Before using this product, we recommend that you carefully read the product's hardware manual

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Chapter one: **M2NanoDRV** An introduction to Board

Wiring

■ Power supply: **LO NC GND 36V**

36V: represents the maximum supply voltage must not exceed **36V**, do not have to use **36V** power supply, it is recommended that **10V-36V**; Please note: power supply voltage exceed **36V** Will cause the **M2NanoDRV** Control Panel is damaged!

GND: GND;

NC: not used, that is, without wiring;

LO: laser control signal output, open laser low level, high level off laser;

M2NanoDRV with integrated laser power supply connector production the following diagram:

Note : If using a separate laser power, simply connect both power cables **36V (10V-36V)**, and**GND** ,**NC**, and**LO** are without wiring.

■ X Motors, Y Motor: **PUL DIR +5V ENA**

PUL: the step pulse output; **DIR**: direction of signal output;

+5V:**5V** power output (Max **0.05A = 50mA**);

ENA: offline control (offline, the stepper motor in free State);

(1), and**M2NanoDRV** and single-ended control signals for stepper motor drive connection method:

PUL: drive **PUL**; DIR: drive, **DIR**;

+5V: drive **VCC** or **OPTO**(such as ray drives);

ENA: drive of the **ENA**.

(2), and**M2NanoDRV** with the difference the stepper motor drive control signal connection methods:

PUL: drive **PUL-**; DIR: drive **DIR-**;

+5V: drive **PUL +**, and**DIR +**, and**ENA +**;

ENA: drive **ENA-**.

☠ laser control:5V g l

Integrated laser power supply is used, then the socket without wiring, the use of independent laser power supply, then the wiring according to the following programme:

5V: independent of laser power supply **5V**; g: independent power supply of **g**;

L: independent of laser power supply **l**(or **TL**)

■ Limit switch: GND YL XL GND V+

GND: signal ground;

YL: **y** axis limit signal input, XL: **x** axis limit signal input;

GND: signal ground;

V+: power supply (electronics limited, when used, required to power) Description:**V+** the control panel input power, or power outlet (**LO NC GND 36V**) **36V** pin input voltage.

(1), mechanical switch as a limit switch connection method:

Advantages of mechanical limit switches are simple connections, and less susceptible to damage from electrical sources. But quality limit switches are recommended, because the inferior limit switches, not only a limited life span, and contact jitter can cause positioning accuracy less than ideal.

(2), proximity switch as a limit switch connection method:

Proximity switch is a non-contact sensor, it close and stay away from a certain material (such as metal) to determine its status. How to choose a suitable proximity switch as a limit switch?

A, proximity switch working voltage **M2NanoDRV** power supply voltage match. **M2NanoDRV** power supply for **36V**, then use **36V** proximity switches;

B, the detection range of the proximity switch. Detection distance proximity switch should not be too large, and suggested the use of detection distance of **5mm–8mm** the proximity switches;

C, the operating frequency of the proximity switches with difference size. Operating frequency is high, the difference is smaller, more precise positioning accuracy can be obtained;

D, should use a three-wire **NPN** normally closed type proximity switch. Three-wire **NPN** proximity switch open collector output structure is set. If you do not understand what the collector output structure, when buying please

To the proximity switch suppliers in the following figure:

VCC OUT

GND

E, to use strong anti-jamming ability of proximity switches. Anti-jamming ability of proximity switches may lead to malfunction because of electromagnetic interference, thus affecting the positioning precision.

M2NanoDRV proximity switch connection method shown in the following figure:

Usually proximity switch as a limit switch only applies to the accuracy requirement of situations. **M2NanoDRV** using software, hardware, greatly improving the proximity switch repeat positioning accuracy.

M2NanoDRV Install model figure

Chapter II: motor, timing pulleys, drive segments, software setup

☠ the first scenario:

- **0.9** ° **42** stepping motors;
- **20** tooth **MXL** timing pulleys;
- **MXL** timing belts, timing belt width according to load size selection;

⑩ Motor drive segment is set to **16** segments (or **3200**);

⑩ Control panels model **6C6879-LASER-M2**, logical resolution is set to **1000dpi**, as shown in the following figure:

☠ the second option:

- **1.8** ° **42** stepping motors;
- **20** tooth **MXL** timing pulleys;
- **MXL** timing belts, timing belt width according to load size selection;
- ⑩ Motor drive segment is set to **32** segments (or **6400**);
- ⑩ Control panels model **6C6879-LASER-M2**, logical resolution is set to **1000dpi**, as shown in the following figure:

☠ the third option:

- **0.9** ° **57** stepping motors;
- **40** tooth **MXL** timing pulleys;
- **MXL** timing belts, timing belt width according to load size selection;
- ⑩ Motor drive segment is set to **32** segments (or **6400**);
- ⑩ Control panels model **6C6879-LASER-M2**, logical resolution is set to **1000dpi**, as shown in the following figure:

☠ fourth scenario

- **1.8** ° **57** stepping motors;
- **40** tooth **MXL** timing pulleys;
- **MXL** timing belts, timing belt width according to load size selection;
- ☹ motor drive segment is set to **64** segments (or **12800**);

⑩ Control panels model **6C6879-LASER-M2**, logical resolution is set to **1000dpi**, as shown in the following figure:

☠ fifth scenario

- **0.9** ° **57** stepping motors;
- **24** toothed **3M** wheel;
- **3M** timing belt, timing belt width according to load size selection;

⑩ Motor drive segment is set to **32** segments (or **6400**);

⑩ Control panels model **6C6879-LASER-M2**, logical resolution is set to **1129dpi**, as shown in the following figure:

☠ sixth scenario

- **1.8** ° **57** stepping motors;
- **24** toothed 3**m** wheel;
- **3M** timing belt, timing belt width according to load size selection;

☹ motor drive segment is set to **64** segments (or **12800**);

⑩ Control panels model **6C6879-LASER-M2**, logical resolution is set to **1129dpi**, as shown in the following figure:

On the motor and the power of choice:

M2NanoDRV plotter designed to drive heavy, how do we match the motor and power supply?

☠ the first and the second option, using a **42** stepper motors:

- **X** axis selection **34mm-36mm** thickness of **1.7A-2.0A 42** stepper motor**y** axis selection **44mm-48mm** Thickness of **2.0A-2.4A 42** stepper motors stepper motor Derating use: current settings for that drive is not recommended more than **1.5A**.

☹ choice **24V/6A** switching power supply: about **150W 24V** power supply. If you need a better high-speed performance, or may choose **36V/6A** switching power supply: about **200W 36V** switching power supply.

☠ third scenario, using a **57** stepper motors:

- **X** axis selection **40mm-60mm** thickness of **2.5A-3.5A 57** stepper motor**y** axis selection **50mm-80mm** Thickness of **3.0A-3.5A 57** stepper motors stepper motor Derating use: current settings for that drive is not recommended more than **2.5A**.

☹ choice **36V/8A** switching power supply: approximately **300W 36V** switching power supply.

Why we recommend stepping motor Derating used? Because stepping motor is used at full capacity, not only noise, heat and movement accuracy may be affected. How to set to the optimal size of drive current? Some people think that stepping motor driving current of larger stepper motor speed is higher, and greater torque. This view is one-sided, why we do not speak here any more. We only speak of how the current drive settings to optimal size. If a laser machine, drives when current is set to one of the stalls, can guarantee that laser machine maximum speed is not offset (set to low first gear current dislocation), then set the current high school. Yet another way is: When you set higher drive current, laser speed no longer raise or promotion is limited, then we do not further increase the drive's current!

Chapter III: **M2NanoDRV** System

A by **M2NanoDRV** is used to control the laser engraving machine, it should consist of several modules:**M2NanoDRV** control panels, laser power,**x-** axis stepper motor driver,**y-** axis stepper motor drives,

power supply (**M2NanoDRV** control panel power supply power supply,**x-** axis stepper motor driver power supply power supply,**y-** axis stepper motor driver power supply power supply).

☠ full isolation system

So-called isolation systems, refers to the various modules of the system are not directly on the electrical contacts, therefore, theoretically there is no electrically interfering, so as to improve the reliability of the system. Total isolated system, is the most reliable (strong anti-interference ability), but complete isolation systems, each of which requires a separate power supply, so cost is higher. As shown in the following figure, full isolation systems need **3** separate power supply.

M2NanoDRV control panel with a power supply, two stepper motor drives share the same power supply.

M2NanoDRV Control Panel, two stepper motor drives share the same power supply. Do not isolate the lowest system cost, but reliability is the worst, because current chopper stepping motor driver, can cause strong interference may cause **USB** communication exception.

Appendix: phase stepping motor driver supplying

At present, the Department could provide the drive to **M415DRV**(maximum peak current of up to **1.60A**, it is recommended that no more than **1.50A**), as shown in the following figure. On the drive for more technical information, please refer to the**M415DRV** stepper motor driver instruction manual, we've only been here our test performance.

■ Test a **(** Control Panel:**M2NanoDRV**, logical resolution of **1000dpi**, said of the second chapter of the second option**)**

- ⑩ Tracks:**x** axis,**y** axis are **12mm** wide square linear Guide (**x-** rail **600mm**,**y** Track **400mm**), no design on mechanical reduction structure;
- ⑩ Motor:**x** motor is **1.8** °and the**34mm** thick,**1.70A 42** stepper motor,**y** Axis is **1.8** °and the**48mm** thick **2.20A 42** stepper motors and two **42** Motors are our motor, two bearings in the motor are the **NMB** (Minebea) high-speed bearings;
- ⑩ Timing pulleys and timing belt:**20** tooth **MXL** wheel,**10MM** wide **MXL** timing belt;
- ☹ drive subdivision and the current setting: two stepper motor drives are set to **32** segments,**1.40A**;
- ⑩ Switch power:**150W 24V** switch power supply for two stepper motors drive power supply,**12V 10W** to small switching power supply **M2NanoDRV** Power test results: stable operation of maximum engraving speed is **800mm/s**, motor speed of about **1180RPM**;

■ Test two **(** Control Panel:**M2NanoDRV**, logical resolution of **1000dpi**, said of the second chapter of the third way**)**

- ⑩ Tracks:**x** axis,**y** axis are **15mm** wide square linear Guide (**x-** rail **750mm**,**y** Track **550mm**), no design on mechanical reduction structure;
- ⑩ Motor:**x** motor to **0.9** °, and**45mm** thicker,**2.50A 57** stepper motor,**y** Axis of **0.9** °, and**56mm** thickness **3.0A 57** stepper motor two **57** motor for our custom motor , Two bearings in the motor are the **NMB** (Minebea) high-speed bearings;

⑩ Timing pulleys and timing belt:**40** tooth **MXL** wheel,**15mm** wide **MXL** timing belt;

☹ drive subdivision and the current setting: two stepper motor drives are set to **32** segments,**1.50A**;

⑩ Switching power supply:**250W 36V** switching power supply for two stepper motors drive power supply,**12V 10W** to small switching power supply **M2NanoDRV** Power test results: stable operation of maximum engraving speed is **800mm/s**, motor speed of about **590RPM**;

From the above two tests : **X** axis motor thickness smaller motor should be chosen because thickness of small motors, less weight, the motor coils are also lighter, has excellent acceleration and deceleration characteristics more suitable for **x-** axis high-speed scanning back and forth movement of the engraving. **Y** axis because the load is heavy, thick motor should be chosen to ensure there is enough torque output. Also, because high speed engraving, stepper motor speed is very high, two bearings in the stepper motor, suitable for high quality high speed bearings to ensure smooth movement reliable.

Conclusion :**M2NanoDRV** tie **M415DRV** drive suitable for high speed durability in manufacturing large-format laser engraving machine if you choose to drive greater drive capability,**M2NanoDRV** laser engraving machine suitable for any size, Particularly suitable for making large-format, low cutting speed of sheet metal cutting machines (because the laser power limitation, nor high speed cutting of thick plates).

Drive service

✞ our drives, there would be a price advantage. Have the price advantage is not to say has churned out, but because we only design for the laser industry. For example, now used in most laser drive subdivision, basic is fixed, for example, **4000 (20** segments), and**5000**(**25** segments), and**6400** (**32** segments), and laser manufacturers buy the drive, there are more than 10 kinds of segments is set, use it? Removed laser industry doesn't need subdivision, and naturally a little price advantage;

✞ our drives, current step-less, best concessions as far as possible into the motor current. Drive stepper motor with a disadvantage is the Control Panel cannot be dynamically adjusted current electricity because most drives, use dip switch setting, dial when you switch to a current position, stepping motor current is fixed, cannot participate in adjusting the Control Board. However, most of the current drive setting sediment, such as **0.5A**, and

1A、**1.5A**、**2A**、**2.5A**、**3A**、**3.5A**、 **4 a**, each step is **0.5A**, so if **1 a** too small,**1.5A** , what should I do? No way. Too much subdivision so we can eliminate the need to set and refine current step, it will be more suitable for laser use.

✞ our drives will do some high voltage protection. In the laser machine, laser power is a misery, can even say**10** times hardware failure **9** times is caused by the trouble. Most drive manufacturers generally do not take into account the particularities.

✞ drives our integrated hot swap functionality, which continue to be directly plugged. Most of the drive, no live plug the connectors of the motor, or you will cause the drive to destroy. Charge plug is difficult to stamp out, so the resulting repair, there are;

✞ now some stepper motor driven core chips are very advanced, far beyond the conventional stepper motor drives: some low-speed automated double frequency function, according to load size automatically adjusts the current function, some bet on the turn feature testing motor stall, some also have closed-loop feedback functions ... . Different core chips, the price difference is very big, but the outer shell is the same.

Tip : we design of the drive, usually only for binary segments of the law, such as **2** segments (**400**), and**4** segments (**800**), and**8** Subdivision (**1600**), and**16** segments (**3200**), and **32** segments (**6400**), and**64** segments (**12800**), and**128** segments (**25600**) , And**256**(**51200**) segment, but not the **5** segments (**1000**), and**10** segments (**2000**), And**20** segment (**4000**), and **25** segments (**5000**), and**40** segments (**8000**), and**50** segments (**10000**), and **100** segments (**20000**). Some users may say, I used to use are **25** segments (**5000**) to do? It does not matter, use **32** segments (**6400**) and modifying the pulse equivalent and the deceleration parameter. Choose **25** segments (**5000**) and selection of **32** segments (**6400**), is there any difference? Selection of **32** when the subdivision, run more smoothly, vibrations will be smaller, fineness of engraving be better, smooth cutting will be higher, but maximum engraving speeds will drop slightly. That is, more high of subdivision, step into motor run will more smooth, and vibration will more small, and carved fine degrees will more good, and cutting smooth sex will more high, but by limited to motor of response frequency, highest run speed will declined, because more high of subdivision, to reached low subdivision as of speed, need more high of pulse frequency, and motor of highest response frequency General is not variable of .

☞ if only the pursuit of maximum engraving speed, rather than carving and cutting effect, choose a lower subdivision of stepping motor. In other words, high speed and high accuracy are usually interdependent!

2016 – 11 - 17 Li Huiyu preparation

(Finish)