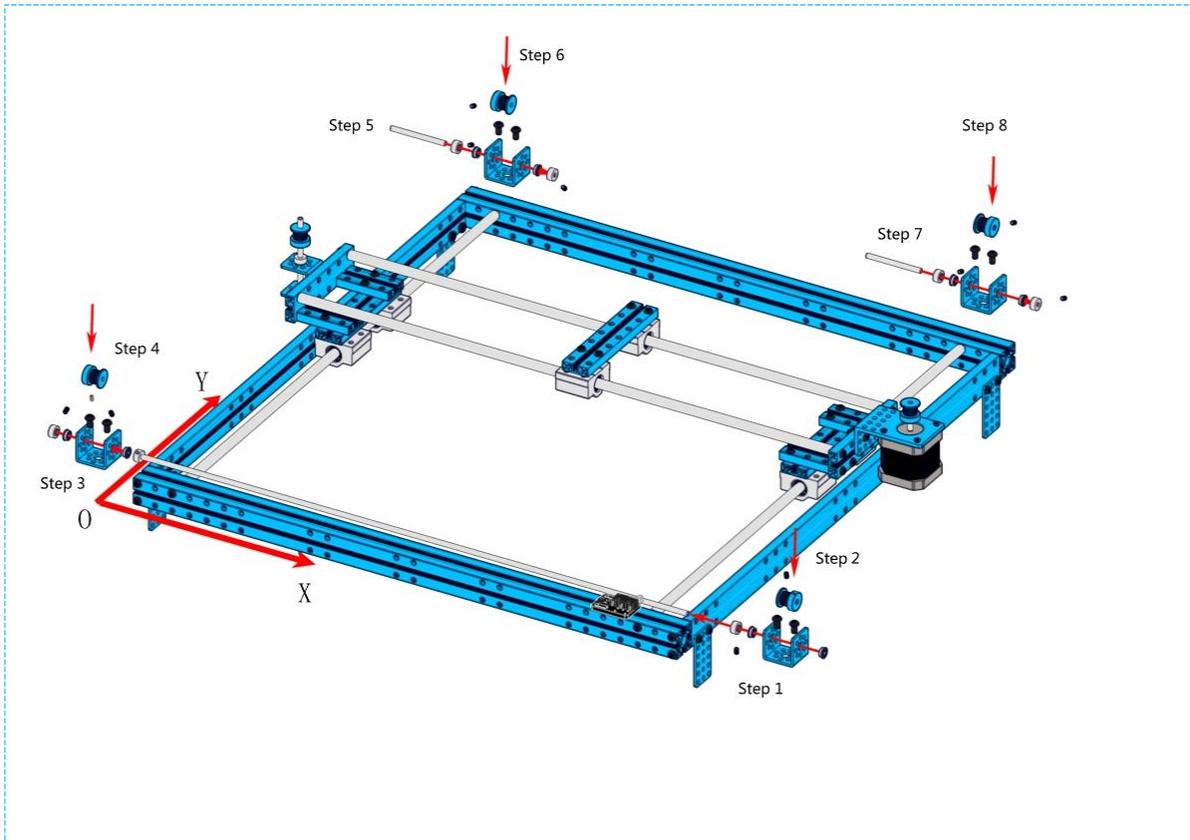
7×Shaft Collar 4mm

8×Flange Bearing 4x8x3mm

11×Headless Set Screw M3x5

8×Screws M4×8





Step 5

2×Open-end Timing Belt (1.3m)

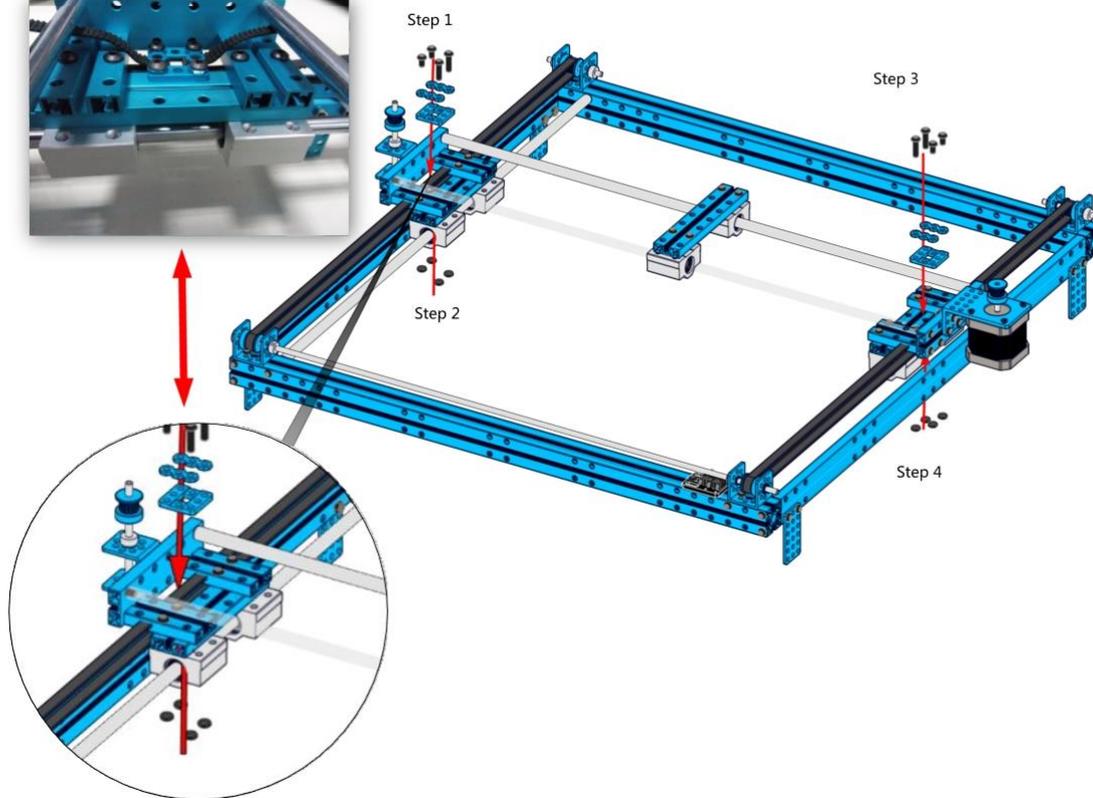
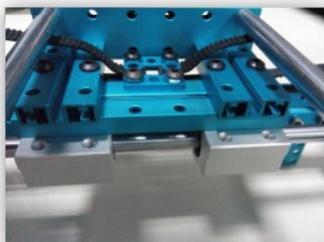
2× Belt Connector

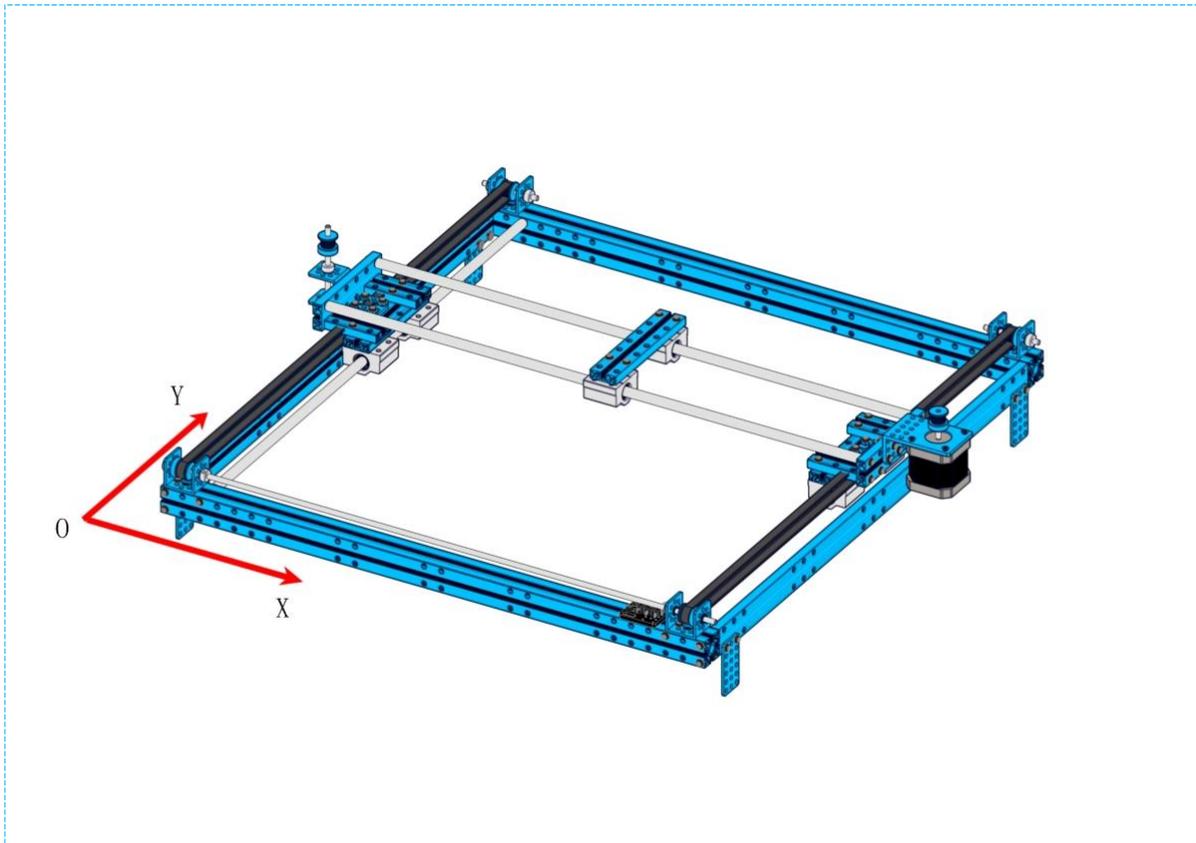
4×Cutttable Linkage 3

4×Screw M4×16

4×Screw M4×8

8×Nut M4





Step 6

1×Bracket 3×3



1× Belt Connector



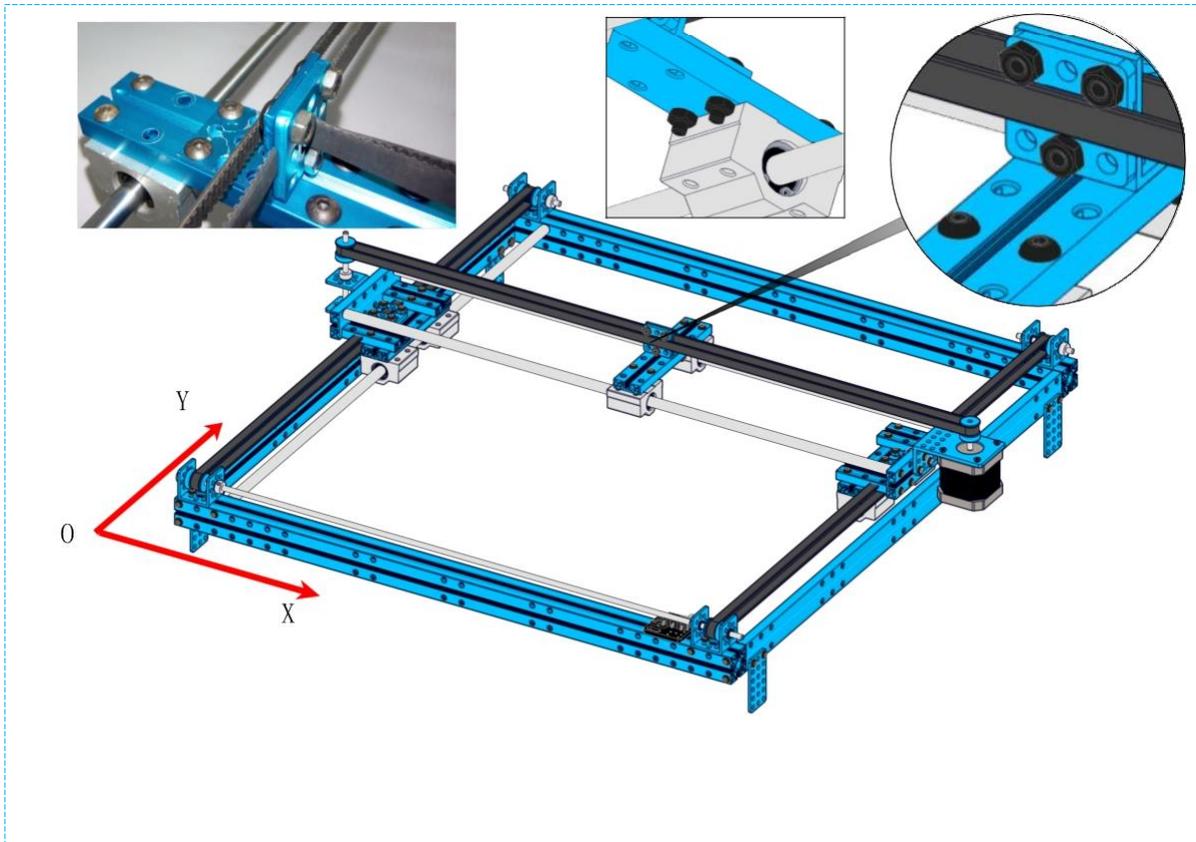
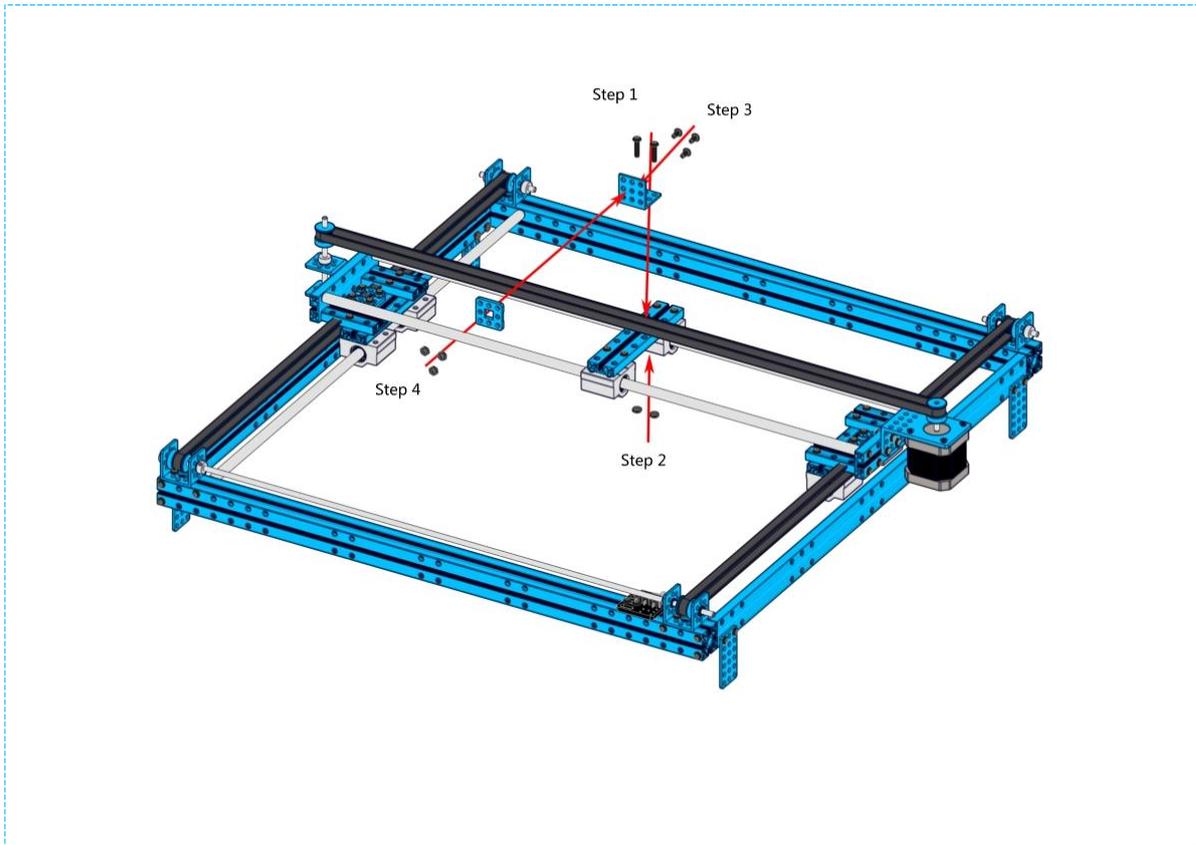
1×Open-end Timing Belt (1.3m)

2×Screw M4×16

3×Screw M4×8

5×Nut M4





Step 7

1×42BYG Stepper Motor

1×42BYG Stepper Motor Bracket V2.1

1×Beam 0824 112

1×Flexible coupling 4x4mm

1×Plate 3×6

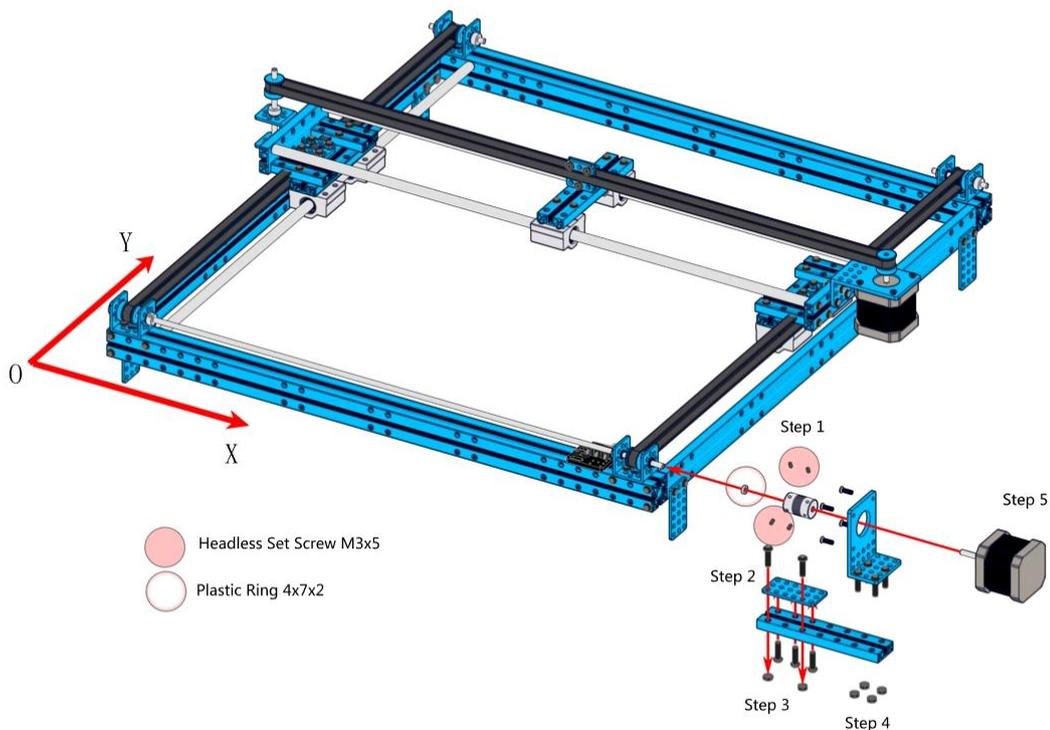
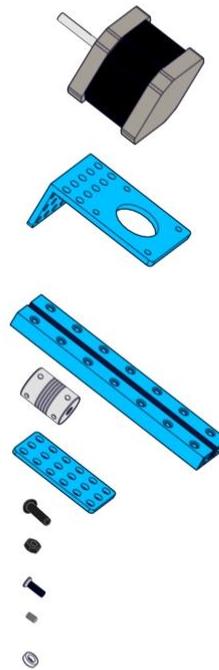
9×Screws M4×16

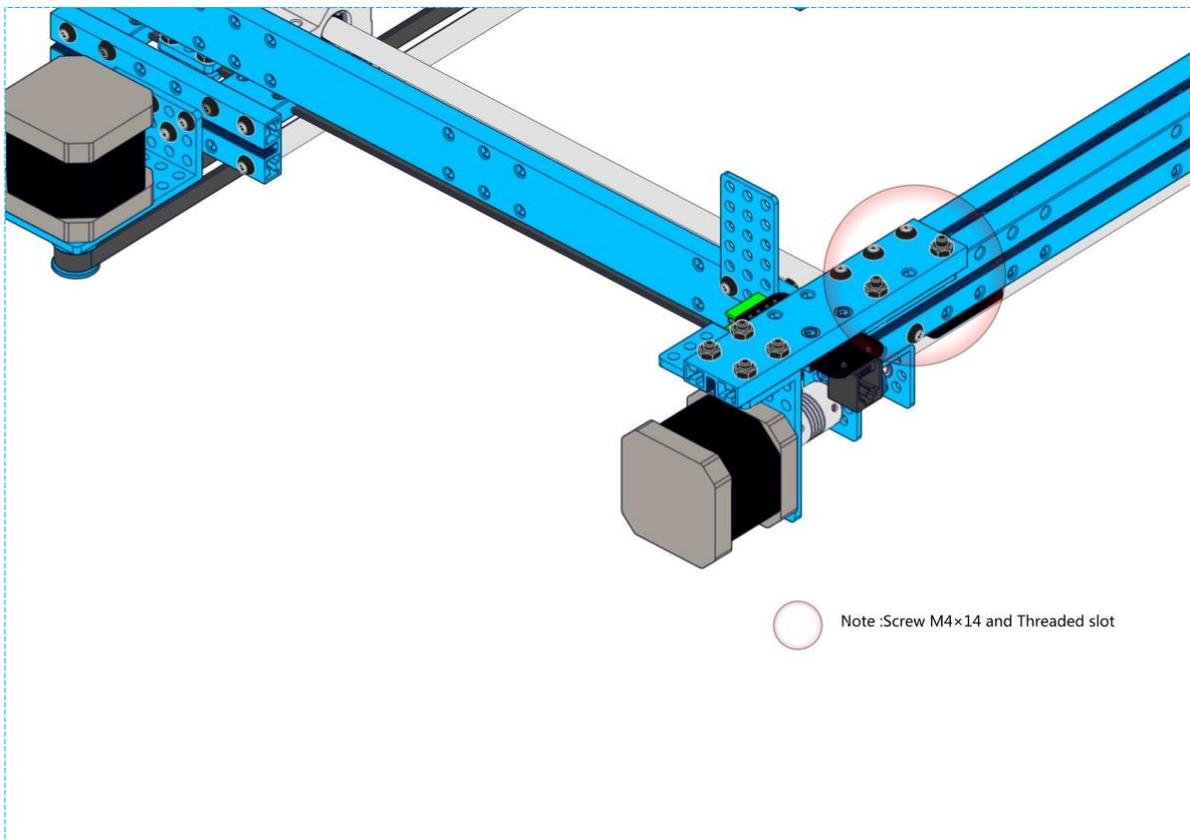
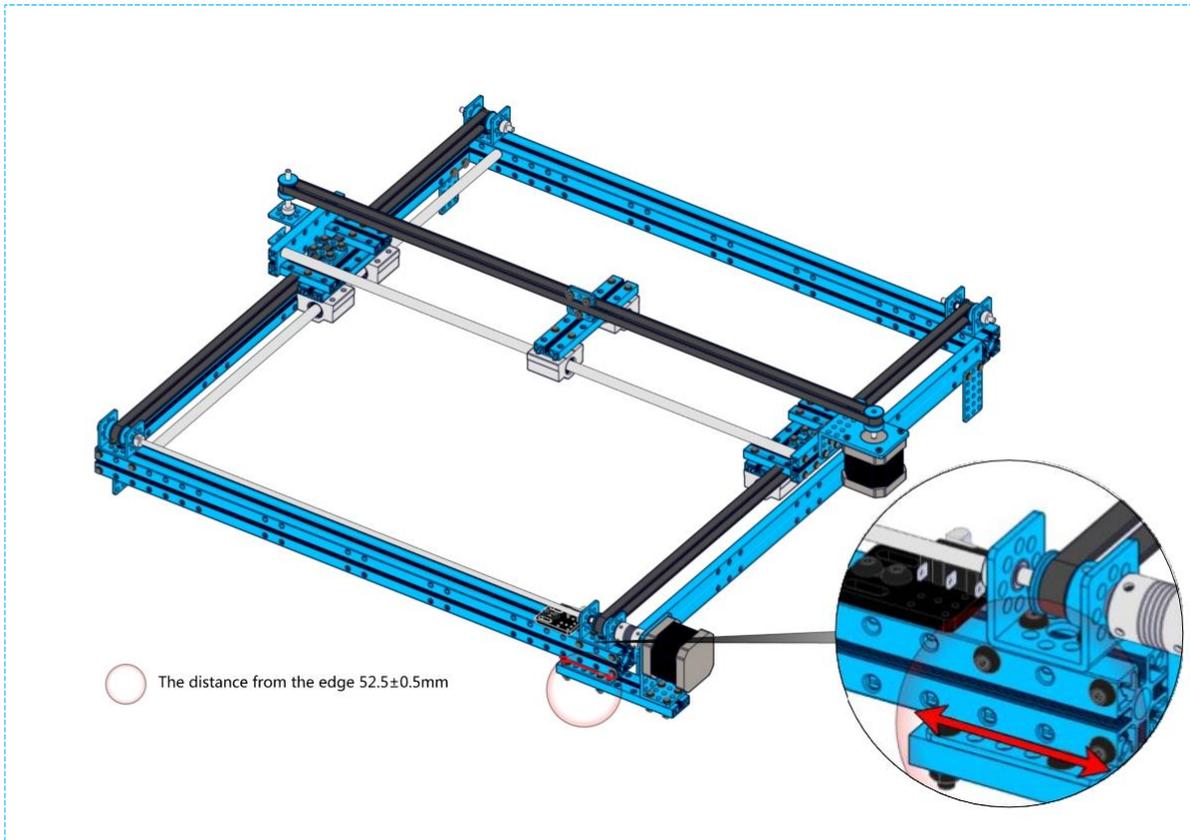
6×Nut M4

4×Screw Countersunk M3x8

4×Headless Set Screw M3x5

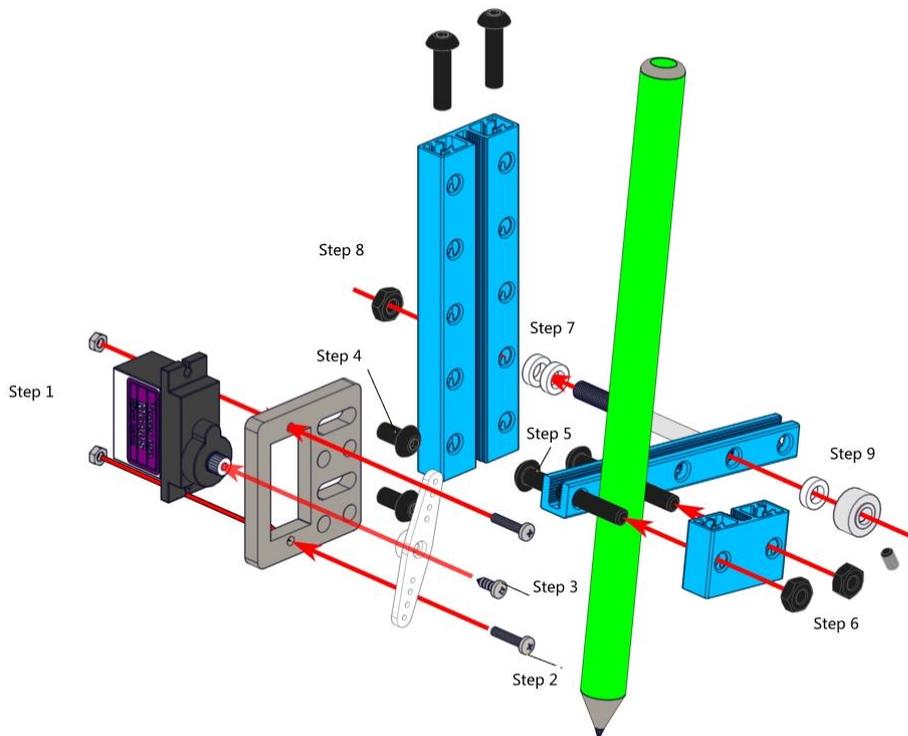
1×Plastic Ring 4x7x2

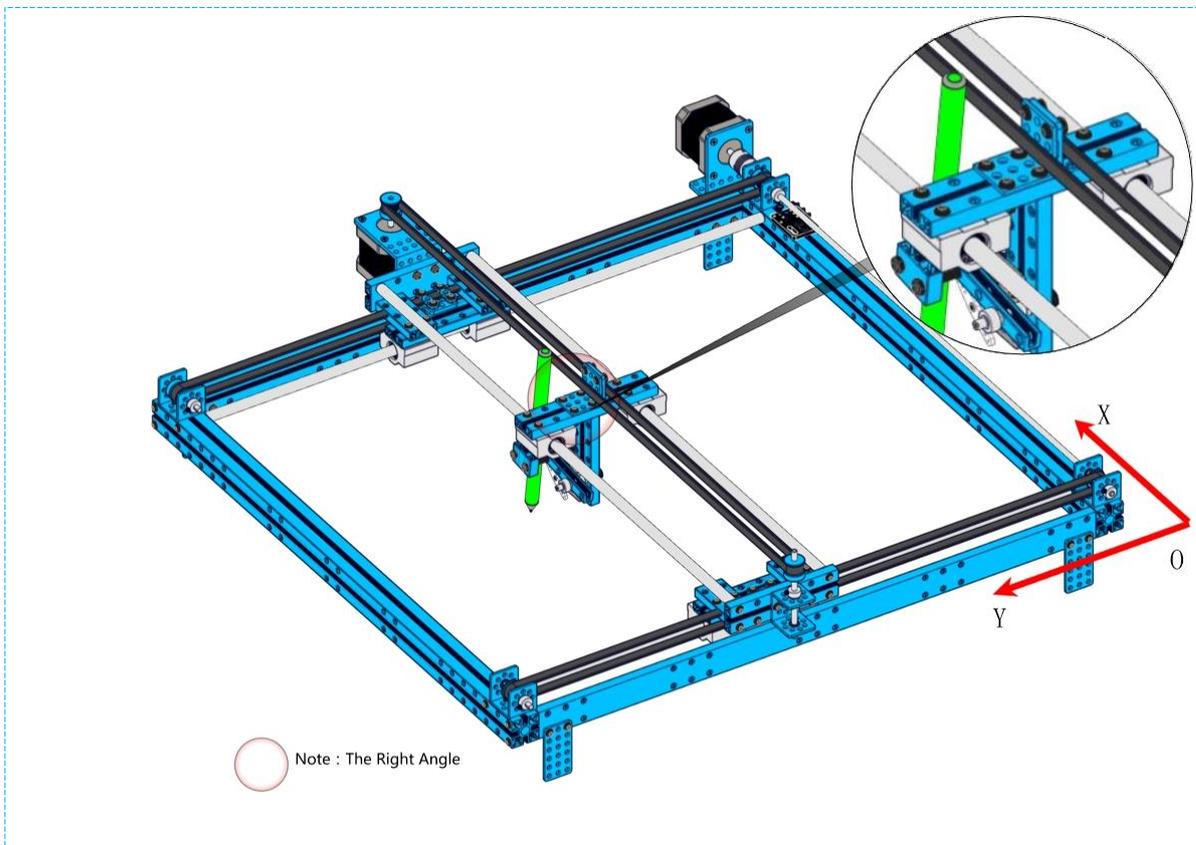
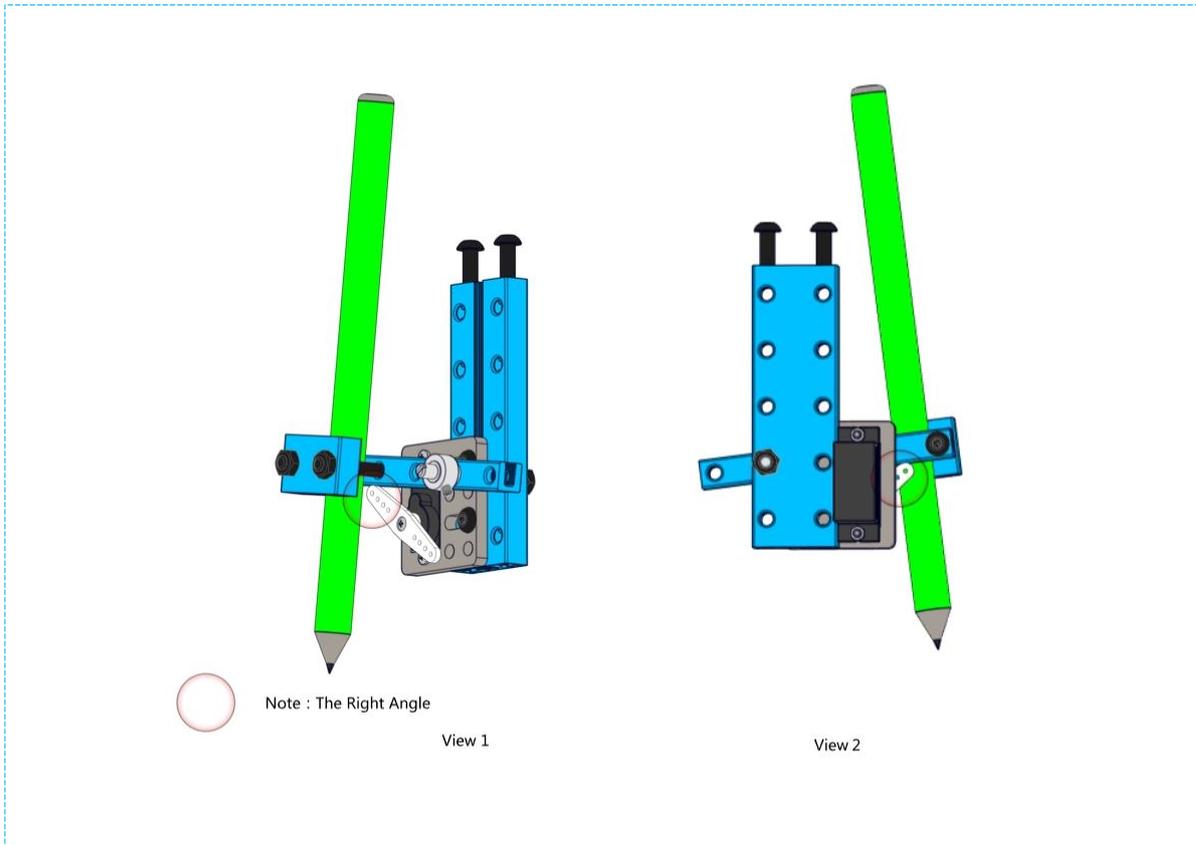




Step 8

- 1×Pencil,etc(provide for oneself)
- 1×Beam 0824 80
- 1×Beam 0828 16
- 1×Beam 0808 72/80
- 1×Micro Servo Fixed Slices
- 1×9g Micro Servo
- 1×Threaded Shaft 4x39mm
- 2×Screw M4×30
- 2×Screw M4×16
- 2×Screw M4×8
- 2×Screw M2×10
- 3×Nut M4
- 2×Nut M2
- 1×Screw Headless M3×5
- 1×Shaft Collar 4mm
- 3×Plastic Ring 4x7x2





Step 9

3×Micro Switch Button



3×LS Bracket



6×Cross Recessed Pan Head
Tapping Screws ST2.2×9.5



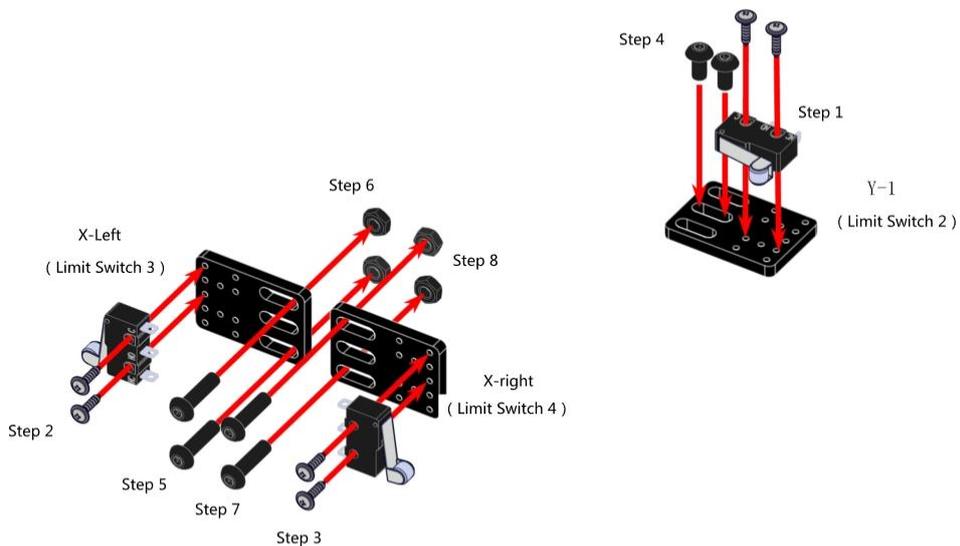
2×Screw M4×8

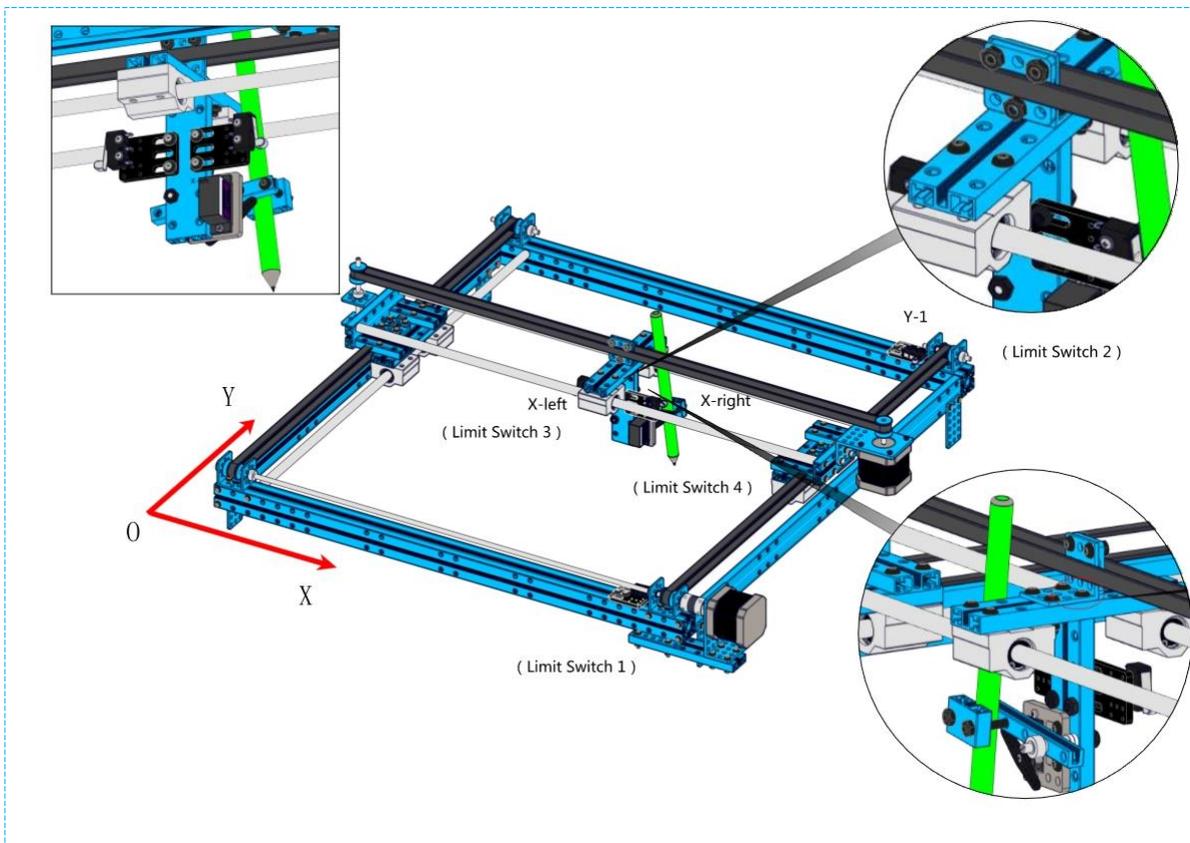
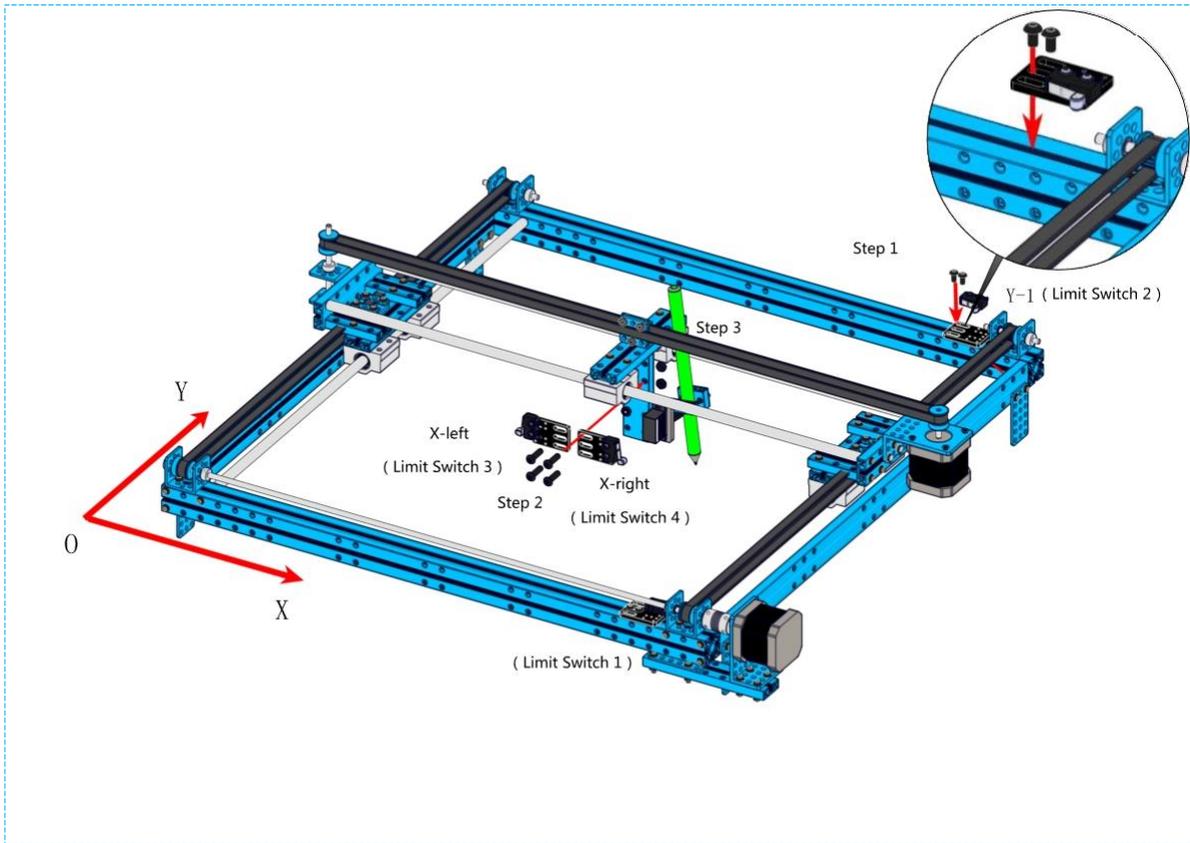


4×Screw M4×16



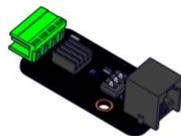
4×Nut M4



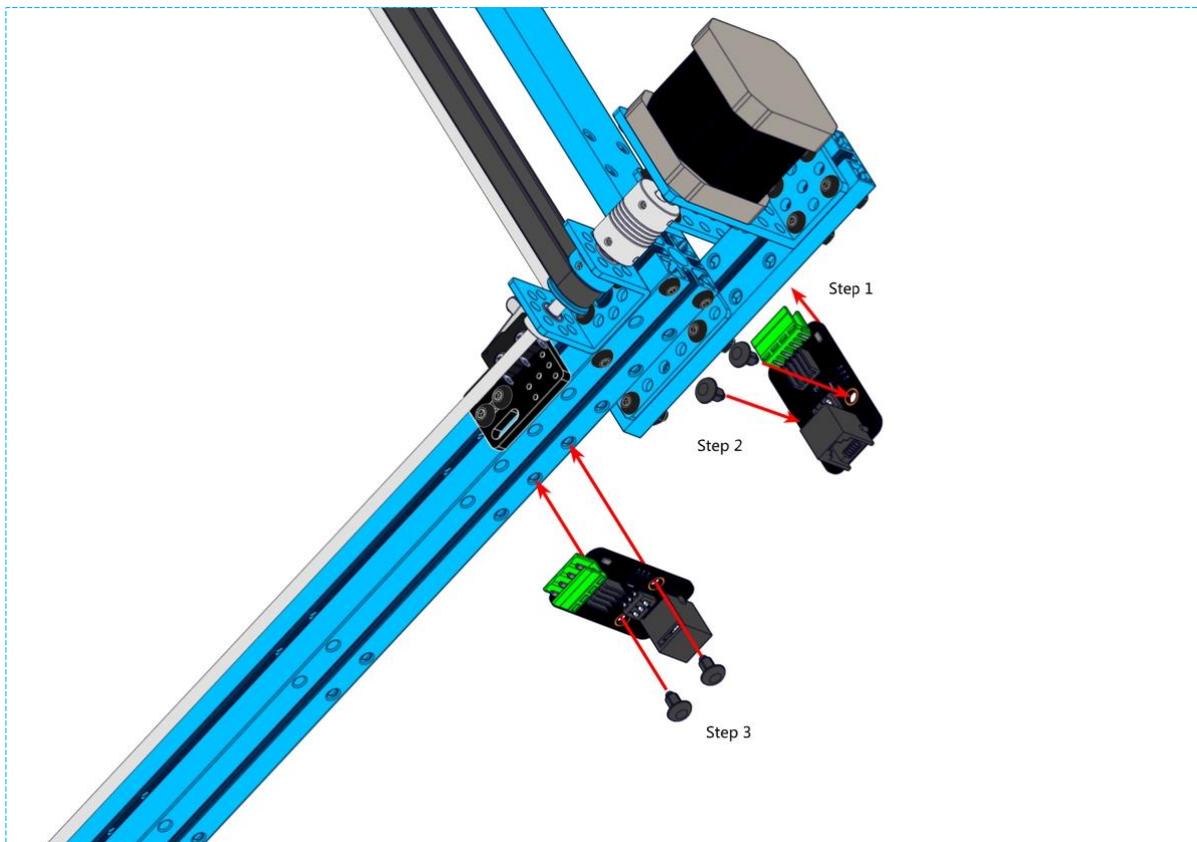


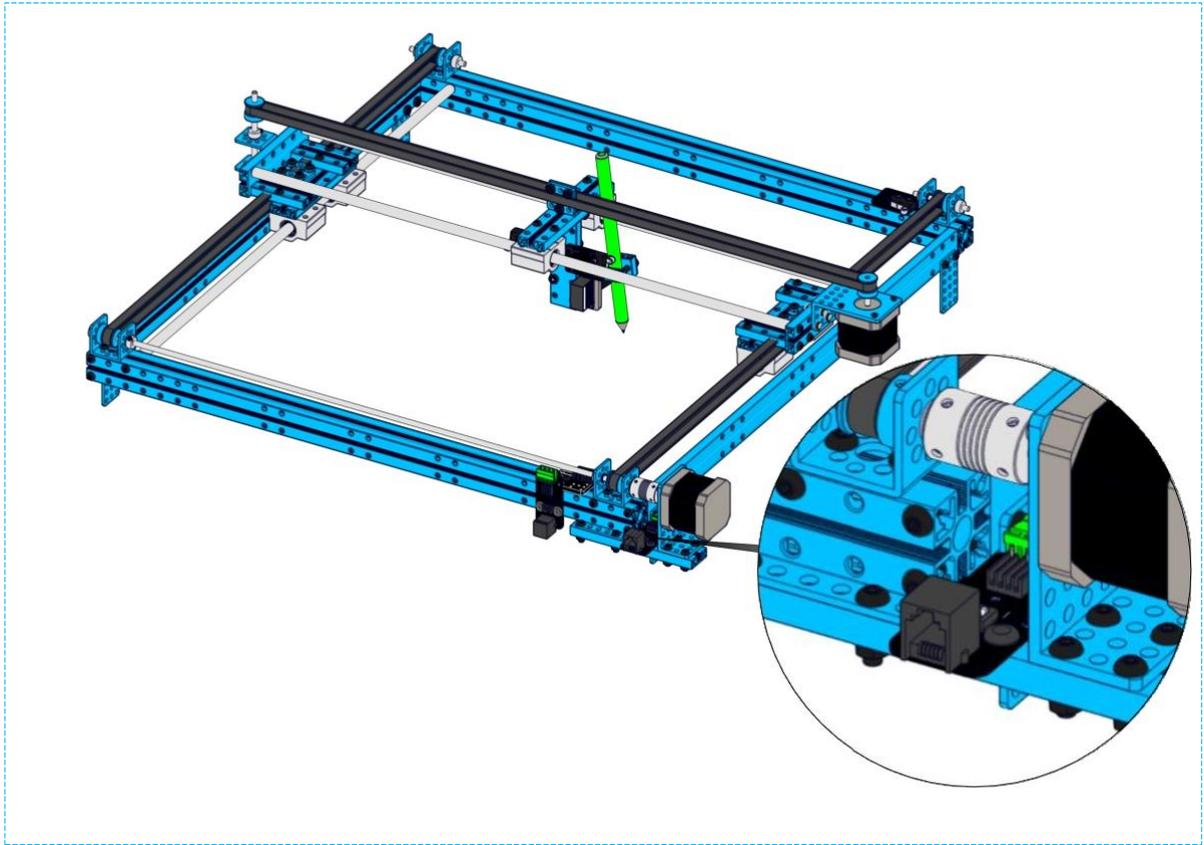
Step 10

2×Me Stepper Driver V1.0



4×Plastic Rivet 4060





Step 11

3×Me RJ25 Adapter



1×Bracket 3×3

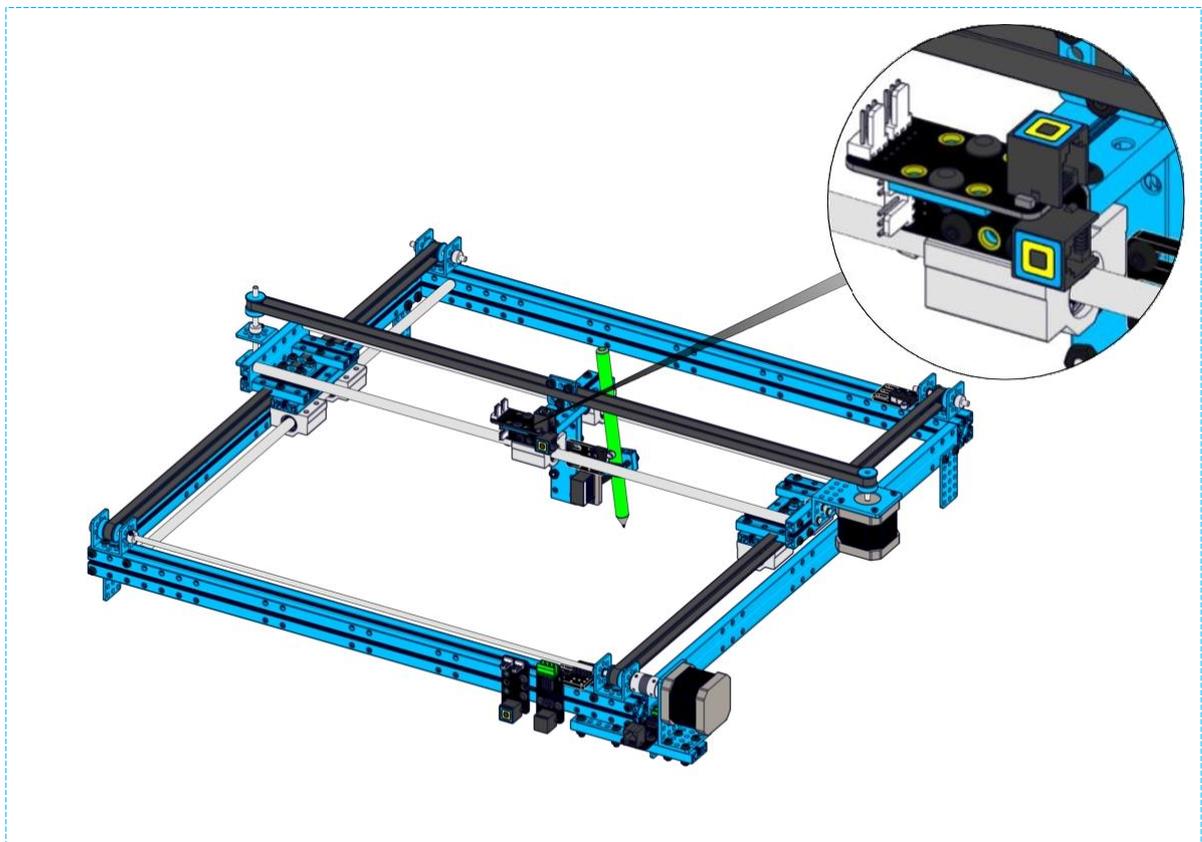
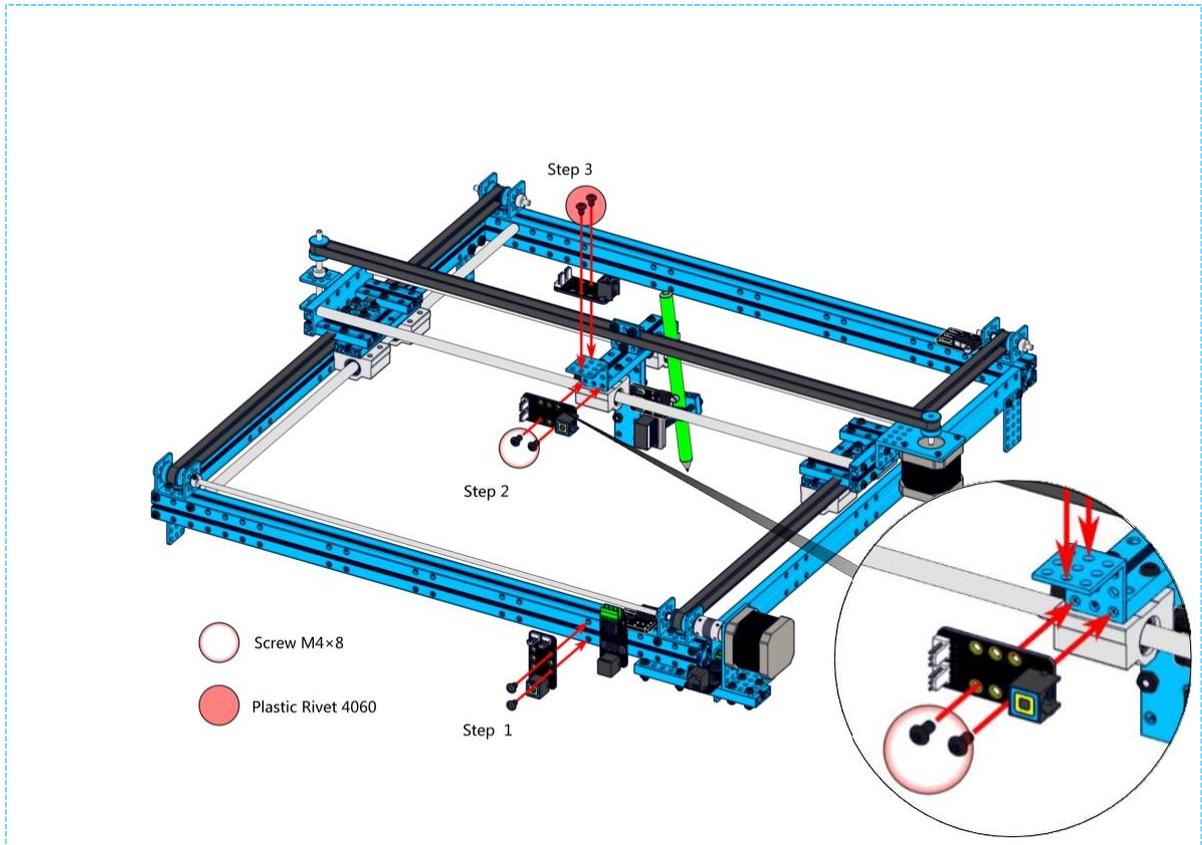


2×Screw M4×8



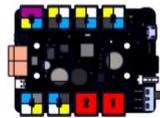
4×Plastic Rivet 4060



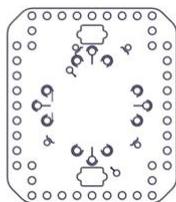


Step 12

1×Me Baseboard



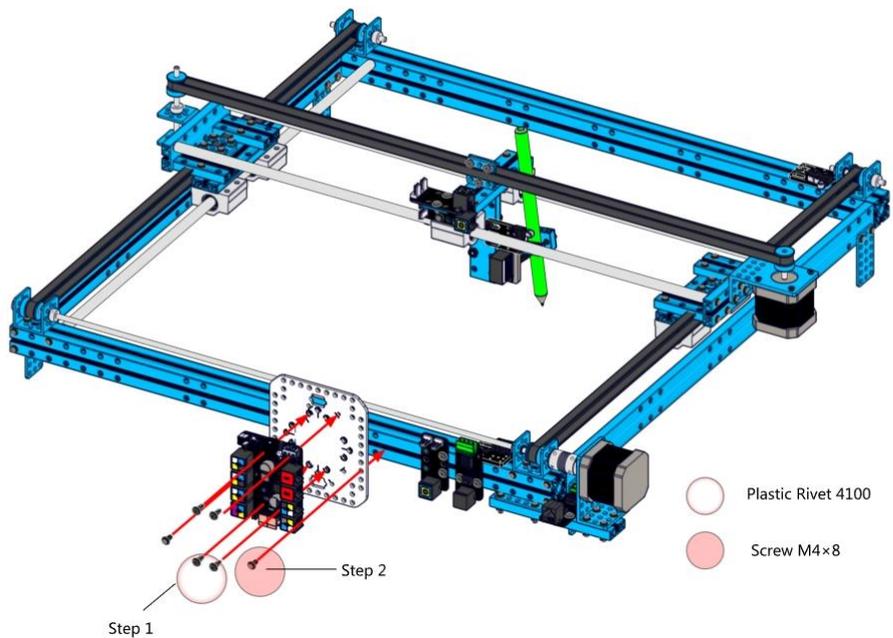
1×Base Board Plate

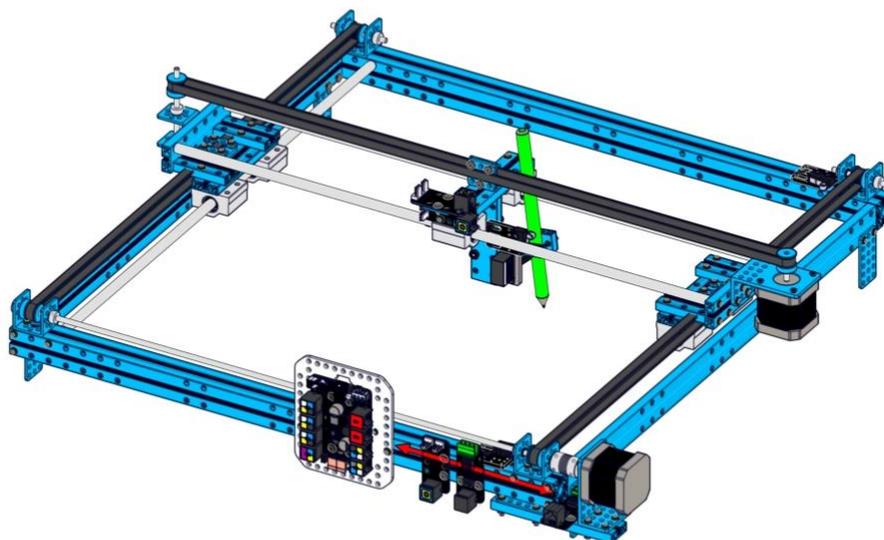


2×Screw M4×8



4×Plastic Rivet 4100





The distance from the edge $142\pm 3\text{mm}$

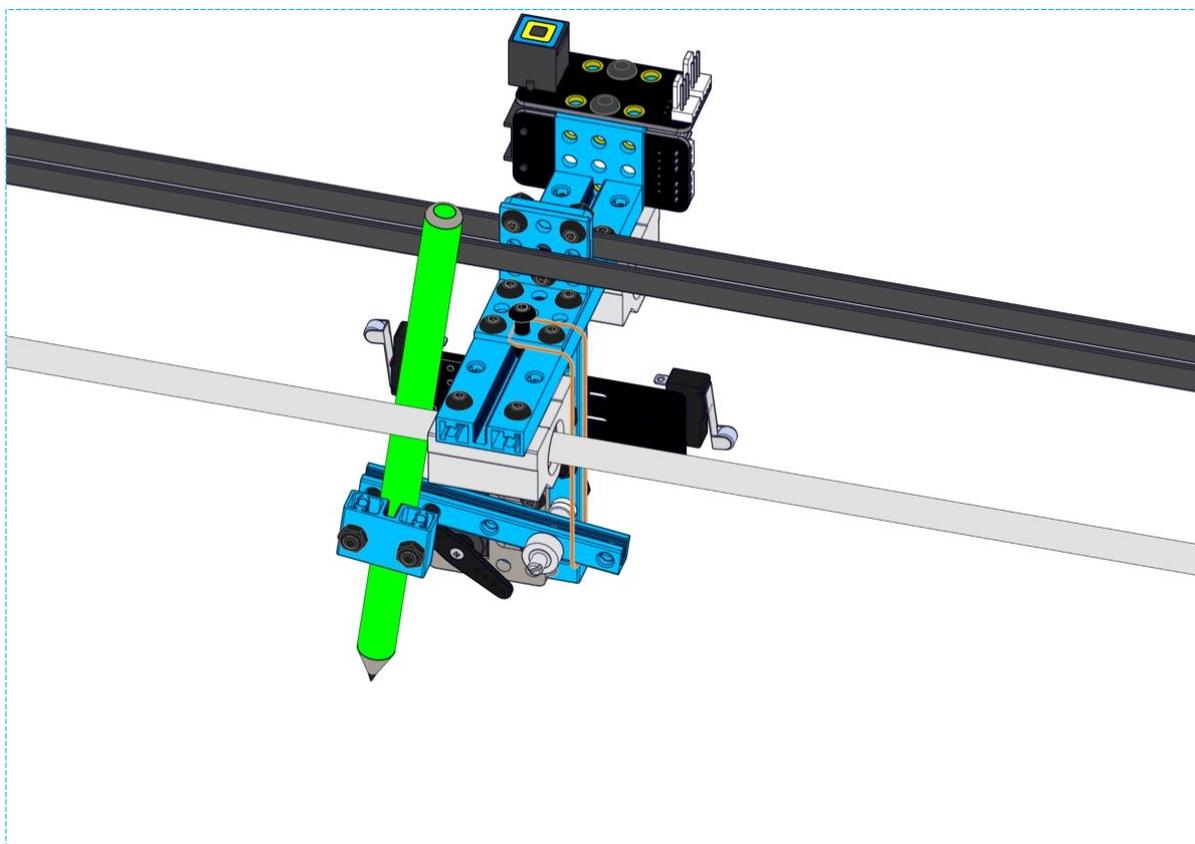
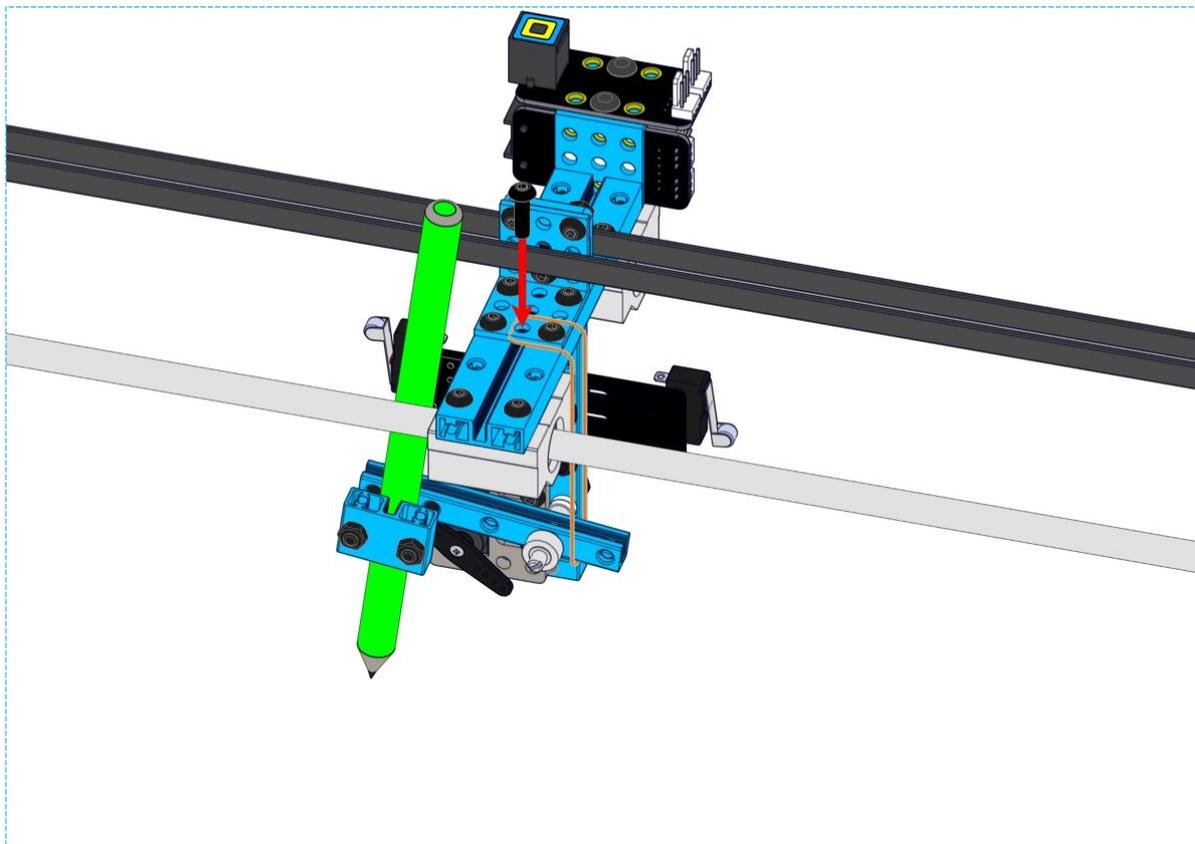
Step 13

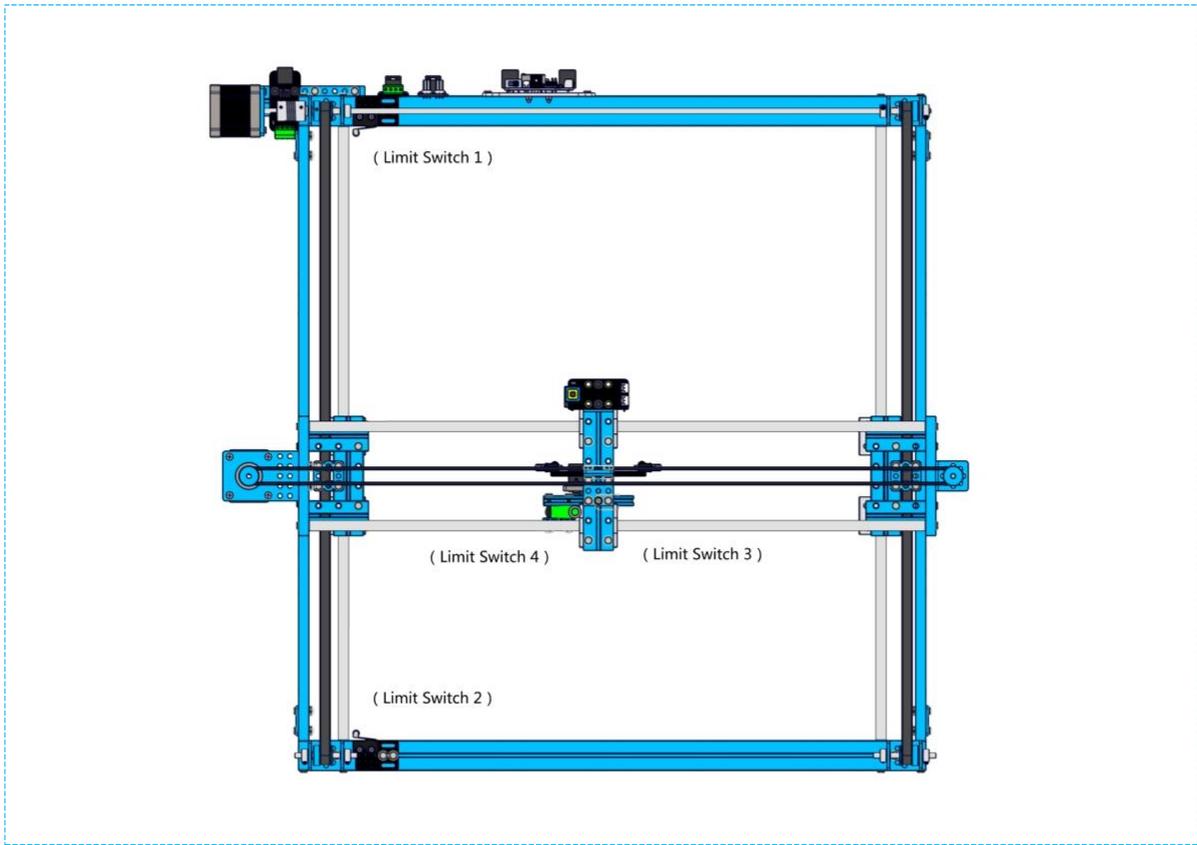
1×Screw M4×14



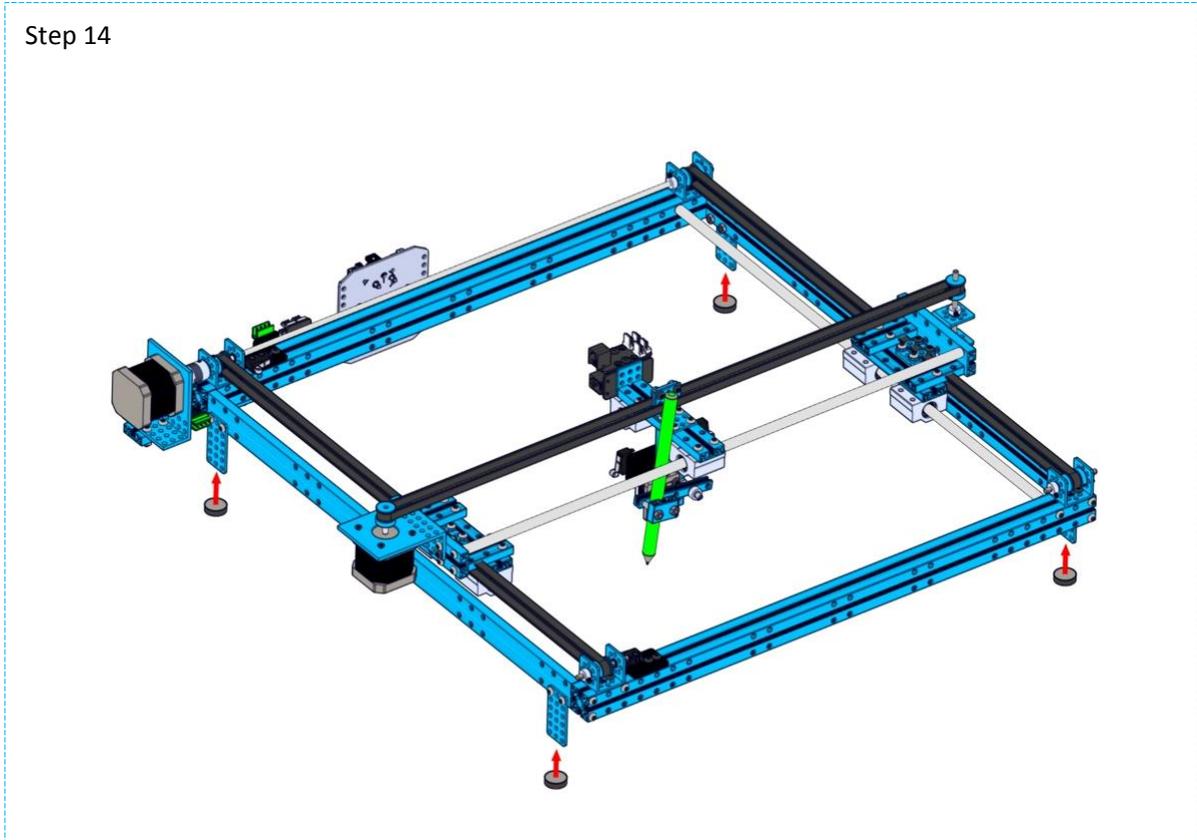
1×Rubber band

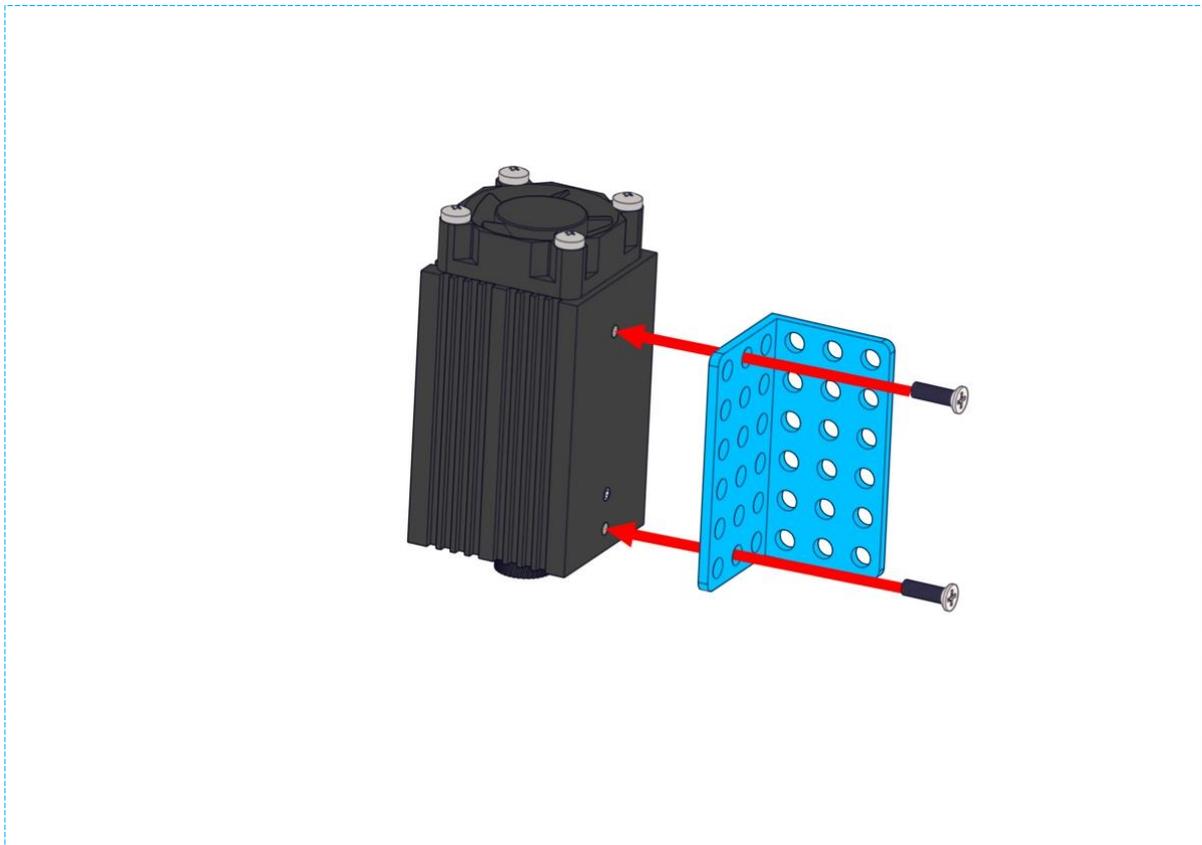
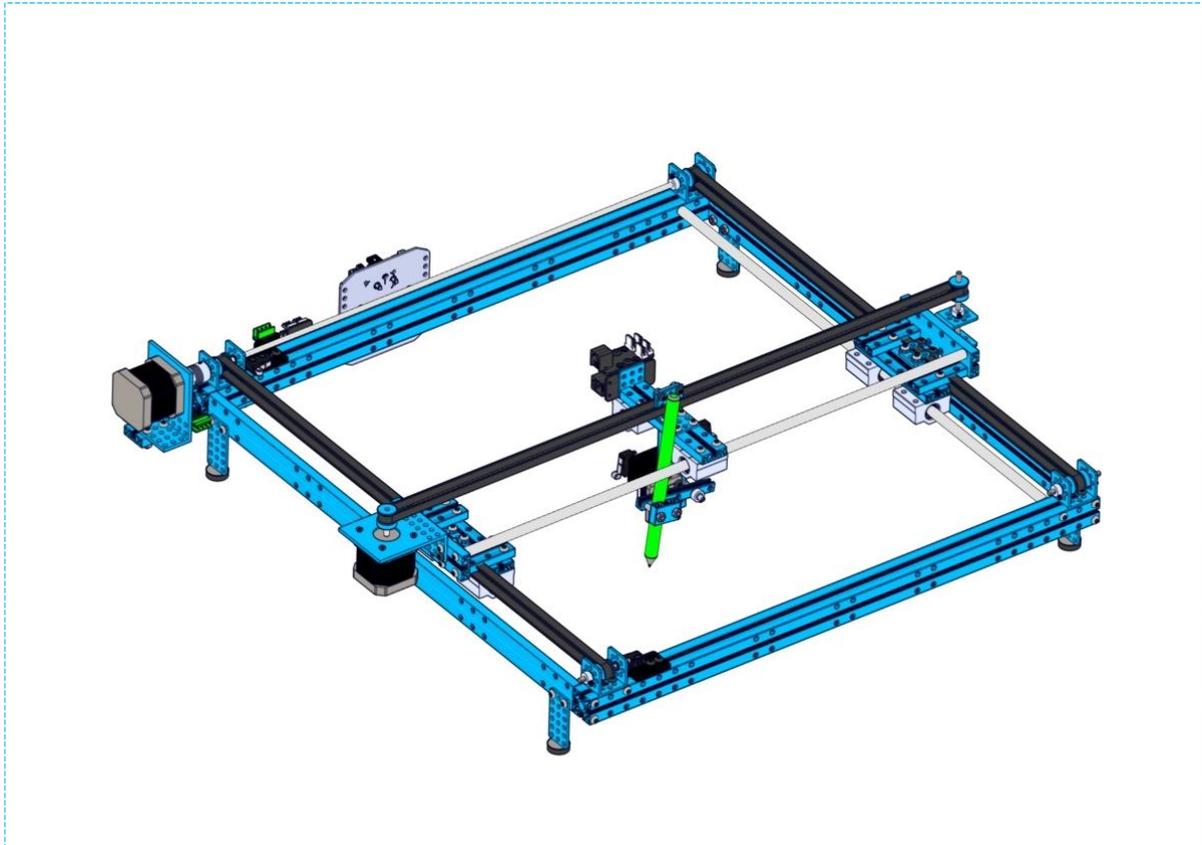


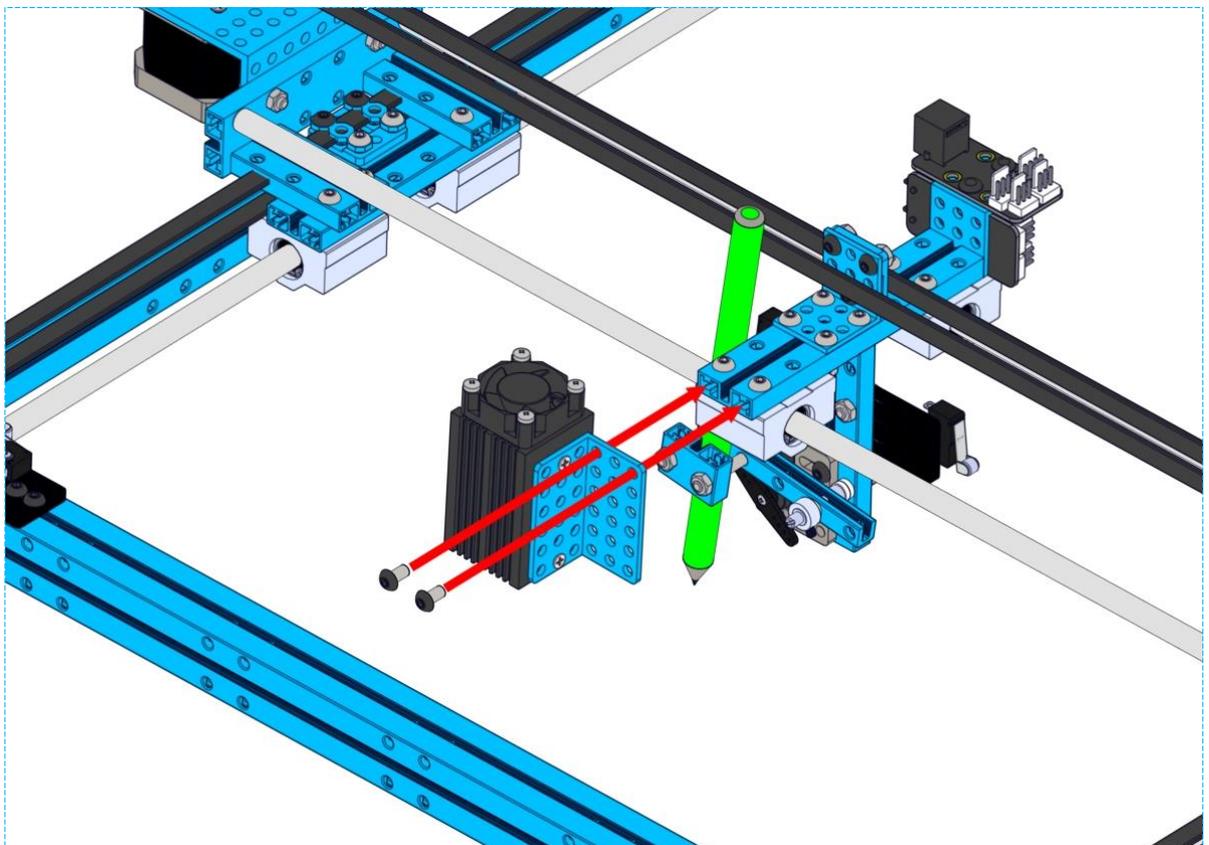


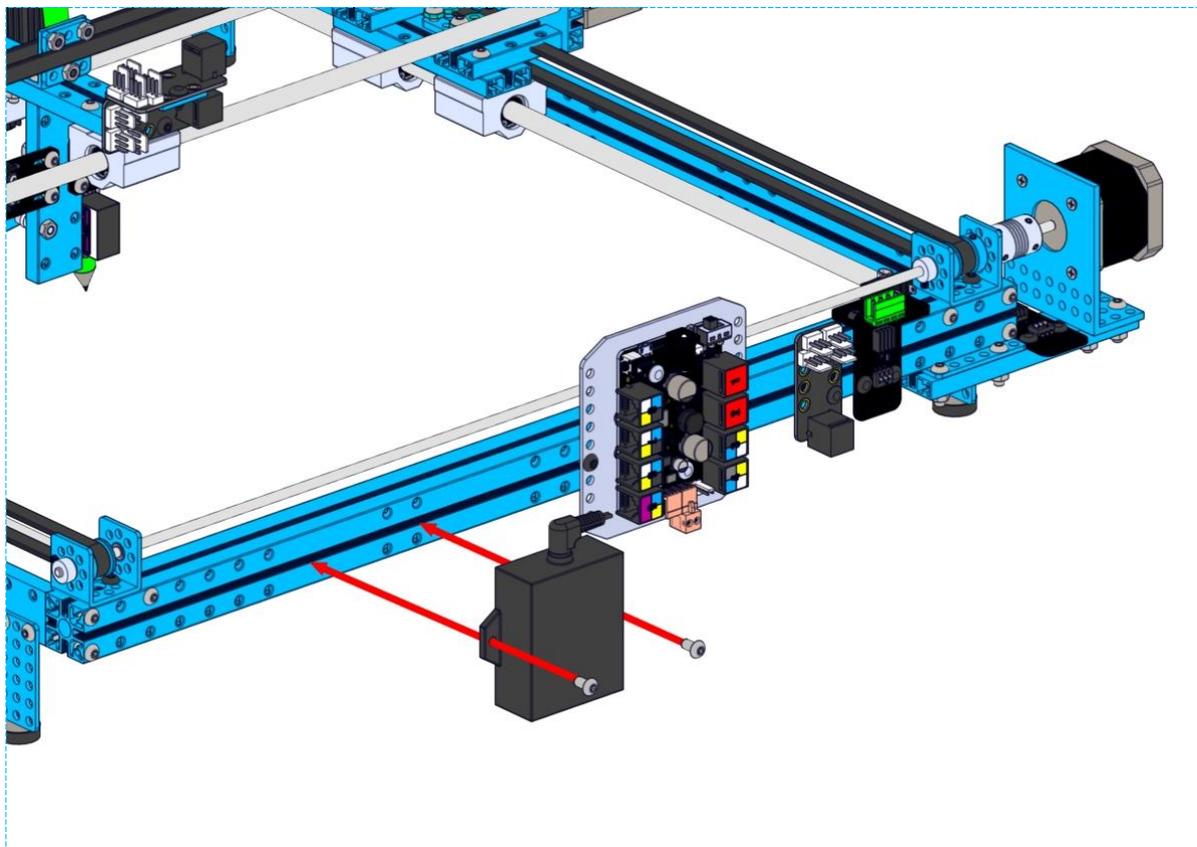
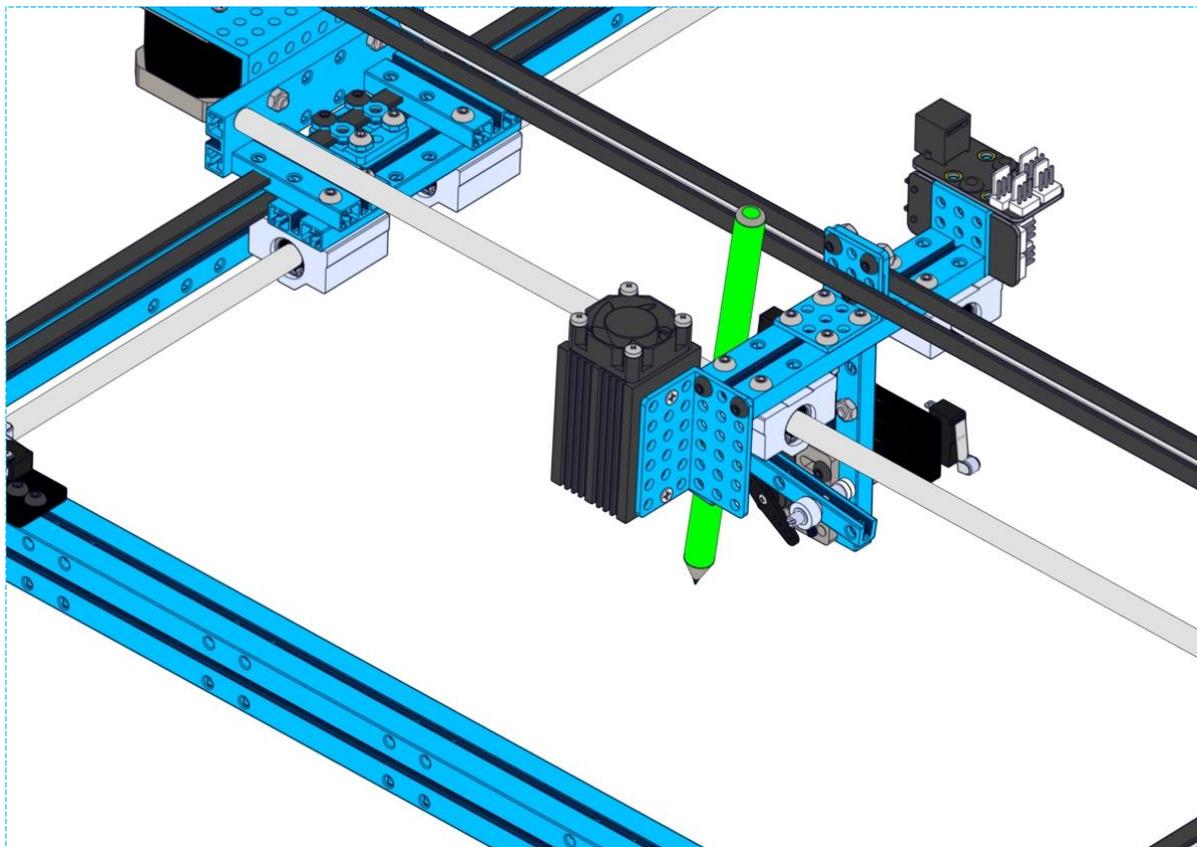


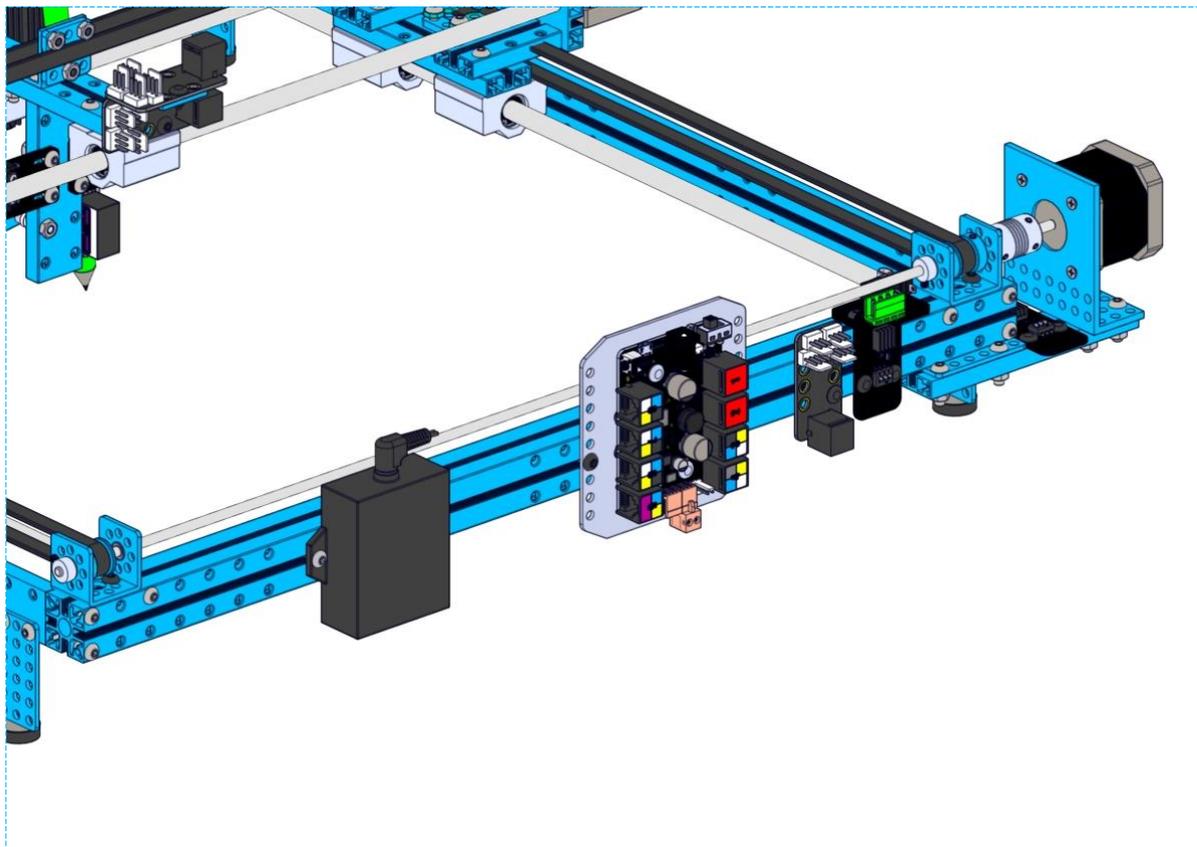
Step 14



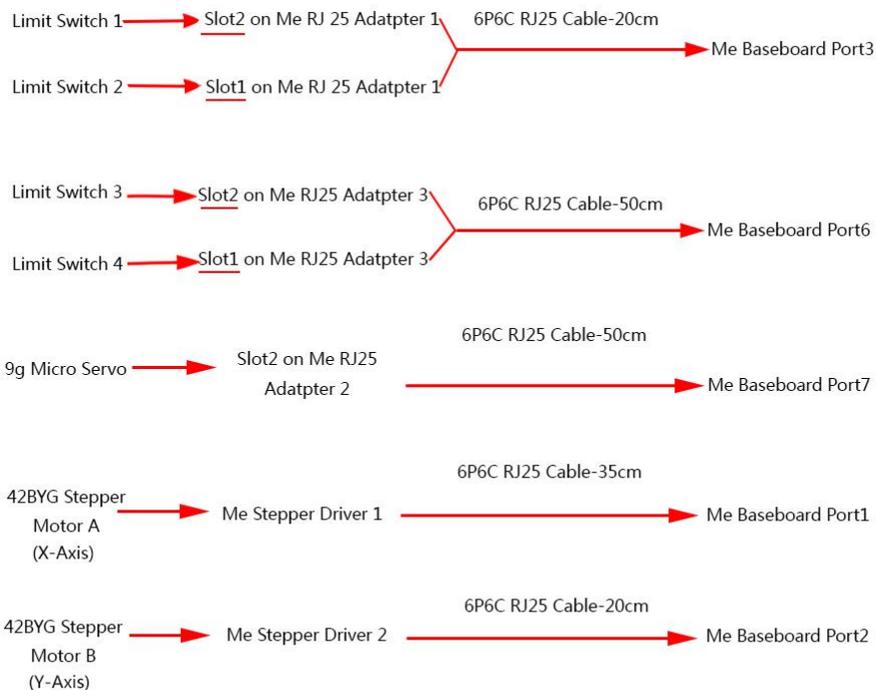


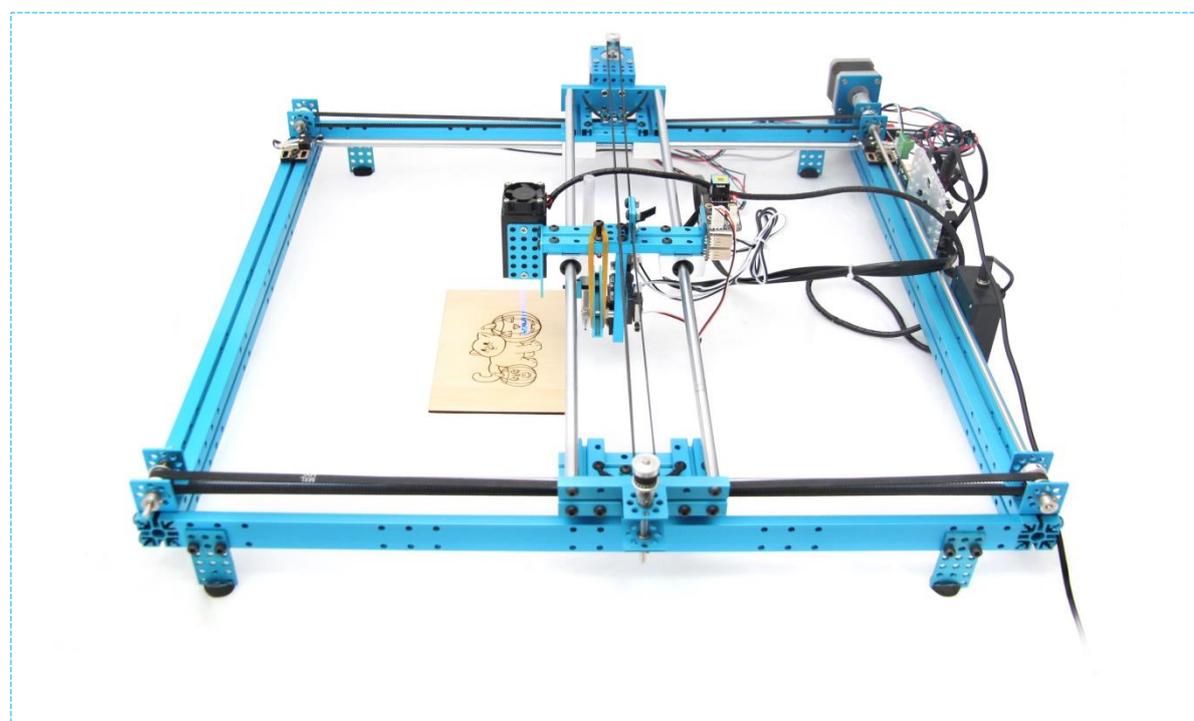
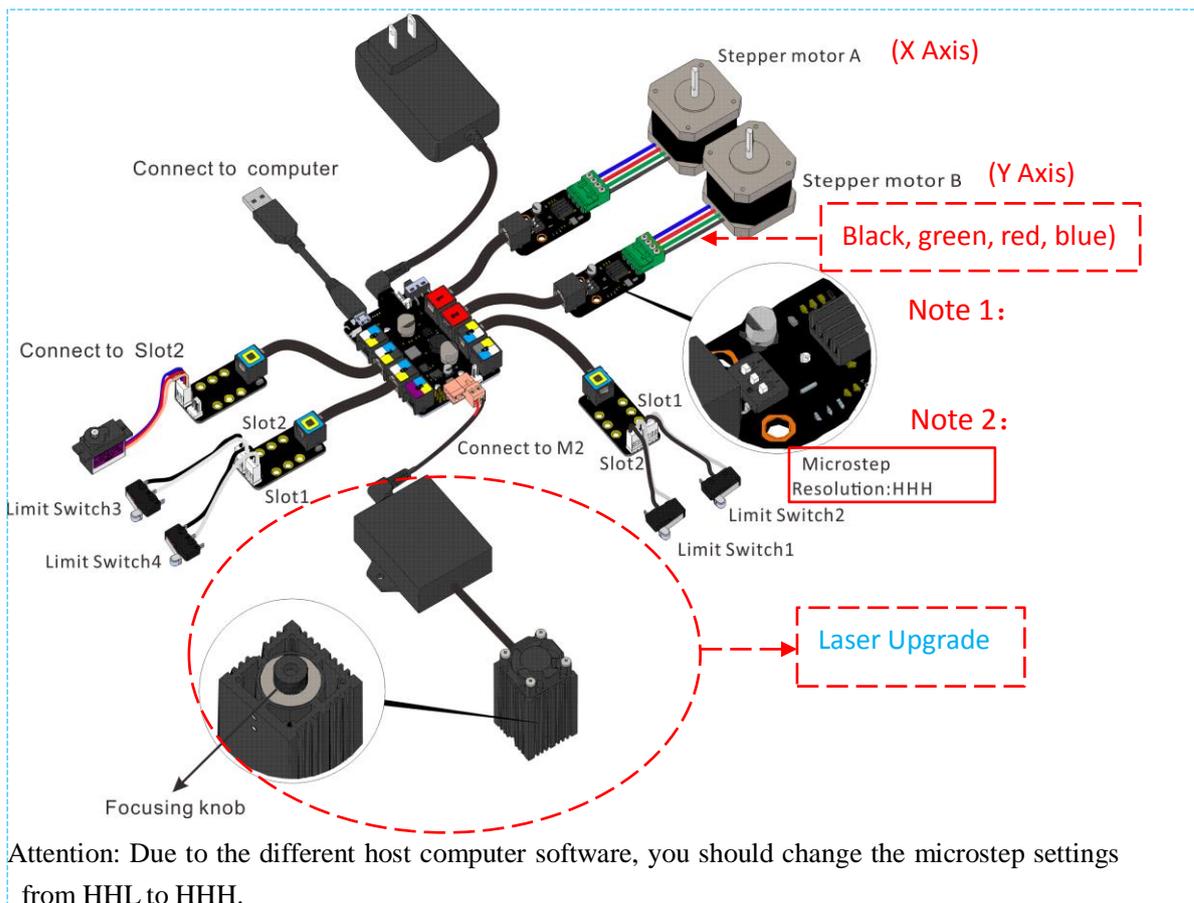






Step 15





After you finishing this step, congratulations! You can move forward to the next stage – using mDraw to control your robot. Here you go the introduction of software mDraw.

6. mDraw

a) Introduction of mDraw

mDraw is an cross-platform open-source software developed by Makeblock.

Compatibility: mDrawBot (mScara, mCar, mEggBot, mSpider), XY Plotter kit (servo mode, laser mode)

OS Environment: Windows, Mac, Linux

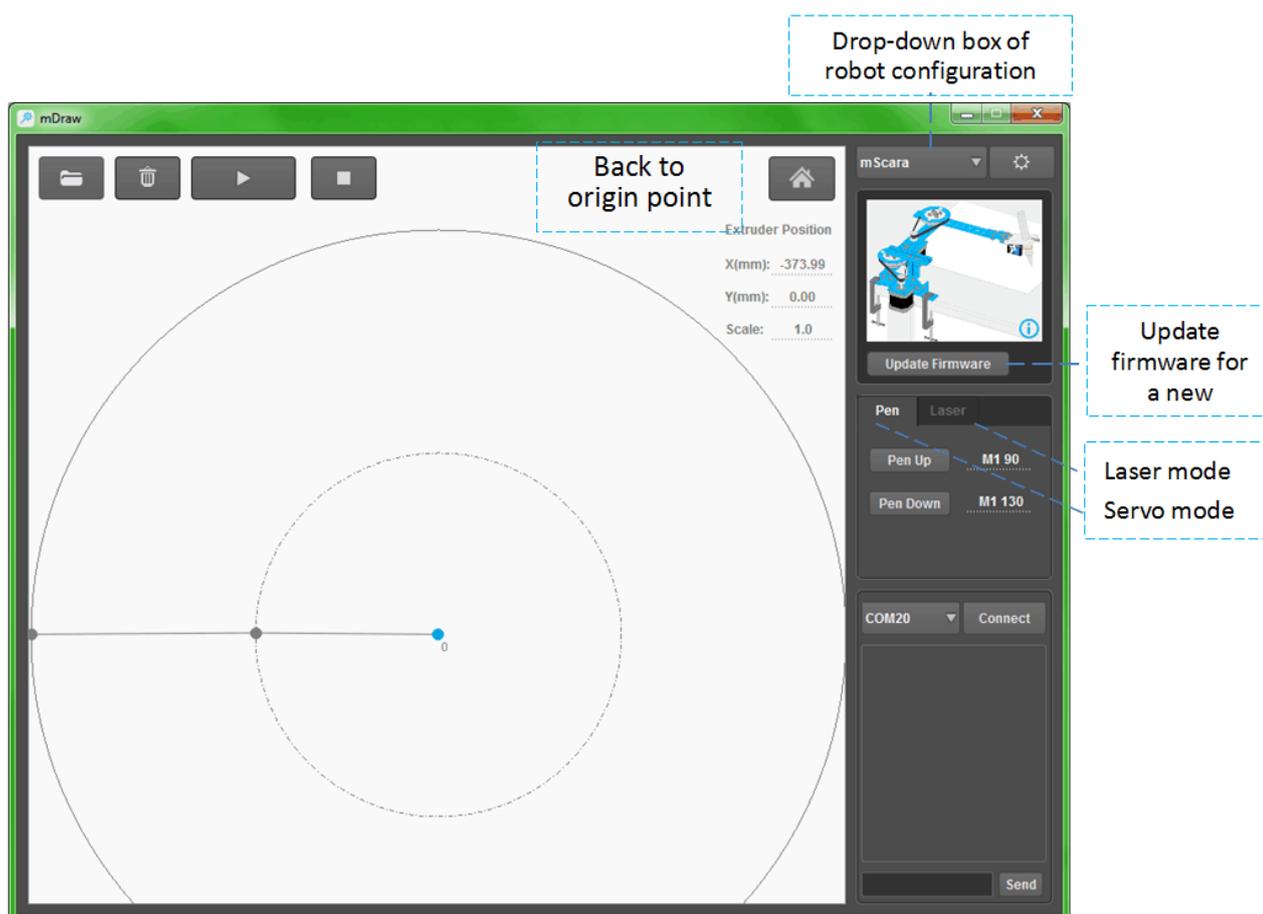
Supported File Type: *.svg, *.bmp (convert to *.svg)²

b) Installation

Download and open the installation pack of [mDraw](#), follow the prompts to install mDraw.³

c) Button Function in Main UI

Click in the Drawing zone, robot will move accordingly. Drag the loaded SVG graphics in drawing zone could adjust the size and position of graphics. Size can be adjusted by inputting values in the right-down window directly.

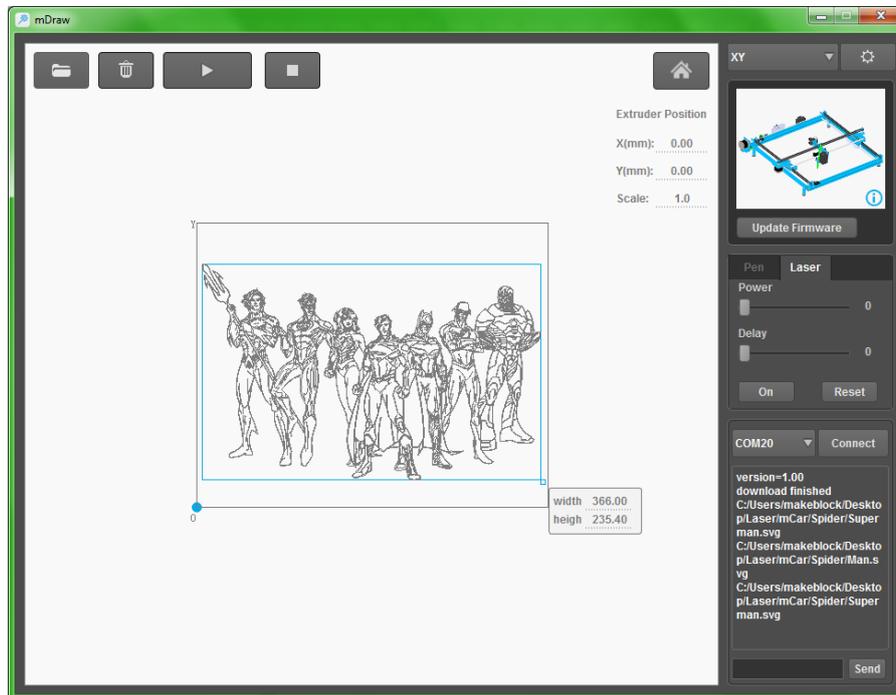


² All file must be named in English.

³ The installation directory must be named in English.

Load in BMP file, mDraw will pop out a dialogue for converting SVG file. Follow the prompts, BMP file can be converted into SVG file.

Load in SVG file, drawing is as follows.



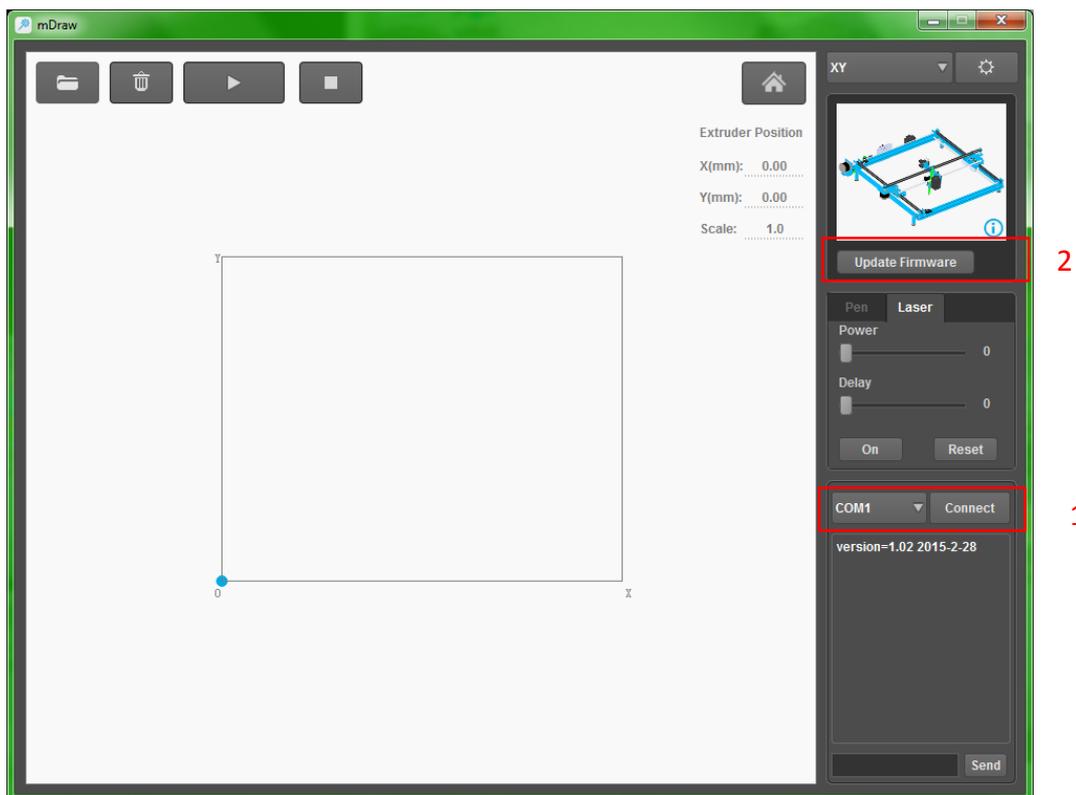
d) Setting

(1) XY Plotter V2.0

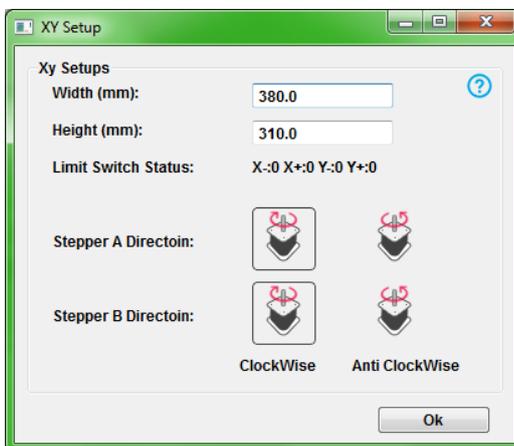
- Check and make sure all wiring is correct. Connect robot to computer via USB cable.⁴
- Choose XY as robot configuration, select the correct COM port, click “connect”, and then click “Update Firmware”).⁵

⁴ For Bluetooth connection, please be sure that you’ve installed the Bluetooth driver software in computer.

⁵ You need to click “update firmware” for the first time you use a new configuration, and each time you switched robot configuration.

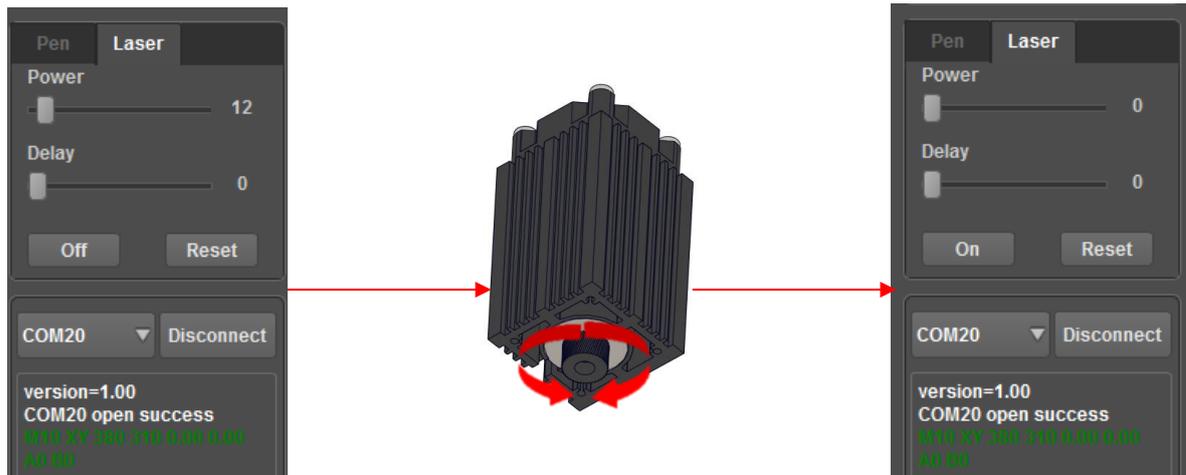


- c. Click button  to enter the setup window. Generally default value is fine, you can revise parameters per your own necessary.



- d. Click Laser button, switch to laser mode. Power stands for the intensity of laser, Delay stands for the engraving time (Unit: ms). Please adjust those parameters per your own necessary.
 NOTE: Please open laser before you start engraving, intensity as 10-15, wear your goggles and observe the light point. Please fix the focusing point by the focusing knob on laser box, rotate the focusing knob in clockwise and anti-clockwise until you find the smallest position, and then turn off the laser.

Here you go the procedure:

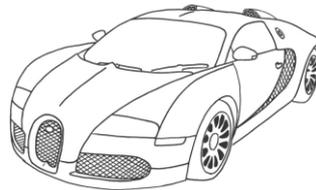


- e. Please keep graphics stay in the rectangle zone, or it will cause abnormal drawing.
- f. Make XY Plotter back to origin point before starting.
- g. Load SVG file, adjust the position. Open laser, set intensity and time, click start.

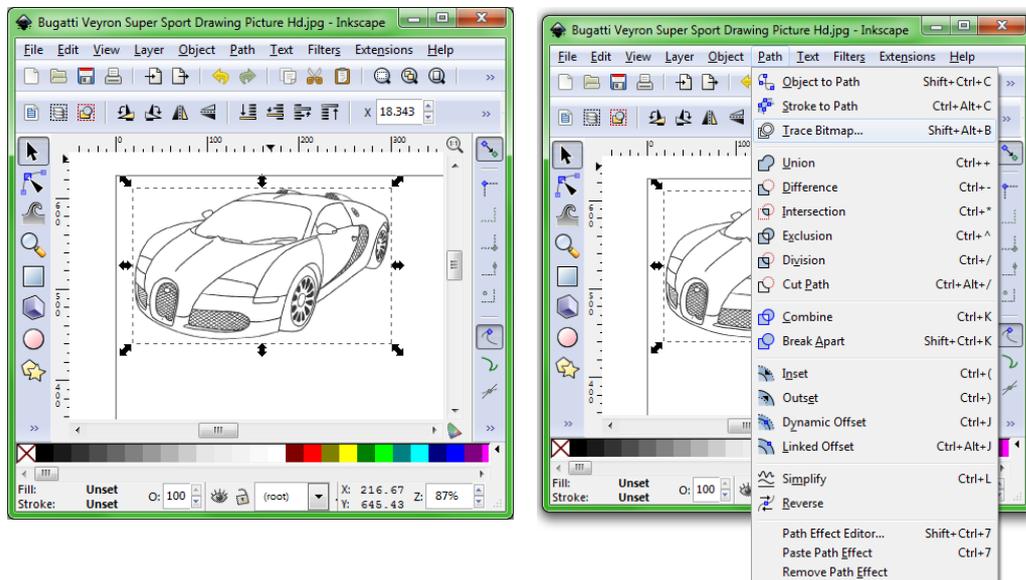
7. Samples for Software mDraw and Inkscape

mDraw supports SVG file which is based on open-source software Inkscape. For better experience of mDraw, please learn the basic operation of Inkscape.

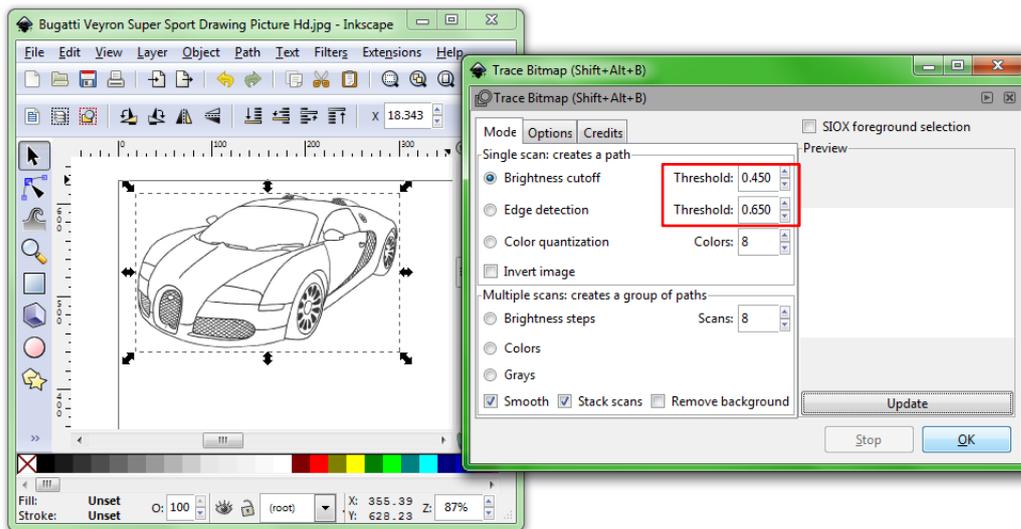
- a) Install Inkscape.
- b) Create a new vector graphic or open a vector graphic in Inkscape. Inkscape supports to convert other vector types into SVG file, like *.dxf, *.cdr (please save as an earlier version) files. Here you go a simple sample.
- c) We suggest to choose sketch for BMP as below sample.



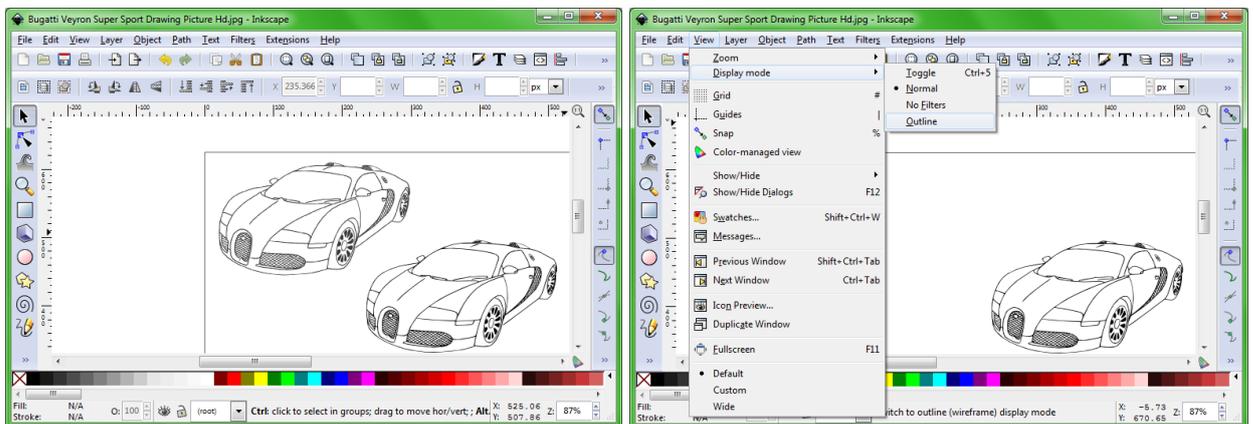
- d) Open a BMP file with Inkscape, select the picture, and then click Path->Trace Bitmap.



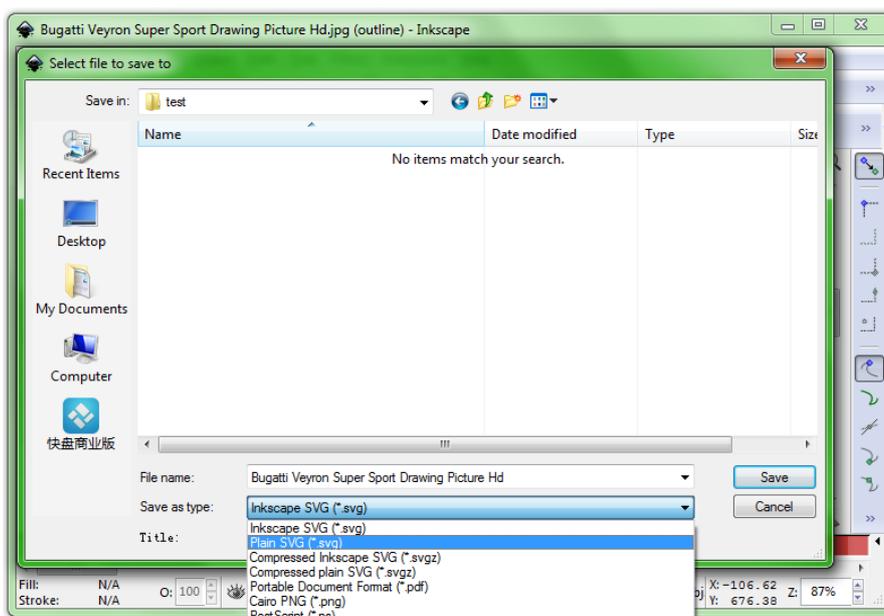
e) Set value for Threshold, click Update-> Ok.



f) Drag out the generated vector graphic, select View -> Display mode -> Outline. Delete the original BMP picture.

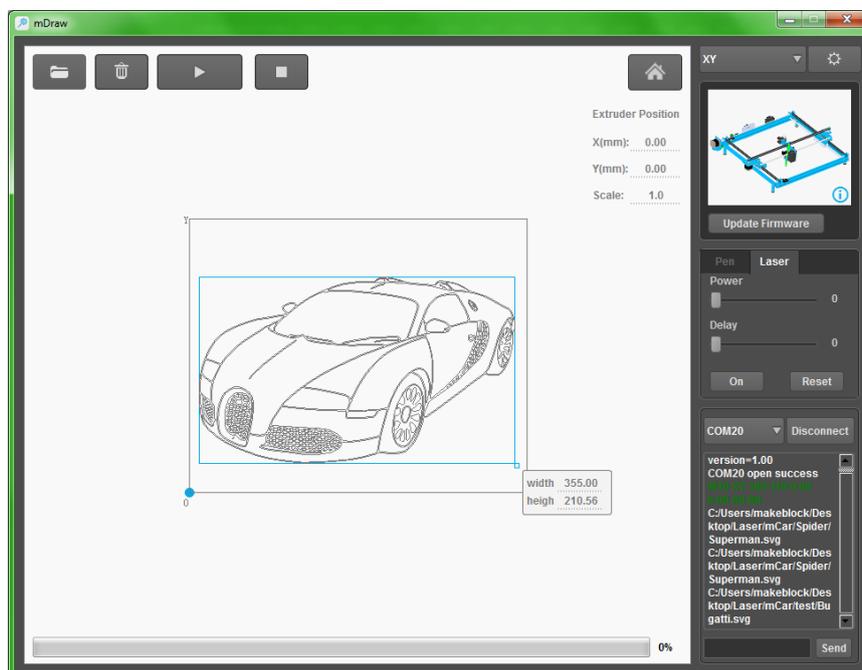


g) Save file as type Plain SVG (*.svg)⁶.



⁶ Please be sure to choose the correct file type, or it will be unsupported.

- h) Open the SVG file you just saved as below, adjust the position and size, and then click button  to start drawing.⁷



8. FAQs

Q1. Why cannot install driver software for Makeblock Orion?

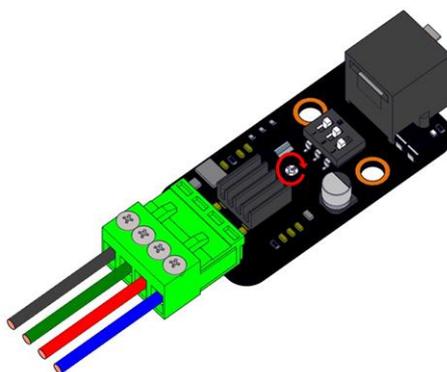
A: If your computer cannot install driver software for Makeblock Orion successfully, please download the driver installation here and install it manually.

Makeblock Orion driver download link:

http://learn.makeblock.cc/driver_installation/

Q2. How to adjust the torque and electric current of stepper motor?

A: You can swirl the tiny knob of stepper motor driver module in “+” direction to increase the torque output if it’s not enough.

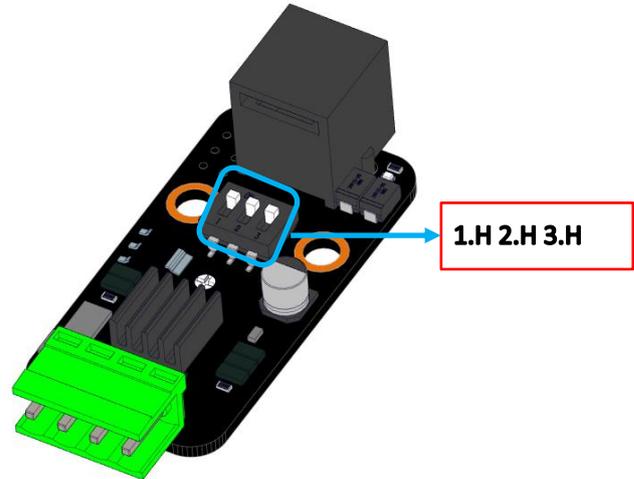


⁷ Before you start drawing anything, please check the manual and be sure that the mDrawBot is located at the same position in software.

Q3. Why the speed and ratio are incorrect?

A: The microstep presets of mDraw is HHH 1/16. If the speed and ratio are incorrect, please check the setting. Here you go the setting chart and default

	1	2	3
Full Speed	L	L	L
1/2	H	L	L
1/4	L	H	L
1/8	H	H	L
1/16	H	H	H



Q4. How to fix the height difference of pen lift mechanism?

A: Check the levelness of your desktop, change a better desktop if it's not good enough.

Q5. Light looks strong, but hard to engrave, how to fix it?

A: Check the size of light spot, if the light spot is too big to focus the laser energy or engrave, please check solution at [Here](#).

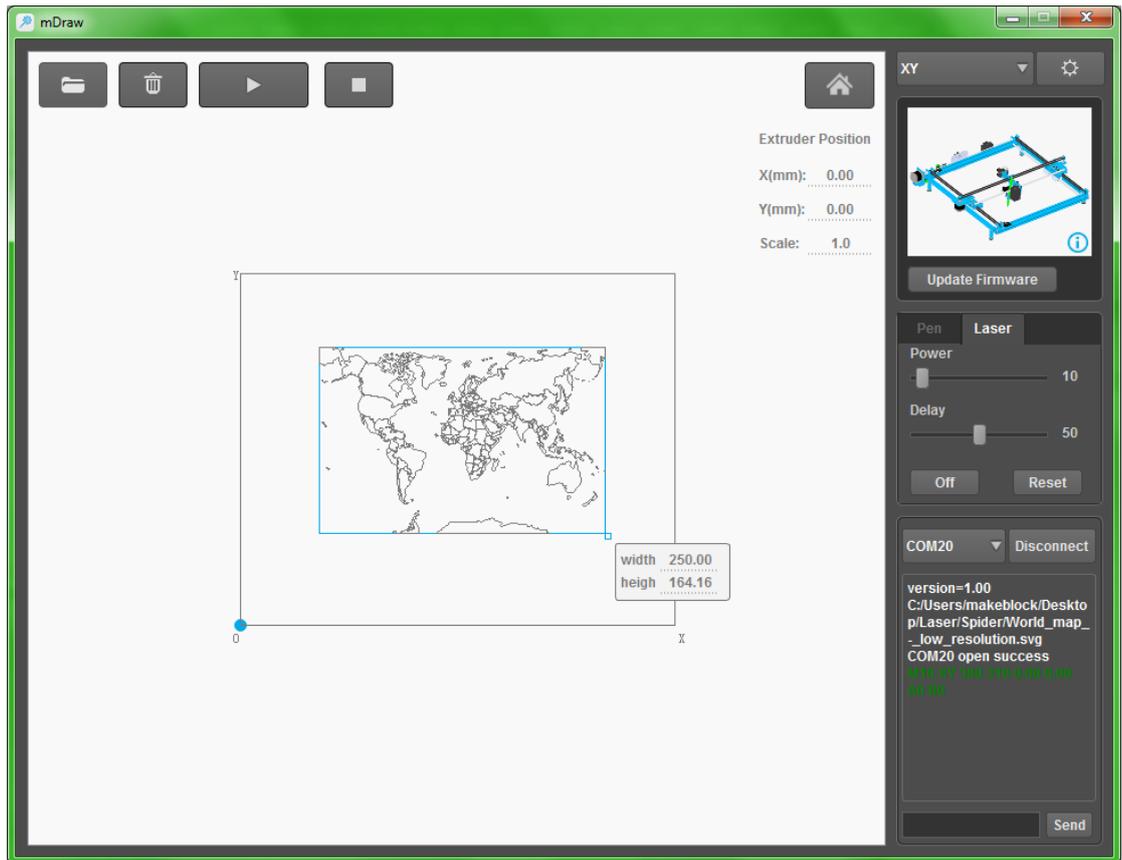
Q6. What can we engrave with a 405nm Blue-Violet Laser 450~500mW semiconductor diode lasers elements?

A: Suggested engrave/cut material: wood board, colorful paper cards, dark opaque acrylic, foam papers, dark cloth (jean, cotton fabric, and flax), leather, etc.

Forbidden engrave material: metal like aluminum alloy and stainless steel, mirror, colorful paper cards, foam papers, ceram etc. Any material with high melt point, high reflectivity, and high transmissivity.

Q7. How to know the corresponding physical position of the graphic in soft UI?

A: Move the machine back to origin position, drag graphic to change its size and position. Lift the pen, click the 4 corners of graphic as below figure, and then observe the movement of machine to identify the graphic's physical size and position.



Q8. How to download the related sources and 3D models?

A: Please download related sources at our official Grabcad website.

Q9. How to convert BMP into SVG?

A: Please refer to below teaching videos.

<https://www.youtube.com/watch?v=W0V-4O9x9Uk>

<https://www.youtube.com/watch?v=-yBMB5KtZj4>

Q10. How to share your work?

A: Welcome to upload and share you work at

<http://forum.makeblock.cc/category/showcase>.

Q11. How to contact us?

A: Welcome to email us at support@makeblock.cc. Or you can contact us at below.

https://www.facebook.com/Makeblock?ref=br_tf

<https://plus.google.com/102486511775733872783/posts>

<https://twitter.com/Makeblock>

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