

# Specification of MC-BOARD Motion Control Mainboard Interface V1.00

## 1. Overview

MC-BOARD mainboard is specially used in the motion control system for laser engraving and cutting, which can support the motion control of four shafts at most, that is, the gang control of two shafts and the inching control of the other two shafts. The gang control system of 3 or 4 shafts can be developed for specific users.

MC-BOARD mainboard supports both the online control mode and the offline control mode, which, after the parameter setting, graph edition and path optimization of machines (For details, see the description of mainboard PC software) can be completed with the supporting PC software of this mainboard, can be started and processed in PC, or generated into data files (.rd) in PC and copied to the mainboard memory through U-disk so as to realize offline operation. This mainboard supports FAT32 and FAT16 file formats of U-disk in addition to copying of .rd file in the mainboard memory into U-disk.

MC-BOARD is equipped with a man-machine operating panel that is connected to RS232 interface and the mainboard.

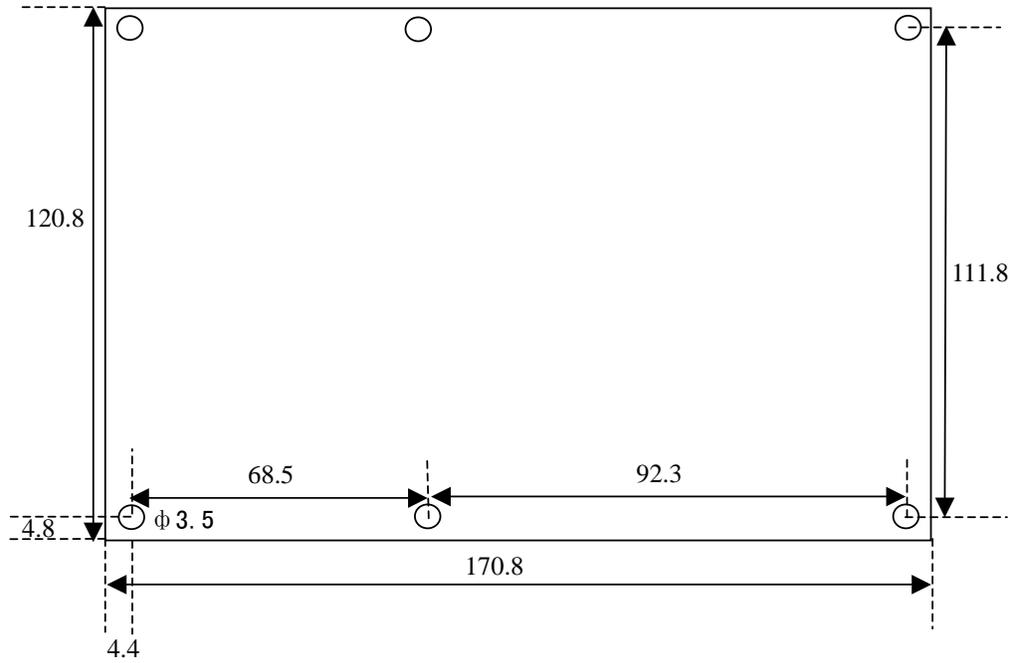
Please pay attention to the following items when using this mainboard:

- ◆ Please read this Specification prior to use of this mainboard;
- ◆ Please don't dismantle and change the chips and components on the mainboard on your own;
- ◆ Please keep it far away from water and corrosive substances;
- ◆ Please don't press the chips and components with force in the process of wiring or installation.

## 2. Installing Dimensions

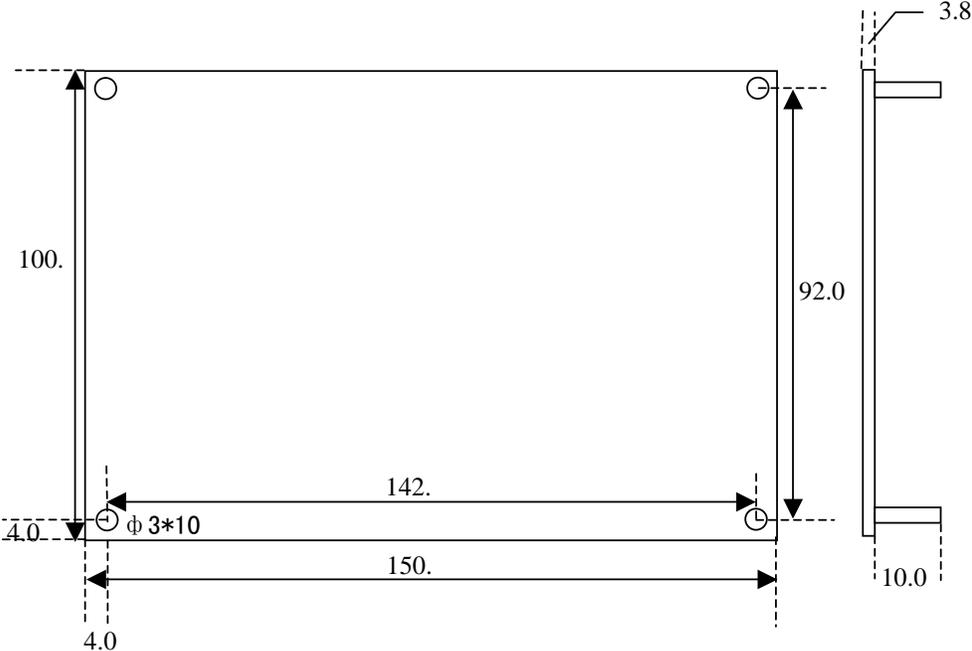
### 2.1 Installing Dimensions of Mainboard

All the dimension units are expressed in mm to the accuracy of 0.1mm.



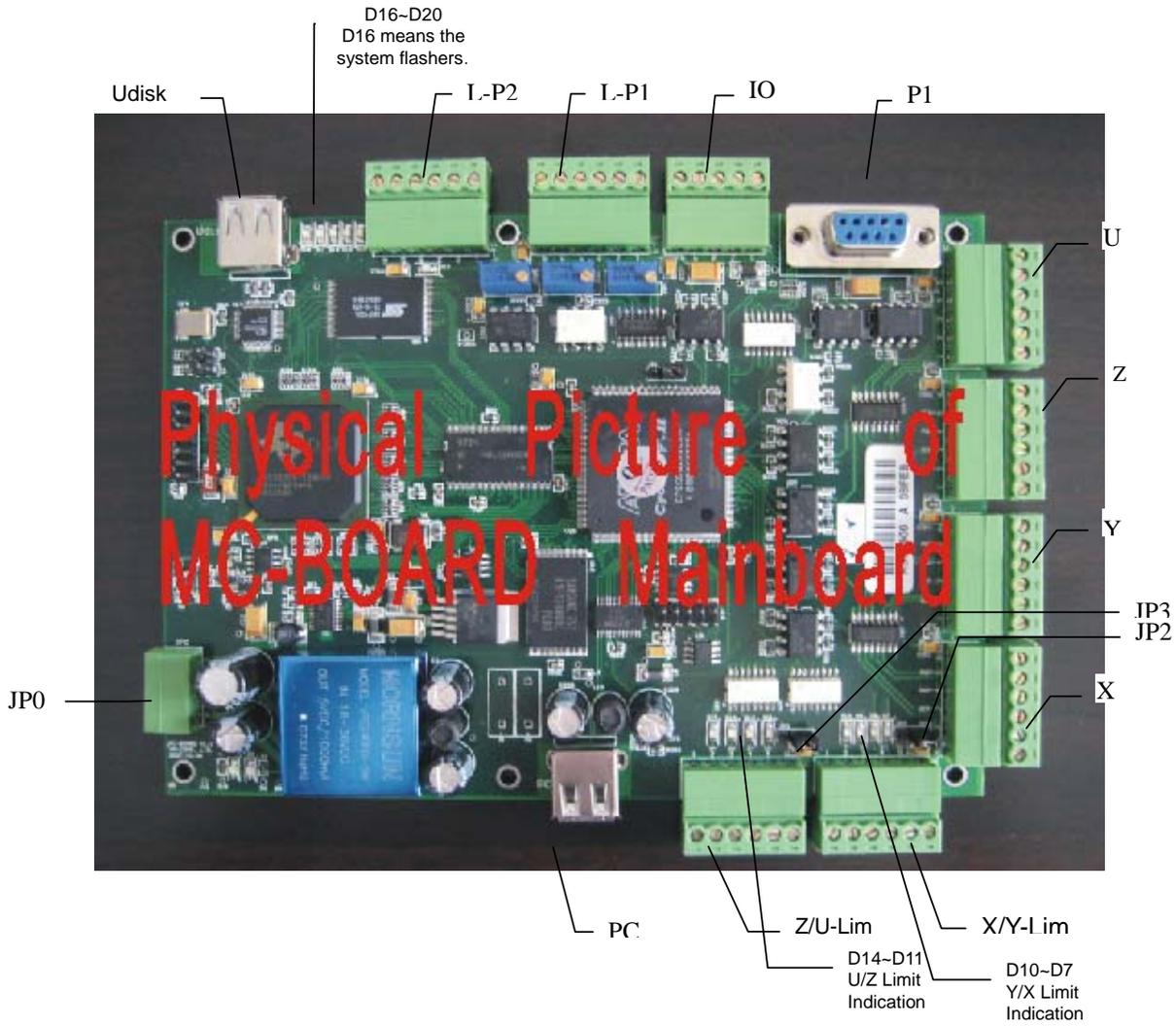
## 2.2 Installing Dimensions of Keyboard

All the dimension units are expressed in mm to the accuracy of 0.1mm.



### 3. Physical Picture and Interfaces

#### 3.1 Physical Picture of MC-BOARD Mainboard



3.2 Physical Picture of Man-machine Panel



## 4. Description of Interface Signal

### 4.1 Power Interface JP0 (4pin 3.81mm)

Pins	Definitions
1	24V GND (Input)
2	24V VCC (Input)
3	5V GND (Input)
4	5V VCC (Input)

This mainboard uses 24V and 5V power supply, of which quality should be guaranteed. Please pay attention to the sequence of all interface pins, with the serial numbers marked on the mainboard.

### 4.2 USB Interface

There are two USB interfaces on the mainboard. One is marked as the Udisk interface used in insertion of U-disk as well as copying of U-disk files and memory files; the other is marked as PC interface used to connect PC to facilitate parameter setting and control of mainboard through PC.

### 4.3 4-axis Limit Interface (6pin 3.81mm)

Z/U-axis Limit Interface Z/U-Lim

Pins	Definitions
1	5V GND (Output)
2	U-, U-axis moves to the limit of 0 coordinate, and corresponds to D14 indicator.
3	U+, U-axis moves to the limit of the maximum coordinate, and corresponds to D13 indicator.
4	Z-, Z-axis moves to the limit of 0 coordinate, and corresponds to D12 indicator.
5	Z+, Z-axis moves to the limit of the maximum coordinate, and corresponds to D11 indicator.
6	5V-1K resistor pulled up or 5V is selectable (Output); when JP3 jumps across Pin 1 and 2, Pin 6 is 5V; when JP3 jumps across Pin 2 and 3, Pin 6 is 1K resistor pulled up to 5V.

X/Y-axis Limit Interface X/Y-Lim

Pins	Definitions
1	5V GND (Output)
2	Y-, Y-axis moves to the limit of 0 coordinate, and corresponds to D10 indicator.
3	Y+, Y-axis moves to the limit of the maximum coordinate, and corresponds to D9 indicator.
4	X-, X-axis moves to the limit of 0 coordinate, and corresponds to D8 indicator.
5	X+, X-axis moves to the limit of the maximum coordinate, and corresponds to D10 indicator.
6	5V-1K resistor pulled up or 5V is selectable (Output); when JP2 jumps across Pin 1 and 2, Pin 6 is 5V; when JP2 jumps across Pin 2 and 3, Pin 6 is 1K resistor pulled up to 5V.

In the PC software of this mainboard, you can select the support to the limit polarity, that is, if the axis moves to the limited position, it will trigger a low-level signal, and the LED corresponding to each limit will light up; when the axis moves far from the limited position, it will trigger the high-level signal and the limit indicator will go out. On the contrary, if the axis moves near to the limit, it will trigger the high level; if it moves far from the limit, it will trigger the low level and the limit polarity is plus.

#### 4.4 X/Y/Z/U Moving Axes Driver Interfaces (X、Y、Z、U 6pin 3.81mm)

The four moving axes have the same interfaces. X-axis interface is taken for example.

Pins	Definitions
1	5V GND (Output)
2	XDIR+ 1. If the motor driver uses the pulse + direction control mode, the pin should be connected to the direction control port of motor driver; 2. If the motor driver uses the double-pulse control mode, the pin should be connected to the opposite pulse input port.
3	XDIR-, reserved
4	XPWM-, reserved
5	XPWM+ 1. If the motor driver uses the pulse + direction control mode, the pin should be connected to the pulse input port of motor driver; 2. If the motor driver uses the double-pulse control mode, the pin should be connected to the positive pulse input port.
6	5V VCC (Output)

If the power system of the mainboard resets and either of X/Y axes moves reversely, it means the directional signal of this axis is not right in polarity. In such a case this axis should be disconnected from the motor driver (otherwise the mainboard can't detect the limit so as to cause the collision of this axis) first, and then such a polarity be corrected on PC after D16 on the mainboard flickers (it means resetting is completed, because D16 will go out when the machine resets each time, and it can start flickering only after resetting. Please don't read any parameters on PC before D16 doesn't flicker). The resetting of the mainboard can be done through pressing the RESET button, the directional signal polarity of this axis having been corrected on PC.

#### 4.5 Man-machine Operating Panel Interface P1

P1 is DB9 mother socket connected to the man-machine operating panel. Both are communicated with RS232.

#### 4.6 General Purpose Input/Output (GPIO) (5pin 3.81mm)

Pins	Definitions
1	5V GND (Output)
2	GPI 2 is inputted from the protection notch. Where the machine needs protection in the specific state, the protection signal should be inputted from this pin that can be enabled and disabled. This pin being disabled, this signal will not be inquired by the mainboard; this pin being enabled, the machine will be protected when the input is at a high level, all operations be suspended and the laser closed.
3	GPI 1 is temporarily reserved for future use.
4	GPO 1, Output high level when work start and output low level when work pause or finish. This port can autocontrol some equipment such as blower, which can be opened when work start and closed when work pause or finish.
5	5V VCC (Output)

#### 4.7 Laser Power Supply Interface (6pin 3.81mm)

##### Digital Laser Power Supply Interface L-P1

Pins	Definitions
1	Laser power supply 5V GND (Output)
2	LSWITCH-, Laser Enable Control Interface 1. The laser being a RF laser, this pin will not be used; 2. The laser being a glass tube, this pin will be connected to the laser power supply enable and used in ON/OFF of laser control if this laser power supply device emits light at low level.
3	LSWITCH+, Laser Enable Control Interface 1. The laser being a RF laser, this pin will not be used; 2. The laser being a glass tube, this pin will be connected to the laser power supply enable and used in ON/OFF of laser control if this laser power supply device emits light at high level.
4	LPWM+, Laser/Tube Power Control Interface 1. The laser being a RF laser, this pin will not be used; 2. The laser being a glass tube and the laser power supply PWM effective at high level, this pin will be connected to the laser power supply PWM and used in control of laser power.
5	LPWM-, Laser/Tube Power Control Interface 1. The laser being a RF laser, this pin will be used in control of laser ON/OFF and power; 2. The laser being a glass tube and the laser power supply PWM effective at low level, this pin will be connected to the laser power supply PWM and used in control of laser power.
6	Laser Power Supply 5V VCC (Output)

##### Simulated Laser Power Interface L-P2

Pins	Definitions
1	Laser Power Supply 5V GND (Output)
2	Simulated Voltage 1 is connected to the power control of simulated laser power supply.
3	Simulated Voltage 2 is connected to the power control of simulated laser power supply. It can at most be connected to two ways of simulated laser power supply to control two laser tubes. The power of such two laser tubes can be matched through adjustment of potentiometer VR1 and VR2.
4	The water-protecting state input has its corresponding indicator D15. Where the system configuration is the RF laser (select the digital control or digital control + pre-ignition in the options of laser type in PC software), the mainboard will not check the water protecting input. When the system configuration is the glass tube (select the analogue control in the options of laser type in PC software), the mainboard will always detect the water protecting input. If this input is of low level, it should be deemed as normal (D15 lights up); if it is of high level (D15 goes out), the mainboard will close the laser forcibly. In such a case, when the configuration is the glass tube, please connect it to the water protecting input correctly.
5	Laser Power Supply 5V VCC (Output)
6	1K resistor is pulled up to the laser power supply 5V VCC. (Output)

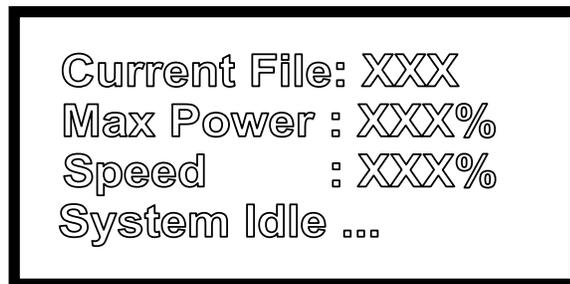
The supporting PC software of this system supports laser. Where the glass tube is provided, please select the "Analogue" in the options of laser type; where the RF tube is provided or there is pre-ignition, please select the "Digital Quantity/Pre-ignition". Altering the options of laser type, please reset the mainboard to make the alteration function after resetting.

## 5. Operating Instructions of Man-machine Interface

On the man-machine operating panel there are 16 buttons, among which the function of each is described as shown on the button.

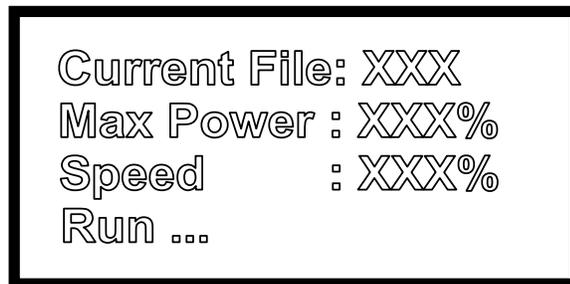
### 5.1 Main Interface

Main Interface 1 (idle)



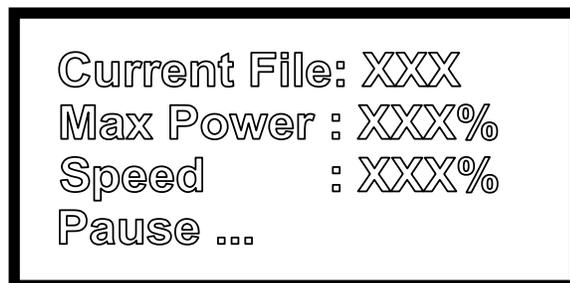
Current File: XXX  
Max Power : XXX%  
Speed : XXX%  
System Idle ...

Main Interface 2 (run)



Current File: XXX  
Max Power : XXX%  
Speed : XXX%  
Run ...

Main Interface 3 (pause)



Current File: XXX  
Max Power : XXX%  
Speed : XXX%  
Pause ...

Main Interface 1 displays when the system idles. The current file shows the memory file selected by the operator currently as well as its number. If it shows 000, it means that the memory file is not selected; the max power and the engraving speed are separately the maximum power and the engraving speed currently set on the keyboard, which are expressed in the percentage of ultimate value to the accuracy of 1%. Below Main Interface 1, any button on the keyboard can be pressed.

### 5.2 Buttons

(1) RESET button

In any interfaces (including each main interface and auxiliary interfaces), press this button and the mainboard will reset and the machine will look for the origin.

(2) LASER button

In the interface of system idle and pause, press this button and the laser will emit light when it shoots in situ, of which the time is the time when the LASER button is pressed, that is to say, the laser emits light as soon as the button is pressed; it will stop as soon as the button is not pressed. Pressing the LASER button, you can at the same time press the lower arrow button to start manual cutting. The laser power from shooting in situ is the maximum power set on the keyboard. It results in nothing to press this button in other interfaces.

(3) SETTINGS button (Speed, MinPower, MaxPower)

There are such three buttons for parameter setting as: minpower, maxpower and speed, as long as which are pressed in the interface of system idle, parameters can be changed. When PC software generates the cutting/engraving data file, the corresponding parameters will be those set on the keyboard if one or all parameters are set at zero.

For example, in speed setting, press the SPEED button in the interface of system idle and the following content will make an appearance:



At this time press the arrow buttons to change the percentage. If you press the up and down buttons, the percentage will change at the unit of 1%; if you press the right and left buttons, it will change at the unit of 10%. After change, press the ENTER button to make the parameters function and the interface return to the system-idling one. To cancel this change, press the ESC button to return. The change of the maximum and minimum power is the same as above.

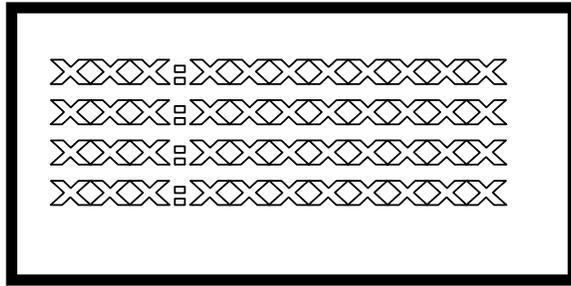
(4) FILE button

In the system idle interface, press the FILE button and the interface will show as follows:



Move the cursor to an item by pressing the arrow buttons first, and then press the ENTER button to access the memory file or U-disk file. Where there are no files in the accessed object, the interface will

not show any files, otherwise it will show all names and numbers of objective files in the form of four files per page:



At this time press the arrow buttons (move the cursor up and down by pressing the up and down buttons and turn the page by pressing the right and left buttons) to select a certain file, and then press the ENTER button to enter the next interface. As for the memory file, it supports such three options as “Copy to U-disk”, “Process” and “Del”. Select “Copy to U-disk” and the memory file at this number will be copied to U-disk. If it fails, the interface will show the wrong information; if it succeeds, the interface will return to the previous one after the machine rings. Selecting “Process” and pressing the ENTER button, you can directly start the processing of this file. At this time the interface shows Main Interface 2 (the run interface). When you select the “DEL” and press the ENTER button, this file will be deleted from the memory. As for the U-disk file, it supports “Copy to U-disk” and “Del” and operate the similar memory files. In the above operations, where the interface shows the wrong information, press the ENTER button or ESC button to have the interface return to the previous one.

This mainboard supports FAT32 and FAT16 file formats in the U-disk, but they can be identified only when they are placed in the root directory of U-disk. The file name with more than 8 characters will automatically be cut off by the system. Except for the file name in English and digits, other name will not display. The files copied from the mainboard to U-disk are placed in the root directory of U-disk.

(5) START/PAUSE button

In three main interfaces this button can be pressed. Where the system idles, press this button to manipulate the selected files. In the run interface press this button and the work will pause. In the pause interface press this button and the paused work will continue.

(6) ORIGIN button

In the system idle interface, press this button and the mainboard will take the current position of X/Y axes of the machine as the relative origin of graph. In other interfaces, it will result in nothing to press this button.

(7) LANGUAGE button

The man-machine interface supports the display in three languages. In the system idle interface, press this button to enter the interface of selecting such three languages as: “Simplified Chinese”, “Traditional Chinese” and “English”. Press the ENTER button after selecting a language, and the interface will display the corresponding language. Prior to that the language is not changed, it will always prevail (even if the machine is restarted).

(8) ESC button and ENTER button

In each interface, press the ESC button and the ENTER button to deny or confirm this operation.

(9) Arrow buttons and Z/U button

The arrow buttons can be used to move the motion axes besides altering the parameters and moving the cursor. In such two interfaces as system idling and suspension, press the arrow buttons to move the motion axes. To move X-axis, press the right or left button; to move Y-axis, press the up or down button. In moving the time, press the down button to start motion; loosen the button to stop motion. In the motion process the speed will automatically increase or decrease until it reaches the maximum/minimum coordinates. The moving speed of the button is the percentage set with the keyboard. After the directional signal polarities of each axis in the machine are adjusted well, press the left button and the X-axis may move to the right; press the up button and the Y-axis may move downward, which means the button polarities of the axes moving reversely are not correct. In such a case you should change the button polarities of this axis in PC.

In the system idle interface, press the Z/U button to access the Z/U-axis inching interface.



In this interface, press the up/down buttons to move Z-axis and press the left/right buttons to move U-axis, at the speed as the percentage of Z/U-axis ultimate speed (the percentage is the set value in the keyboard). Z/U-axis button can also support the change of button polarities, but presently this axis can only support the manual uniform motion, so if this machine is equipped with Z/U-axis, its ultimate speed can't be set too high.