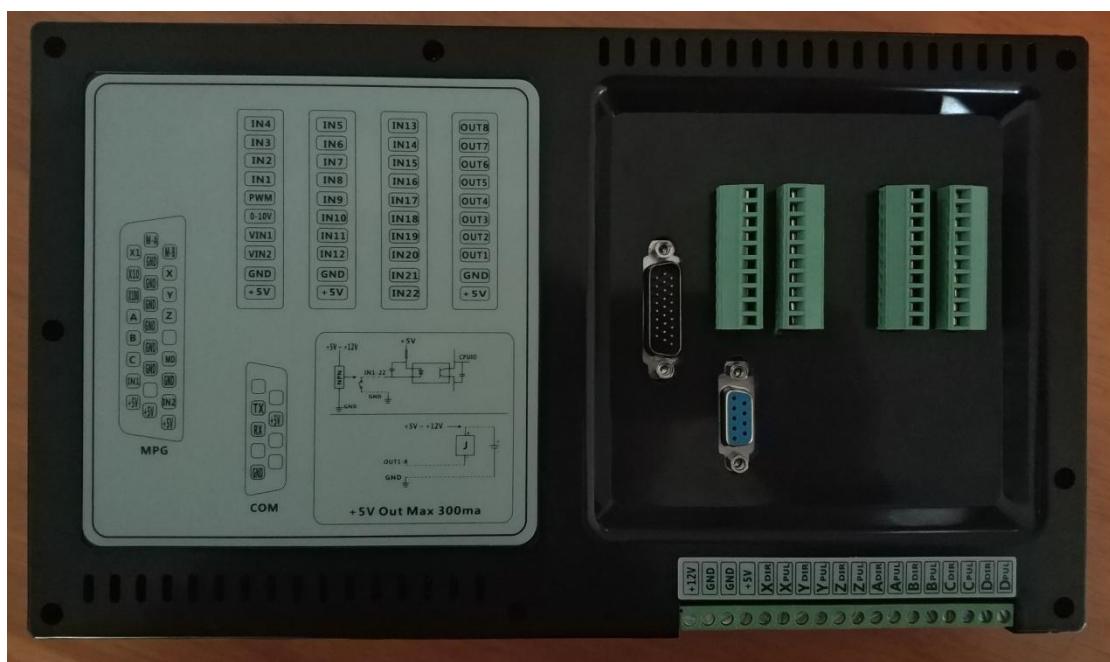
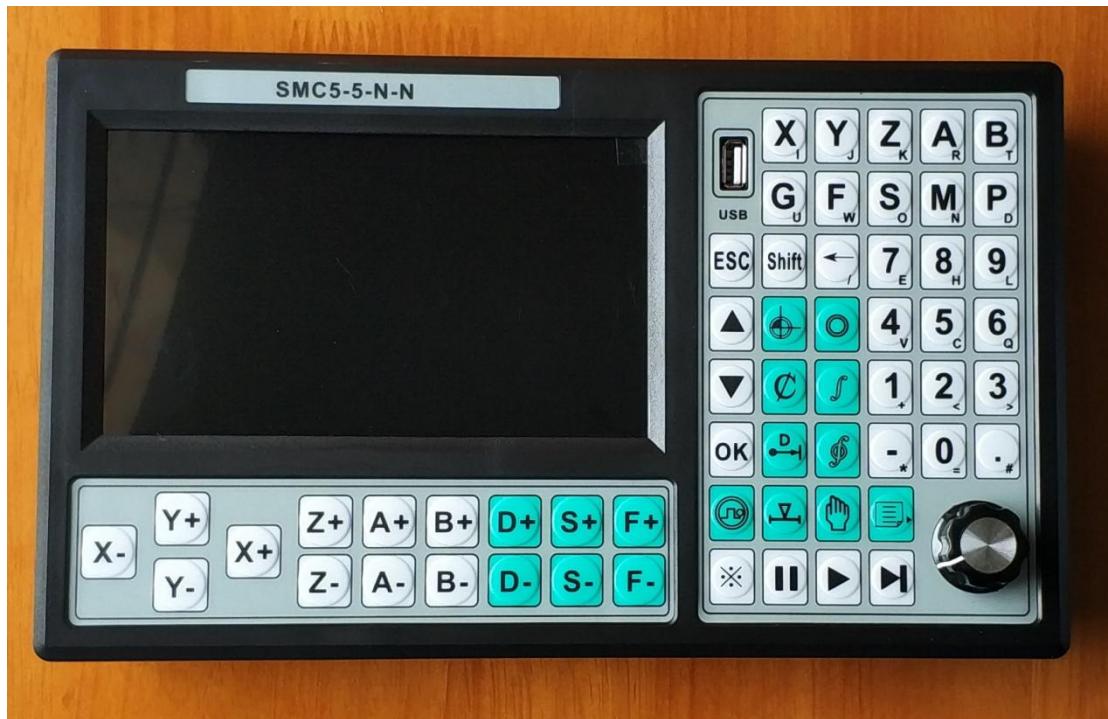


# Five-axis offline motion controller instruction manual

V3.0.1

2017\_12\_11

Appearance: (panel 297mm\*176mm) (inlay: 284mm\*164mm) (thickness 58mm)



## Supported G Commands Table 1

Instruction	Parameter	Function	Remark
G00	X. Y. Z. A.	Machine fast moving	Press the machine's maximum speed for rapid movement
G01	X. Y. Z. A. F.	Machining operation	The processing speed is limited by the given F value
G02	X. Y. Z. A. F.	Clockwise round machining	
G03	X. Y. Z. A. F.	Counterclockwise circular machining	
G04	P	Delay	Affected by P value
G17	(X, Y) coordinate plane		
G18	(X, Z) coordinate plane		
G19	(Y, Z) coordinate plane		
G28	XYZA	Back to the mechanical origin	Can be controlled individually or combined
	P1X*Y*Z*A*	Assign to current coordinates	
	P2X*Y*Z*A*	Current coordinate plus the given value	
	P3XYZA	Conditional back to mechanical origin	Only valid after power on, after calling the machine origin, calling this function is invalid
G54		Workpiece coordinates 1	Memory workpiece origin offset value of the mechanical origin
G55		Workpiece coordinates 2	Memory workpiece origin offset value of the mechanical origin

G56		Workpiece coordinates 3	Memory workpiece origin offset value of the mechanical origin
G57		Workpiece coordinates 4	Memory workpiece origin offset value of the mechanical origin
G58		Workpiece coordinates 5	Memory workpiece origin offset value of the mechanical origin
G59		Workpiece coordinates 6	Memory workpiece origin offset value of the mechanical origin
G80		Drilling instruction ends	
G81	X. Y. Z. R. F	Drilling instructions	Universal drilling
G82	X. Y. Z. R. P. F	Drilling instructions	Lower part Stay time controllable
G83	X. Y. Z. R. I. F	Drilling instructions	Drilling discharge

Supported G Commands Table 2

instruction	parameter	function	Remark
G40		Cancel tool compensation function	
G41		Left compensation knife	
G42		Compensation to the right knife	
G43		Z compensation knife	
G90		Absolute size	default
G91		Incremental size	

## Supported M instruction table

instruction	parameter	function	Remark
M00		Pause instruction	Continue until you press the start button
M03		Spindle forward	Continue until you press the start button
M04		Spindle reverse	Continue until you press the start button
M05		Spindle stop	
M07		Spray on	Continue until you press the start button
M08		Cooling on	Continue until you press the start button
M09		Also close M07M08	
M30		The total program stops	
M47		Cycle instructions	Return to the first line of operation

## — : Safety Information

Before using this control system, please read this manual carefully before performing related operations.

Carefully read this manual, the user must do the appropriate protection, take the necessary safety precautions before proceeding.

**For heavy machinery, devices that are likely to cause personal safety accidents, do not use this controller.**

The operator who performs the operation for the first time, should understand the correct use of the corresponding function before carrying out the corresponding operation. For unfamiliar functions or parameters, it is forbidden to operate or change the system parameters.

System maintenance:

When the system is abnormal, it is necessary to cut off the power of the system when it is necessary to repair the corresponding cable or socket connection. Then make the necessary inspections.

Operators who have not undergone rigorous training or units or individuals not authorized by the studio cannot open the control system for maintenance operations, alterations, repairs, etc.

Other Matters:

If there are any discrepancies or inconsistencies in the description of this manual, the functions of the system software shall prevail.

The control system function is changed or improved (upgrade) without notice. If the user has other needs, please contact the studio.

## — : Overview

The latest development of the studio "motion controller" uses high-performance 32-bit CPU and high-performance FPGA, equipped with seven-inch LCD display, user-friendly window-type man-machine interface, memory using external USB port and built-in TF card (user can Select), large storage space, working voltage 12-24 volt ultra-wide input, touch-type keyboard. The system has the characteristics of high reliability, high precision, low noise and easy operation.

The controller can be five-axis linkage, there is a multi-line section forward-looking control algorithm, which can achieve five-axis linear interpolation and five-axis multi-micro segments continuous interpolation, and there is broken line continued carving control, power down storage coordinate function. Support handwheel control interface.

Simple and clear parameters bring convenience and quickness to your operation. The input/output setting function is convenient for your use and maintenance.

The main function:

Parameter setting: Various control parameters related to processing and operation can be set to achieve the best processing results.

Manual operation: Manual, inching, program zero return, mechanical zero return, coordinate zero clear, etc.

Program management: New, delete, modify, read, save, copy and paste programs, automatic processing, continuous, pause and other functions.

External Manual: Multiple external manual functions can be defined for ease of use

External wheel controller: It can set the step length of each step, and supports both position and speed modes.

Teaching function: External input or panel control input can be defined.

Freely select input function: make the limited input port can realize various user needs

System composition:

The numerical control system is mainly composed of the following parts:

High-Performance, High-Speed 32-Bit ARM CPU, High-Performance FPGA

LCD display (resolution: 800×480)

I/O (16 optically isolated 10MA inputs, 8 optically isolated canisters flow 500MA output)

Technical indicators

The minimum standard data unit 0.001mm

The general accuracy is positive and negative 2PP

The accuracy of straight corners is one-fourth of the corner bow height under normal conditions.

(can be defined as any value to meet the demand for high precision)

Maximum data size ±99999.999mm

The highest pulse output frequency 500KHz (all five axes can be 500KHZ at the same time)

Control axis number 5 axis (X,Y,Z,A,B)

Number of linkage axes 5-axis linkage and 5-axis multi-line segment forward-looking interpolation control

Supports handwheel control input, and optional, speed mode or position mode

Intelligent software limit, predict the deceleration point in advance, and the reverse will be automatically cancelled, making the control more humane

Support U disk, built-in memory, can expand to 32G high storage capacity

### 三： Functional Description

#### Splash Screen



The upper left corner shows the current file path.

The lower right corner shows the state of the U disk insertion.

(workpiece coordinates) (machine coordinates)

The (workpiece coordinates) in the display can be changed to display the machine coordinates by pressing SHIFT on the panel under the main interface.

## Panel's direct function keys:



The panel shortcut key X Y Z A B is "direct coordinate operation"



The "run to" axis will directly run in the specified coordinates.

**“Change coordinate”** : The corresponding axis will directly change to the set number  
(this operation is irreversible, please operate with caution)

(Note: The mechanical coordinates of the point where the changing coordinates of the operating system will be redistributed)

**Panel quick key S is "spindle operation"**



The input basket can be filled with the number of revolutions. The highest value of this parameter can be set in the host settings.

**Panel quick key F is "manual feed speed operation"**



The value in the display basket is the manual feed speed of the navigation key and does not affect the highest speed of the handwheel.

The panel shortcut key  is the "coordinate clearing operation"



X axis single axis clear Y axis single axis clear Z axis single axis clear A axis single axis clear B axis single axis clear

Axis clearing and exiting (works the same as the word meaning)



Panel shortcut keys  For "origin operation"



**“Return to reference point”** The Z-axis is raised to the safe altitude, all other axes return to the specified position, and the Z-axis returns to the specified position (this point can be set at the mechanical origin).

**"Return to mechanical origin"**: Z axis retracts to mechanical origin, Y axis retracts to mechanical origin, and Y axis retracts to mechanical origin.  
(Please note the configuration pin, level and enable)

**"Return to origin"** The Z axis goes up to the safe altitude, the XY axis goes back to the origin, and the Z axis goes back to the origin.

The **"setting tool"** Z axis descends (or rises). When the probe is touched and the operation is stopped, the Z axis coordinate is the offset value of the tool offset and the Z axis raises the tool so that it rebounds back to high. This process ends.

**(Please note the configuration pin, level and enable)**



**"Manual"** recovery manual

"1mm","0.1mm","0.01mm","0.001mm": When the user presses the corresponding direction key, the corresponding length will be moved (incremental movement method).

If you want to move a specific length, you can enter the specific number in the input basket (you can only enter "OK" to enter the yellow basket and return it to become green). Press the corresponding axis direction key.

Correspond to X+X- Y+Y- Z+Z- A+A B+B-- all effective



Panel shortcut keys "Panel handwheel operation"



After calling the panel hand wheel operation, the blue basket handwheel parameter items in the screen will be displayed.

Press X,Y,Z,A,B on the panel to select the corresponding axis

Press 1, 2, and 3 on the panel corresponding to the X1, X10, X100 of the handwheel,

Rotate the advanced function keys on the panel, corresponding to the shaking of the handwheel.

Press ESC to exit.

Panel quick key G is "workpiece coordinate system operation"



When G\* is selected, the coordinate system of the seat can be selected and it needs to cooperate with the mechanical coordinates.



Fast (press on the panel) Columns shows the file:



## "machine configuration"



Click "Motor Parameters" to enter the following screen



Pulse equivalent = pulse when 1/pulse equivalent 2

(Note: Pulse equivalents 1 and 2 cannot be 0, pulse equivalent 2 is generally set to 1)

Pulse equivalent: Number of pulses per unit length, (pulse per millimeter) Support floating point

input

**Maximum speed:** The maximum speed (mm/min) that this motor can run. When the input exceeds the maximum that the system can achieve, it will be based on the maximum value the system can achieve. The ideal value is 70% of the maximum value. , after prompting the red character.

**Acceleration:** The maximum acceleration that the motor can run. Too small value of this value can seriously affect the corner speed of many micro segments.

**Pulse level:** 1 or 0, active high or active low, determined by the driver. Most drivers are 0 active.

**Direction level:** 1 or 0 active high, or active low, change this will change the direction of operation

**Pulse Width:** The effective output time of the pulse is only one value. Normally, it can take 0.

The value is as follows:  $T = 1 \text{ microsecond} * N$  (number selected)

### plan 1:

Pulse equivalent 1 = Stepper motor drive subdivision x (360/stepper motor stepping angle) / Lead screw pitch

Pulse equivalent 2=1

Example: Step angle = 1.8 Lead pitch = 5mm Subdivision = 8

Pulse equivalent 1 =  $8 * (360 / 1.8) / 5 = 320$  Pulse equivalent 2=1

### Scenario 2:

Pulse equivalent 1 = Stepper motor drive subdivision x (360/stepper motor step angle)

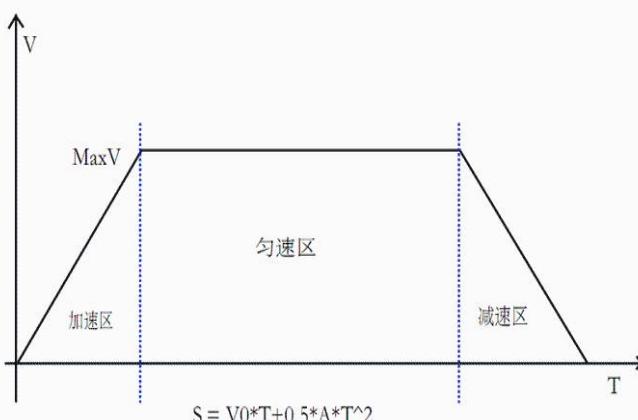
Pulse equivalent 2 = screw pitch

Example: Step angle = 1.8 Lead pitch = 5mm Subdivision = 8

Pulse equivalent 1 =  $8 * (360 / 1.8) = 1600$  Pulse equivalent 2 = 5

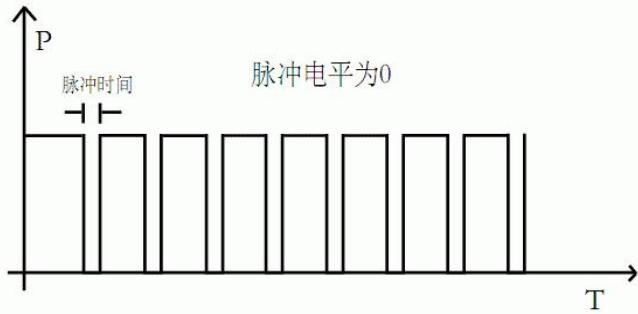
**The maximum speed value:** According to the final determination of the motor's ability to take the principle of no loss of step, take the maximum speed value of 70%, leaving 30% of the balance to the motor (stepper motor characteristics).

The T acceleration table is as follows:



The final determination of the acceleration value is based on 70% of the maximum allowable acceleration value of the motor, and the 30% mutation value is reserved for the motor to ensure that the motor will not lose step (the characteristics of the stepper motor).

Relationship between pulse level and pulse width (Note: The actual width is the given width plus the system default)



### Direction level:

When the direction level is 1 when the axis is running, the output is high and the reverse operation is low  
 When the direction level is 0 when the axis is running, the output is low and the anti-operation is high

### Limit input:



The limit input is generally based on the maximum value of the stroke of the machine table. Once touched, it will cause an emergency stop and no deceleration. Protection does not exceed the mechanical stroke type.

### Software limit:



Software limit, generally select the mechanical origin mode, it will decelerate according to the mechanical origin as a reference

Clearing the machine origin (without the mechanical origin switch) can be assigned to the zero machine origin. Press SHIFT to view

If the manual or handwheel overtravel, the coordinates will show a red reminder overtravel. The current axis is reversed to retract.

If over-range during G code processing, it will prompt and exit.

(Reminder: Do not install mechanical origin switch, you should always pay attention to the virtual machine origin coordinate position)

## Mechanical origin:



The mechanical origin switch is recommended to be installed in the longest stroke position of the

machine, and the selected direction can correspond to the position

**Exceeding:** When the machine runs at the deceleration stop after reaching the machine's home switch, it will return by one pulse length each time. If the machine exceeds the set limit, the machine will not exit the mechanical travel switch, and then it will exit the alarm prompt.



**G2/G3 Tolerance:** Refers to manual calculation or other calculations. G02/G03 is input because of calculation accuracy. The arc center is inconsistent with the given value. At this moment, there is a fault tolerance value, and the system will use the given parameters. , recalculate the ideal center coordinates, detailed description can be seen G02/G03

**Chord length:** The arc chord length when the system fits to create a segment arc. For details, see G command code description.

**Precise stop:** Open CVL control, CVL control: Corner length limit as shown below

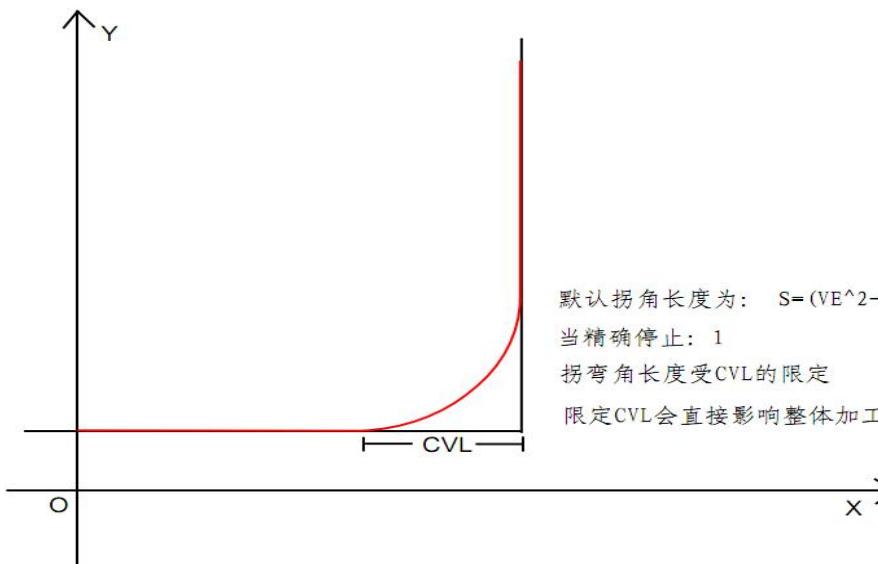
G1 resolution: refers to the minimum length of G01. This is the limitation of the algorithm. The user can use the default value: 0.0001

**Safe altitude:** refers to the pause, or back to the origin, back to the reference point, Z-axis elevation safety altitude.

**Offset to tool offset:** The Z axis after tool offset is offset by this value. This value is mainly used to adjust the height of the tool.

**Counter-blade Rebound:** After the knife is set, after the Z-axis stops, it will leave the counter setter according to this value, and it is convenient to remove the knife setter.

**Fixed point tool setting:** Valid only for the mechanical origin. The system performs tool setting according to the agreed mechanical position to facilitate the installation of the tool.



默认拐角长度为:  $S = (V_E^2 - V_S^2) / 2A$

当精确停止: 1

拐弯角长度受CVL的限定

限定CVL会直接影响整体加工速度

Z-axis

mode: In

the

restart

mode,

the

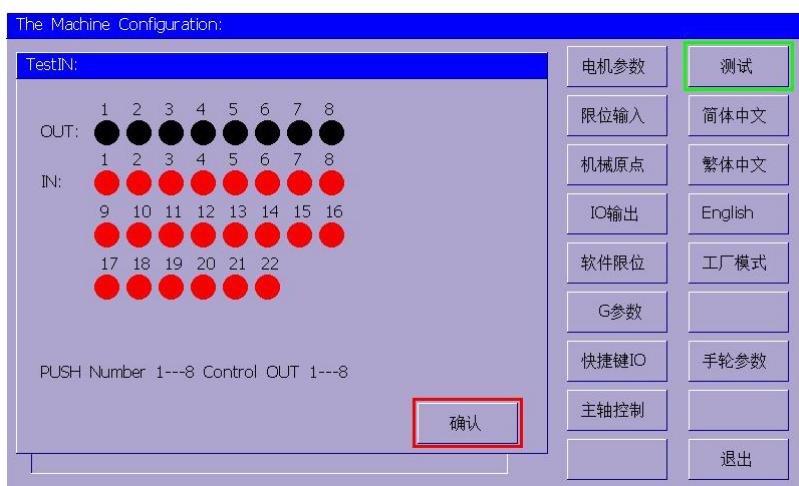
knife-lifti

ng mode

is selected. If it is selected to run to a safe altitude, then the knife will be moved.

(Details and practicality are still being repaired.)

## Test:



Press 1-8 on the panel to control the output port number 1-8. Check if the input is normal.

## Fast IO input:



**Motor emergency stop:** It is the auxiliary emergency stop input, mainly the emergency stop caused by the error of the external motor.

(Note: This pin is not the same as the main emergency stop, this pin is self-irreversible control, such as the external touch emergency stop, must first withdraw the introduction factor, and then the main emergency stop reset, safety is guaranteed)

## Spindle control:



M03, M04, M05

M03 runs clockwise: At this time, the corresponding pin of M04 is turned off and the corresponding pin of M03 is turned on

M04 runs counterclockwise: At this time, the corresponding pin of M03 is turned off and the corresponding pin of M04 is turned on.

M05 will also turn off M03, M04's foot

M07,M08,M09

M07: Turning on the corresponding pin does not affect M08

M08: Turning on the corresponding pin does not affect M07

M09: M07 and M08 will be turned off at the same time

Delay: Open the time for M03, M04, M07, M08.

The PWM pin is fixed at 16 feet.

PWM frequency: refers to the frequency of the output

**Max S: means that the maximum S corresponds to the maximum frequency**

**Duty Cycle = S (Value given by G command)/(MAX S)**

**Analog ratio: scaling control of the ADC output, the ratio of the main finger**

**0-10V.**

**Handwheel parameters:**



1st file: the length of each step of x1 corresponding to handwheel, generally 0.01mm

10th gear: The length of x10 corresponding to the handwheel is generally 0.1mm

100 files: The length of x100 corresponding to the handwheel is generally 1mm

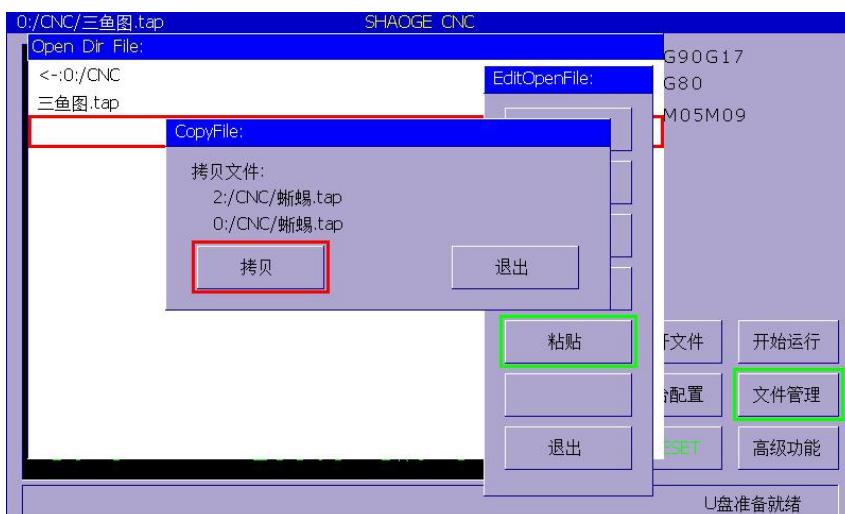
Speed mode: When it is 1, when the handwheel rotates too fast and the motor speed reaches the limit, it will cut the given value of the handwheel. At 0, the motor is in position mode, how much the handwheel is given, how much the motor must run, and if the hand is too fast it will cause the length to accumulate and the motor is still running after the hand is stopped (if not necessary, this mode is not recommended).

## File Management:



You can edit the file.

New, delete, copy, paste



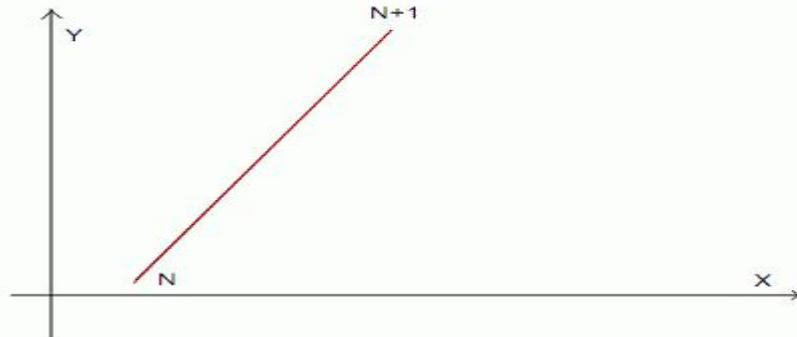


## G command interpretation

### G00:

Format: G0X..Y..Z...A

The axis moves quickly and G0 is used to quickly position the tool without machining the workpiece. The rapid movement can be performed simultaneously on several axes, resulting in a linear trajectory (point to point) as shown. In the machine data, the maximum value of the rapid traverse speed of each coordinate axis is defined, and a coordinate axis is quickly moved at this speed. If the rapid movement is performed on two axes at the same time, the moving speed is the vector velocity of the two axes. The feedrate programmed at address F is invalid when it is moved rapidly with G0. It will run according to the maximum synthetic vector speed of each axis of the system.



走四方案例:

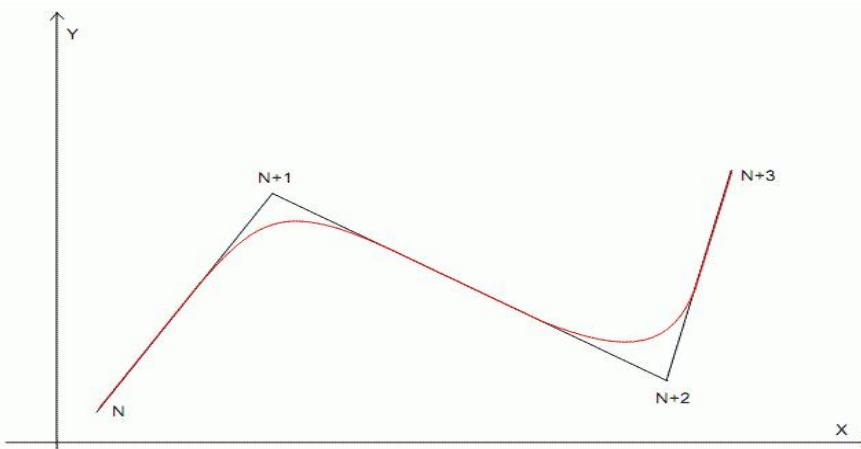
```
G0X0Y0Z0
G0X10
G0Y10
G0X0
G0Y0
```

## G01:

Format G1X..Y..Z..A..F..

The tool moves in a straight line from the starting point to the target point and runs at the programmed feedrate at F. All axes can run simultaneously. G1 remains valid until it is replaced by other instructions.

The controller supports multi-micro multi-line segment prospective control interpolation algorithm, that is, more than one line segment will calculate the trajectory by continuous interpolation algorithm to achieve a smooth and smooth over, and will improve the running speed in the forward-looking method as much as possible.



The red trajectory is the actual running trajectory, F is the processing speed.

In the G parameter, precise stop and CVL can define the corner length. Particularly suitable for milling milling corners. You can also define this line on the software that generates the G command.

画四方案例:

G0X0Y0Z0

X10F1200

Y10

X0

Y0

## G02 G03:

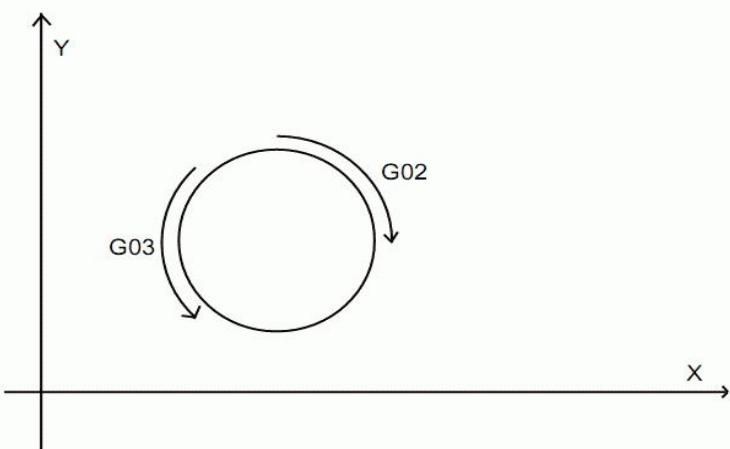
Format: (1) G02X..Y..Z..R..F.. (radius method)

(2) G02X..Y..Z..I..J..K..F (Center Method)

Format: (1) G03X..Y..Z..R..F.. (radius method)

(2) G03X..Y..Z..I..J..K..F (Center Method)

G02 smooth, G03 reverse



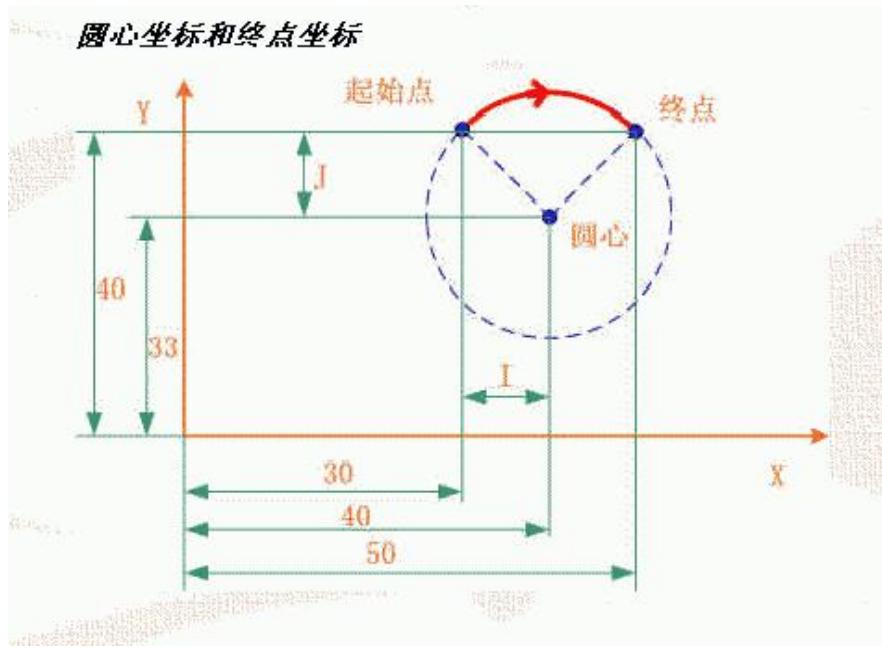
G17 (X, Y) coordinate plane (default plane)

G18 (X, Z) coordinate plane

G19 (Y, Z) coordinate plane

## 圆心法:

G02(G03)X..Y..Z..I..J..K..F..



negative directions of the XYZ axis

X, Y, Z indicate the end point coordinates, F processing speed

I represents the projection of the distance from the starting point of the arc to the center of the circle on the X axis.

J represents the projection of the distance from the starting point of the arc to the center of the circle on the Y axis.

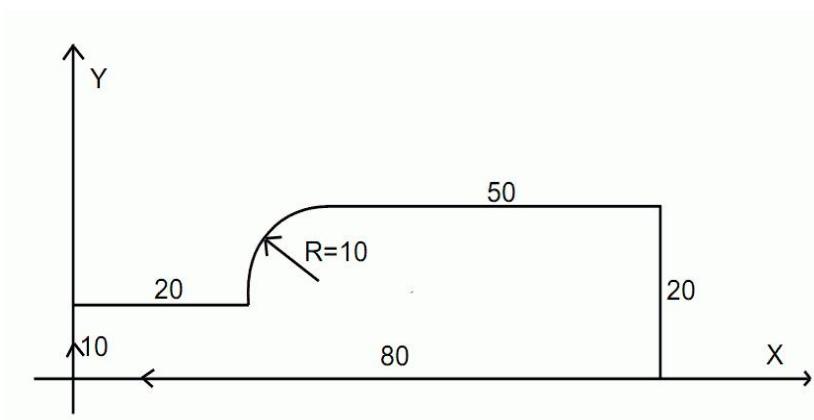
K represents the projection of the distance from the starting point of the arc to the center of the circle on the Z axis.

The directions of I, J, and K correspond to the positive and

Validity of parameters (in XY plane):

The circle center method can directly find the radius  $R = \sqrt{i^2 + j^2}$ . If the length of the starting point and the end point of the line is greater than  $2R$ , then it is impossible to form an arc error on the geometry. When the above conditions are satisfied, the system will recalculate. The most reasonable circle center coordinates, when there is a certain deviation from the actually given circle center coordinates, is called super-difference. If this deviation value is greater than the system-given super-difference, an error is indicated. In the system, this error can be set. The value of the value, convenient and faster input parameters.

(Note: The difference between the center of the circle that can be actually constructed and the center of the input is called the super-difference, the maximum value of this over-reach can be set, and the input limit of the parameter can be tolerated wider.)

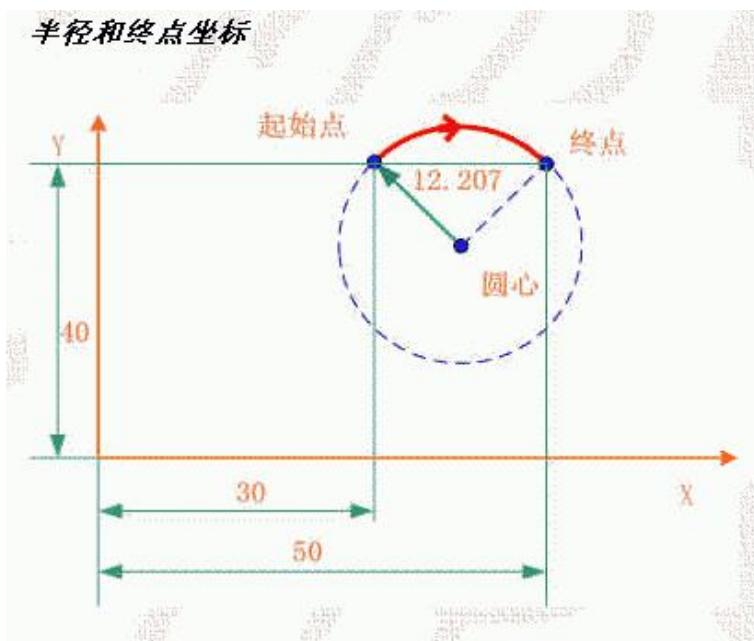


案例:

GOX0Y0Z0  
 G1Z-1F1200  
 Y10  
 X20  
 G02X30Y20I10J0  
 G1X80  
 Y0  
 X0  
 GOX0Y0Z5

**Radius method:**

**G02(G03)X..Y..Z..R..F..**

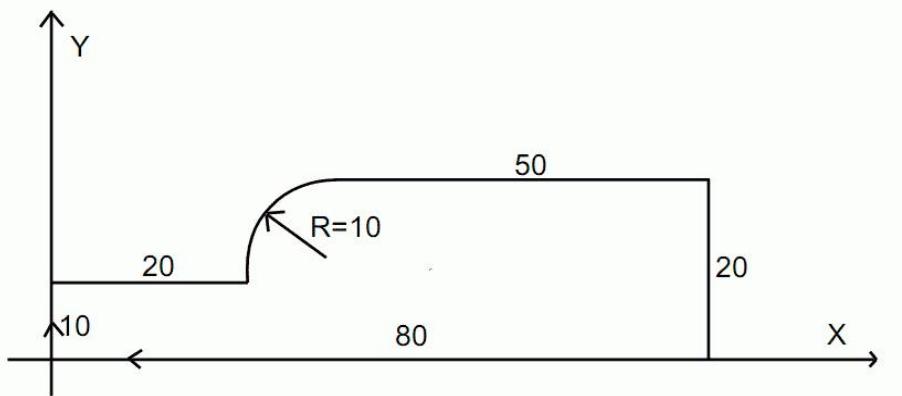


X, Y, Z indicate the end point coordinates, F processing speed  
 R is the arc radius  
 F processing speed  
 In the case of knowing the starting point and ending point of the arc, using radius programming, the geometry drawing will present two arcs, a large arc and a small arc. In order not to cause ambiguity, it is specified that  $R > 0$  is a small circle. Arc,  $R < 0$  is a large arc  
 For the whole circle, since the end point coincides with the starting point, with R programming, there will be

numerous solutions, and the center of the circle cannot be defined. Therefore, the method of

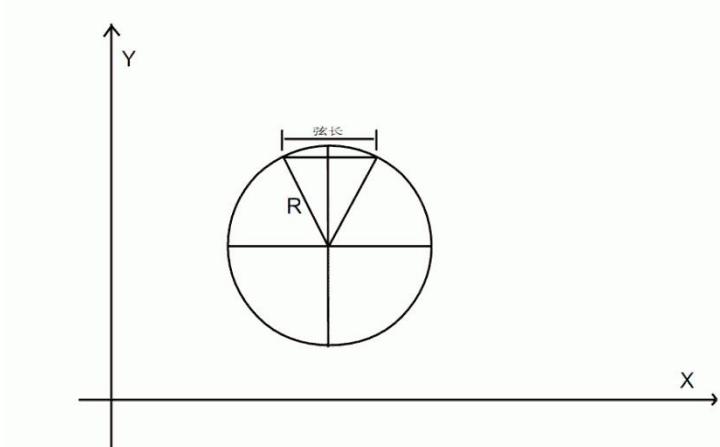
circle center coordinates can only be used.

案例:



GOX0Y0Z0  
G1Z-1F1200  
Y10  
X20  
G02X30Y20R10  
G1X80  
Y0  
X0  
GOX0Y0Z5

Chord length:



Given G02, G03 system will calculate the parameter combination and then decompose the arc into a multi-micro line segment. The forming scale of this multi-micro line segment is the chord length. This length can be set in the system. The reference value is (0.1 Mm-5mm)

Note: Because the system has a forward-looking multi-micro segment interpolation algorithm, the length of this

chord is not too short. When it is necessary to take a short time, the processing speed must be reduced!

G17 (X, Y) coordinate plane (default plane)

**G18 (X, Z) coordinate plane**

**G19 (Y, Z) coordinate plane**

**G04 (pause, delay)**

**格式: G04P..**

By inserting a G4 block between two blocks, you can pause for a given time during machining

The P suffix is milliseconds and the minimum is 500ms+P\*

Case: (1 second delay)

G0X0Y0

G1Z-1F1200

G1X20Y20

G04P1000

G1X40Y40

G0Z5

G0X0Y0

**G90 (default): Absolute size G91: Incremental size**

The G90 and G91 commands correspond to this absolute position data input and incremental position data input, respectively. G90 represents the coordinate size of the target point in the coordinate system, and G91 represents the amount of displacement to be performed. G90/G91 applies to all axes. These two instructions do not determine the trajectory to the end position. The trajectory is determined by other G function instructions in the G function group (G0, G1 G2, G3...). G90 applies to all axes after the program starts and remains active until G91 appears in the following block

**Specific G commands:**

**G54 G55 G56 G57 G58 G59 (workpiece coordinate system)**

**格式: G54 G55 G56 G57 G58 G59**

Can choose 6 different working coordinates

It is based on the mechanical origin to calculate the coordinate offset of the workpiece

Conditions of Use:

1 Equipment origin

2 The machine returns to the mechanical origin once (can be called back to the

mechanical origin with G28P3)

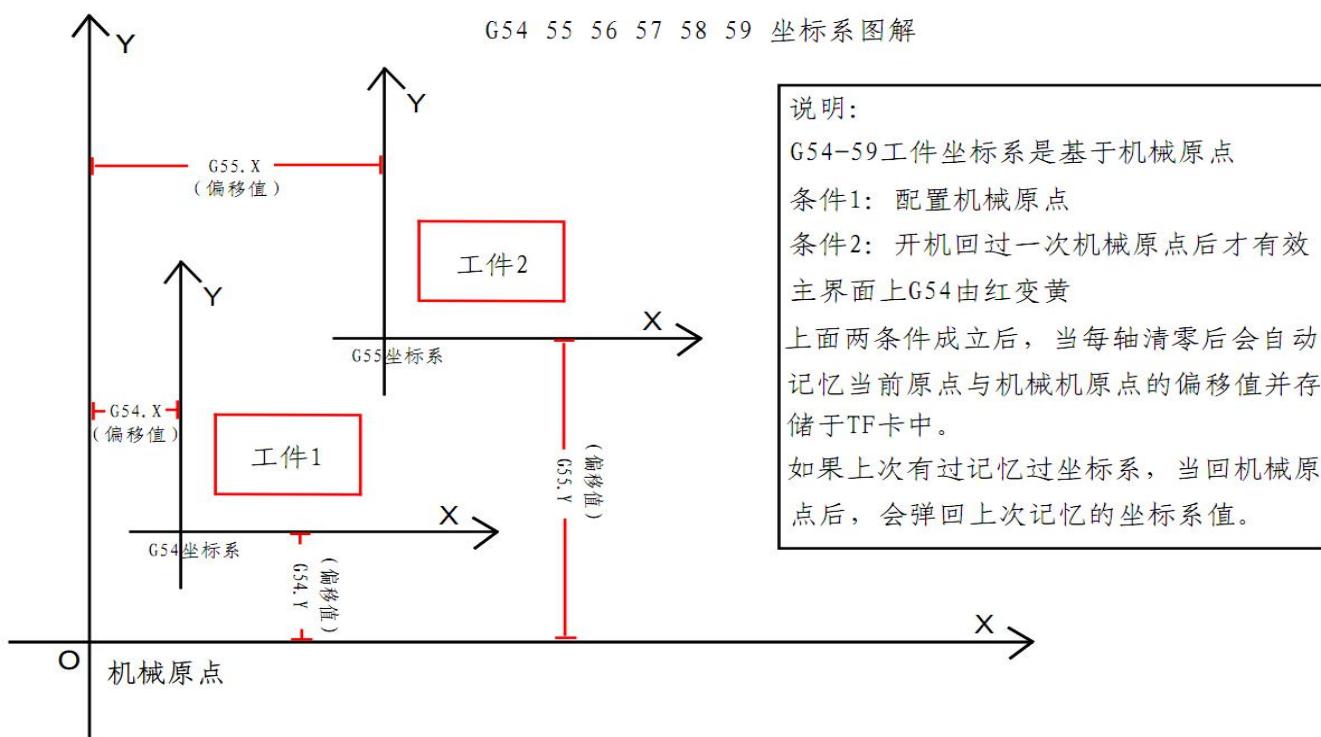
G54 turns yellow from red on the main screen

After the above two conditions are established, each axis will be automatically cleared

Memorize the offset between the current origin and the machine origin and store it.

If you have memorized the coordinate system last time, when you return to the mechanical origin, it will bounce back to the previous memorized coordinate system value.

## G54~ 59 图解



## G28: (Coordinates and Mechanical Origin Operation)

Format (four modes): G28XYZA

G28 P1X\*Y\*Z\*A\*

G28 P2X\*Y\*Z\*A\*

G28 P3XYZA

**G28XYZA**

will automatically return to the mechanical origin after executing this command. X, Y, Z, and A can be written separately.

- 1: G28X (return to X machine origin)
- 2: G28XY (represents the XY mechanical origin)
- 3: G28Z

G28Y (After the two combination commands are present, it means that the Z machine origin will be executed first and then the Y machine origin will be returned)

## G28P1X\*Y\*Z\*A\*

After executing this command, the corresponding values of X, Y, Z, and A axes will be assigned to the current coordinates.

**Case:**

For example, the current coordinates: X100 Y100 Z50 A0

When the code executes G28P1X200Y500Z10A20, the current coordinate value becomes:

X:200  
Y:500  
Z:10  
A:20

## G28P2X\*Y\*Z\*A\*

After executing this command, the corresponding values of the X, Y, Z, and A axes will be added to the current axis value. If \* is given to a negative number, subtraction will be performed.

**Case:**

For example, current coordinates: X200 Y300 Z400 A500

When the code executes G28P2X-20Y-500Z60A520, the current coordinate value will become:

X: 180  
Y: -200  
Z: 460  
A: 1020

## G28P3XYZA

This command is only valid when the machine is turned on and it is not returned to the mechanical origin manually. It means G54 will be valid only when it is displayed in red.

Executing this command will not work if you perform a mechanical origin return.

**Case: (The machine did not return to the mechanical origin)**

- 1: G28P3X  
The X axis automatically returns to the mechanical origin.
- 2: G28P3Y  
The Y axis automatically returns to the mechanical origin.

3: Can combine N G28P3XYZA

**(The boot has returned to the mechanical origin)**

1: G28P3X

invalid

2: G28P3Y

invalid

**(Note: This command is mainly used to have a working coordinate system, and establishes the relationship between the origin of the machine and the workpiece from the target system. After the power is turned off, it is restarted to prevent errors due to no return to the mechanical origin.)**

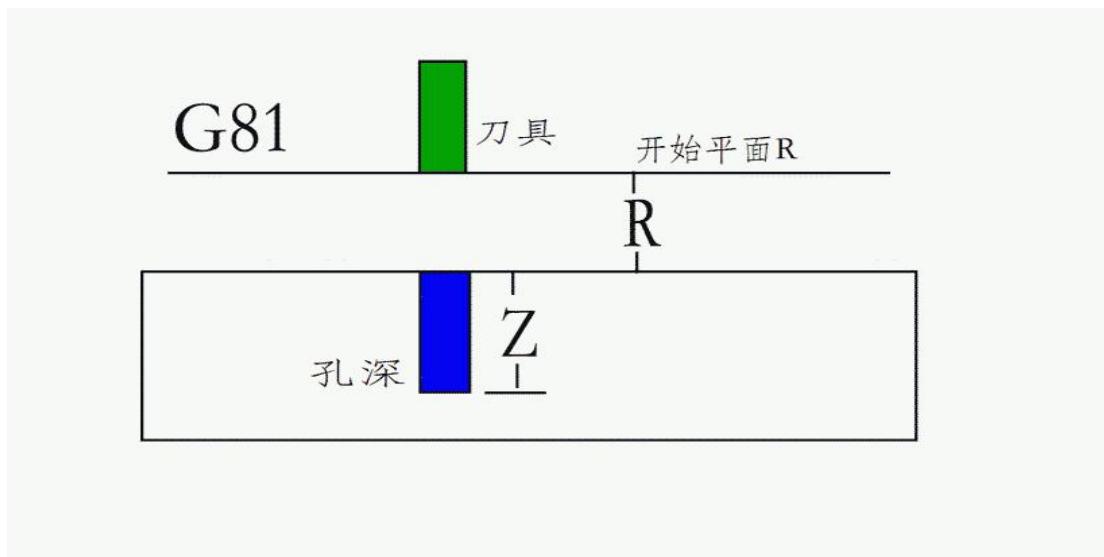
## G81: (drilling instructions)

Format: G81X..Y..Z..R..F..

X, Y indicate the end point coordinates, Z indicates the depth of processing

F processing speed,

R represents the start of the start plane (safety altitude) and indicates the end of the Z after the return



Case: (Drill four holes with depth 5 in coordinates (20,0), (20,20), (0,20), (0,0), safety plane is 2, speed is 200)

G0X0Y0Z5

G81X20Y0R2Z-5F200

G81X20Y20R2Z-5F200

G81X0Y20R2Z-5F200

G81X0Y0R2Z-5F200

G0X0Y0Z5

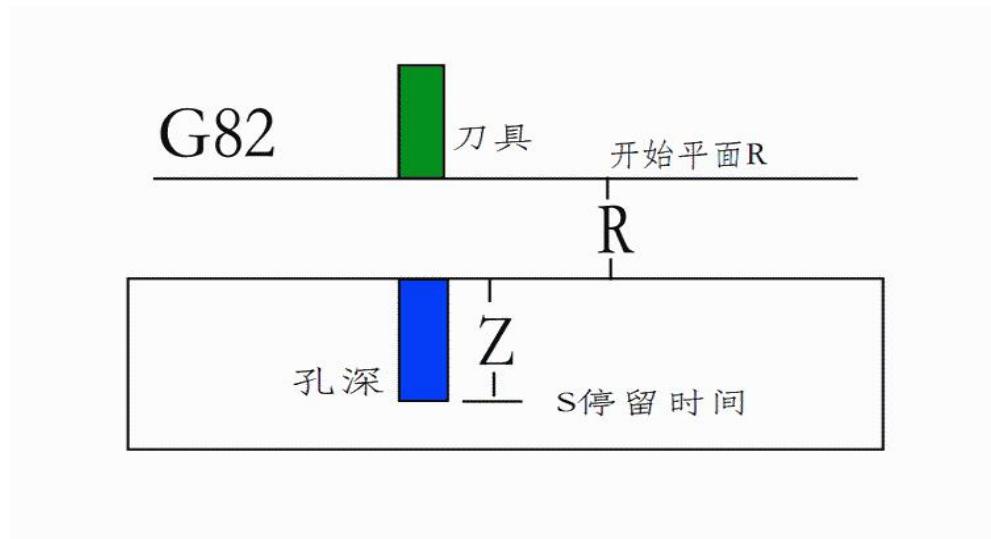
## G82: (drilling instructions)

Format: G82X..Y..Z..R..P..F..

X and Y indicate the coordinates of the end point, Z indicates the depth at the time of machining, and S indicates the dwell time at the bottom of the hole (in milliseconds).

F processing speed,

R indicates the start of the start plane and indicates the end of the Z after the return



Case: (Drill four holes of depth 5 in coordinates (20,0), (20,20), (0,20), (0,0)),

the safety plane is 2, and stay at the bottom of the hole for 1 second,

G0X0Y0Z5

G82X20Y0R2Z-5P1000F200

G82X20Y20R2Z-5 P1000F200

G82X0Y20R2Z-5 P1000F200

G82X0Y0R2Z-5P1000F200

G0X0Y0Z5

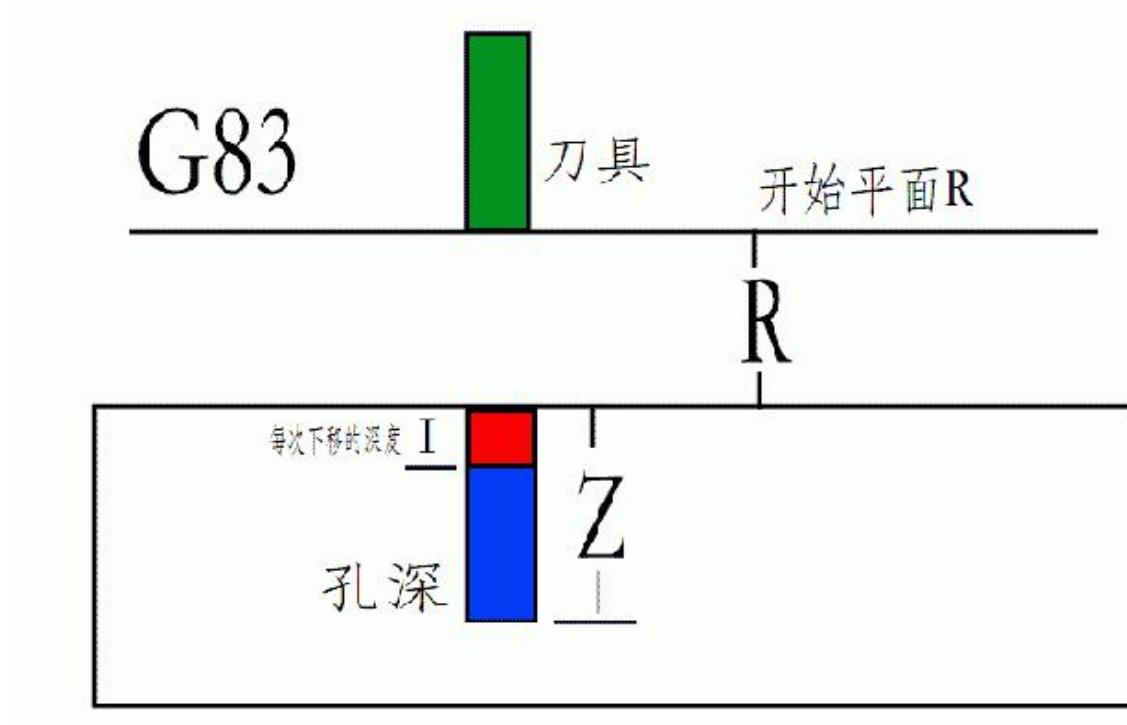
## G83: (Fixed Cycle Drilling Instruction)

Format: G83X..Y..Z..R..I..F..

X and Y indicate the coordinates of the end point, Z indicates the depth at the time of machining, I indicates the amount of displacement at each fall, and a back-off action is performed when the depth is processed to I.

F processing speed,

R indicates the start of the start plane and indicates the end of the Z after the return:



Case: (Drill four holes of depth 5 in coordinates (20,0), (20,20), (0,20), (0,0)),  
the safety plane is 2, and the depth of each drop I is 1, With a retracting action, the  
speed is 200)

G0X0Y0Z5

G83X20Y0R2Z-5I1F200

G83X20Y20R2Z-5 I1F200

G83X0Y20R2Z-5 I1F200

G83X0Y0R2Z-5 I1F200

G0X0Y0Z5

## M instruction:

M00: The instruction is paused and "PAUSE" is displayed on the screen until the start button is pressed to continue.

M03: Turn off the reversal signal first, and then turn the spindle forward. When it is turned on, it will be affected by the delay parameter.

M04: Turn off the forward signal first, and then reverse the spindle. When it is turned on, it will be affected by the delay parameter.

M05: The spindle stops until it turns off M03, M04.

M07: Spray is on and will be affected by the delay parameter when it is turned on

M08: Cooling on, will be affected by the delay parameter when it is turned on

M09: Close M07, M08 at the same time;

M30: The machining is finished and will not be called afterwards. Exit directly.

M47: Return to the first line, the ring is not processed. Do not exit until you press Stop or Pause emergency stop.

## Specific M instructions:

This controller uses some special M commands to do some advanced control  
M47 returns to the first line to start over, and you can add loops at the end of the program.

### Output control M instructions (M1\*\*, M2\*\*)

M101 corresponds to OUT\_1 output high level (dummy high, convenient for different voltage pull-up resistors)

M102 outputs high level corresponding to OUT\_2 (dummy high, it is convenient for different voltages to be connected with pull-up resistor)

M103 corresponds to OUT\_3 output high (dummy high, it is convenient for different voltages to be connected with pull-up resistor)

M104 corresponding to OUT\_4 output high (dummy high, convenient for different voltage pull-up resistor)

M105 corresponds to OUT\_5 output high level (dummy high, it is convenient for different voltages to be connected with pull-up resistor)

M106 corresponds to OUT\_6 output high level (dummy high, convenient for different voltage pull-up resistors)

M107 corresponds to OUT\_7 output high level (dummy high, convenient for different voltage pull-up resistors)

M108 corresponds to OUT\_8 output high (dummy high, it is convenient for different voltages to be connected with pull-up resistor)

M201 corresponds to OUT\_1 output low level (perfusion 500ma to ground)

M202 outputs low level for OUT\_2 (perfuse 500mA to ground)

M203 corresponds to OUT\_3 output low (perfusion 500ma to ground)

M204 corresponds to OUT\_4 output low (perfuse 500mA to ground)

M205 corresponds to OUT\_5 output low (perfusion 500ma to ground)  
M206 corresponds to OUT\_6 output low (perfusion 500ma to ground)  
M207 corresponds to OUT\_7 output low (perfusion 500ma to ground)  
M208 corresponds to OUT\_8 output low (perfusion 500ma to ground)

## Input judgment M command (M3\*\*, M4\*\*)

M301 Corresponding input INTPU\_1 determines that it is a low level to execute the next line, and the other side waits

M302 corresponding to the input INTPU\_2 determines that it is a low level to execute the next line, and the No side waits

M303 corresponds to the input INTPU\_3 determine the low level to perform the next line, no side has been waiting

M304 corresponding to the input INTPU\_4 to determine the low level to execute the next line, no side has been waiting

M305 corresponding to the input INTPU\_5 to determine the low level to perform the next line, no side has been waiting

M306 corresponding to the input INTPU\_6 to determine the low level to execute the next line, no side has been waiting

M307 corresponding to the input INTPU\_7 to determine the low level to perform the next line, no side has been waiting

M308 corresponding to the input INTPU\_8 to determine the low level to perform the next line, no side has been waiting

M401 corresponding to the input INTPU\_1 determine the high level to execute the next line, no side has been waiting

M402 corresponds to the input terminal INTPU\_2 judging that it is a high level to execute the next line, and the other side waits

M403 corresponding to the input terminal INTPU\_3 determines that it is a high level to execute the next line, and the other side waits

M404 corresponding to the input INTPU\_4 to determine the high level to perform the next line, no side has been waiting

M405 corresponding to the input INTPU\_5 to determine the high level to execute the next line, no side has been waiting

M406 corresponds to the input INTPU\_6 to determine the high level to execute the next line, and the No side waits

M407 corresponding to the input INTPU\_7 to determine the high level to perform the next line, no side has been waiting

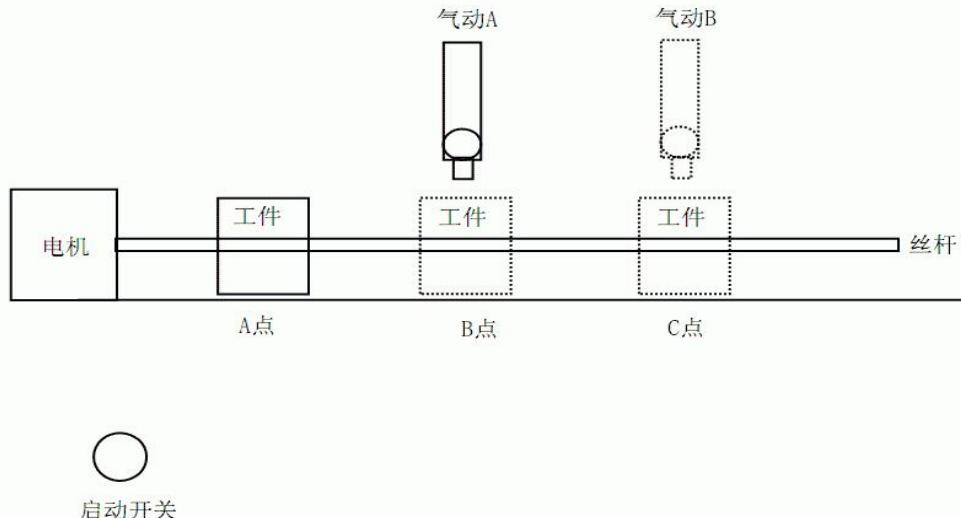
M408 corresponding to the input INTPU\_8 to determine the high level to perform the next line, no side has been waiting

Note: For M3\*\*, M4\*\* IO input, 30 millisecond anti-shake input limit!

## G, M command combination case:

1 Project goal: After the start switch is triggered, the X axis control working moving speed is 600, and after the first designated position A point, an action is output to pneumatic A, "2 seconds, then half closed and back, 1 second, and then move the work. The speed is 600 to B point, then output one move to pneumatic B, 2 seconds, then close and return, 1 second, then move the working speed to 1200 to return to point A, wait for start and close trigger.....

Pictured:



The position of point A is the origin, point B is 500 MM, point C is 1000 MM

Connect the X axis to control all the circuits, and then connect an input switch to the input port 1 as the start button, and connect the two pneumatic units A, B to the output port 1, 2, A connects 1, B connects 2

The sequence instructions are as follows:

G1X500F600 (move workpiece to 500 position)

M101 (open pneumatic A)

G4P2000 (delayed 2 seconds)

M201 (Close Pneumatic A Return)

G4P1000 (1 second delay)

G1X1000F600 (moves work to position 1000)

M102 (open pneumatic B)

G4P2000 (delayed 2 seconds)

M202 (Close Pneumatic B Return)

G4P1000 (1 second delay)

G1X0F1200 (moves work to position 0)

M301 (wait for start key trigger)

M47 (return to the first line to re-open the table Note: The last line is the last to add a carriage return)

(Enter or Empty)

The actual effect of five-axis controller processing:



