Turning center series

Use debug documentation

Guangzhou Keyuan CNC Technology Co., Ltd

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Parameter representation: bit parameters and K parameters are composed of 8 digits, BIT0—BIT7; Representation .0—.7, for example, bit parameter 1 B **IT0 bit is represented as bit parameter 1.0.**

System parameters include bit parameters, number parameters, P LC K (KEEP) parameters, P LC T (**TMR**) parameters, P **LC D (DATA) parameters, P LC C (CTR) parameters.**

statement

This manual explains as many different contents as possible, but because this manual explains as many different contents as possible, but because there are too many possibilities involved to explain all the actions that can or cannot be carried out, what is not specifically stated in this manual may be considered unusable.

warn

Before the installation connection, programming and operation of this product, it is necessary to read in detail Before the installation connection, programming and operation of this product, you must read the manual of this product and the instruction manual of the machine tool manufacturer in detail, and carry out relevant operations in strict accordance with the requirements of the manual and the manual, otherwise it may cause damage to the product and machine tools, scrap of the workpiece and even personal injury.

note

The product functions and technical indicators (such as precision, speed, etc.) described in this manual are only for the product functions and technical indicators (such as precision, speed, etc.) described in this manual only for this product, the CNC machine tool of this product is installed, the actual functional configuration and technical performance are determined by the design of the machine tool manufacturer,

and the functional configuration and technical indicators of the CNC machine tool are subject to the instruction manual of the machine tool manufacturer;

Although this system is equipped with a standard machine operation panel, the function of each button of the standard machine panel is defined by the PLC program (ladder diagram). Please note that the functions of the keys in the machine panel of this manual are described for standard PLC programs!

***The contents of this manual are subject to change without notice.**

Chapter 1 Product Introduction

1.1 System power

1> Input: L, N (AC): AC220V from the isolation transformer;

2> Output: +V:+24V -V:0V ; (two ways in total).

3> +24V and 0V in the system **I/O interface have the** same properties as +**24V** and **0V of the switching power**

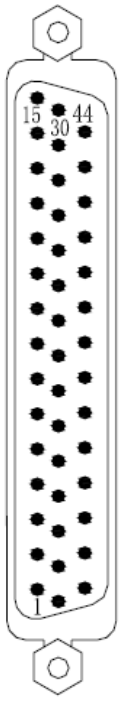
supply, and can be wired straight

+24V and 0V are brought out in the switching power supply**.**

NOTE: This power pod is for system power-up only

Chapter 2 Interface Definition and Connection

2.1 Interface CN61 input signal



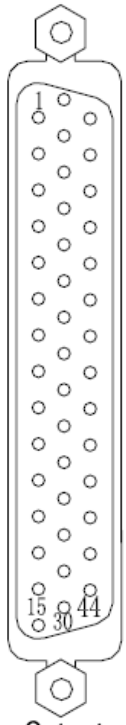
Input interface(CN61)

Note 1: Some input interfaces can define a variety of functions, which are represented by "**/**" in the table **;**

Note 2: When the input

Foot size	address	illustrate
17～20	dangling	
21～24	0V	Power port
25～28	+24V	Power port
1	X0.0	Protective door detection signal
2	X0.1	External pause signal (NC contact)
3	X0.2	Chuck control signal
4	X0.3	X-axis zero deceleration signal
5	X0.4	Tailstock control signal
6	X0.5	Emergency stop input signal
7	X0.6	4-axis zero deceleration signal/lubrication detection signal
8	X0.7	Tool position T05/external feed rate A
9	X1.0	Tool position T06/external feed rate F
10	X1.1	Tool position T07/external feed rate B
11	X1.2	Tool position T08/external feed rate E
12	X1.3	Z-axis zero deceleration signal
13	X1.4	External cycle start (normally open contact).
14	X1.5	Spindle 1 gear in place / chuck clamped in place
15	X1.6	Spindle 2nd gear in place/chuck released into place
16	X1.7	Tool position T01/AK31 BIT0/Liuxin hydraulic Sensor A/servo turret tool position 1
29	X2.0	Tool position T02/AK31 BIT1/Liuxin hydraulic Sensor B/servo turret tool position 2
30	X2.1	Tool position T03/AK31 BIT2/Liuxin hydraulic Sensor C/servo turret tool position 3
31	X2.2	Tool position T04/AK31 BIT3/Liuxin Hydraulic Sensor D/Servo turret tool position 4
32	X2.3	Y-axis zero deceleration signal
33	X2.4	Three-position switch 1/AK31 gating/Liuxin hydraulic SensorE/servo turret loosen into place
34	X2.5	Three-position switch 2/AK31 pre-indexing in place/servo turret servo alarm
		Tool holder locking signal/Liuxin hydraulic Sensor F/servo turret clamping

2.2 Interface CN62 output signal



Output interface(CN62)

Foot size	address	illustrate
19	dangling	
26～28 17～18	0V	Power port
20～25	+24V	Power port
1	Y0.0	Cooling output M08/M09
2	Y0.1	Lubrication output M32/M33
3	Y0.2	Guard door output M34/M35
4	Y0.3	The spindle rotates M03
5	Y0.4	The spindle reverses M04
6	Y0.5	The spindle stops M05/M89 I0 output 0/macro output #1100/servo turret tool selection trigger
7	Y0.6	Spindle clamping M20, M21/M89 I1 output 1/macro output #1101
8	Y0.7	Spindle brake / M89 I2 output 2 / macro output #1102 / servo turret enable output
9	Y1.0	M41/S1 spindle gear 1/M89 I3 output 3/macro output #1103/servo turret tool position selection 1
10	Y1.1	M42/S2 spindle gear 2/M89 I4 output 4/macro output #1104/servo turret tool position selection 2
11	Y1.2	M43/S3 spindle gear 3/M89 I5 output 5/macro output #1105/servo turret tool position selection 3
12	Y1.3	M44/S4 spindle gear 4/M89 I6 output 6/macro output #1106/servo turret tool position selection 4
13	Y1.4	Chuck clamping output M12
14	Y1.5	The chuck releases the output M13
15	Y1.6	Tool holder forward rotation/servo turret comparison mode
16	Y1.7	Tool holder reversal/servo turret selection mode
29	Y2.0	AK31 turret motor brake output / Liuxin turret loosening output / servo turret release
30	Y2.1	AK31 turret pre-indexing solenoid valve output / Liuxin turret locking output / servo turret clamping
31	Y2.2	Tricolor light - yellow light
32	Y2.3	Tricolor light - green light
33	Y2.4	Tricolor light - red light
34	Y2.5	The tail shaft enters M10
35	Y2.6	Tail axis retreat M11
36	Y2.7	Brake output M89 I7 output 7/macro output #1107

Note 1: Some output interfaces can define a variety of functions, which are represented by "**/**" in the table ;

Note 2: When the output function is active, the output signal is internally turned on with 0V; When

2.3 I/O functions and connections

Attention!

The meaning of the I/O function of the lathe CNC is defined by the PLC program (ladder diagram), when the lathe CNC assembles the machine tool, the I/O function is determined by the machine tool factory design, please refer to the machine tool manufacturer's manual.

The I/O functions in this section are described for standard PLC programs in the turning center series V2.10 and above. No special instructions, please note!

2.3.1 External pause, cycle start, emergency stop

Relevant signals

SP: External pause signal, when disconnected from +24V, pause is active;

ESP: emergency stop signal, when disconnected from +24V, emergency stop alarm;

ST: External cycle start signal, when +24V is on, the start is effective;

Signal diagnostics

Signal	SP	ESP	ST
Diagnostic address	X0.1	X0.5	X1.4
Interface pins	CN61. 02	CN61. 06	CN61. 13
Note description	The add-in is paused	Emergency stop	Add-in start

Control parameters

bit parameters

176.0==0 External loop start (0: valid 1: invalid);

176.1==0 External pause signal (0: valid 1: invalid).

176.2==0 Emergency Stop Alarm Signal (0:Check 1:Do not check).

			7	6	5	4	3	2	1	0
1	7	6	****	****	****	****	****	BIT2	BIT1	BIT0

BIT0 : External loop start (0: valid 1: invalid).

BIT1 : External pause signal (0: valid 1: invalid).

BIT2 : Emergency stop alarm signal (0: check 1: Do not check).

PLC parameters

K20.0==0 The external cycle start signal is (0:normally open 1:normally closed) is valid;

K20.1==1 The external pause signal is (0:NO 1:NC) is valid

K	2	0	****	****	****	****	****	****	BIT1	BIT0

BIT 0 : The external cycle start signal is (0: normally open 1: normally closed) active

BIT 1: The external pause signal is (0:NO 1:NC) active

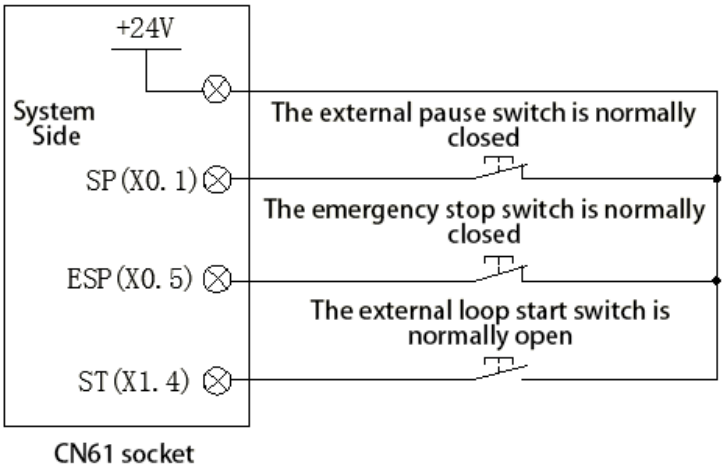
When the external suspension and cycle start are active, the external button is turned on for more than 4 seconds:

A001.6 Loop start open time is too long

A001.7 The external plug-in is paused for too long

External connection of the machine

External pause, start, emergency stop connection diagram:



2.3.2 Hard limit travel alarm and soft limit travel alarm setting

Relevant signals

LMIX: X-axis travel limit detection input

LMIY: 3TH axis travel limit detection input

LMIZ: Z-axis travel limit detection input

LMI4: 4HT axis travel limit detection input

LMI5: 5HT shaft travel limit detection input

Signal diagnostics

Signal	LMIX	LMI3	LMIZ	LMI4	LMI5
Diagnostic address	X3.0	X3.1	X3.2	X3.3	X3.4
Interface pins	CN61.37	CN61.38	CN61.39	CN61.42	CN61.43
Note description	X-axis overtravel	3-axis overtravel	Z-axis overtravel	4-axis overtravel	5-axis overtravel
remark	Address and macro input signal #1000-#1007, M89K0-K7 detection signal multiplexing, note that the three functions can not be used at the same time; X3.4 is multiplexed with external magnification switch of spindle				

Control parameters

PLC parameters

K10.5==1 Overtravel release signal for each axis (0: invalid 1: valid);

K10.6==1 The overtravel signal of each axis is (0:normally open 1:normally closed) is valid;

K10.7==1 Overtravel for each axis (0: invalid 1: valid);

K24.0==0 X-axis hard limit overtravel (0: valid 1: invalid);

K24.1==0 Z-axis hard limit overtravel (0: valid 1: invalid);

K24.2==1 3-axis hard limit overtravel (0: valid 1: invalid);

K24.3==1 4-axis hard limit overtravel (0: valid 1: invalid);

K24.4==1 5-axis hard limit overtravel (0: valid 1: invalid);

K	1	0	BIT7	BIT6	BIT5	****	****	****	****	****

BIT5 : Overtravel release signal for each axis (0: invalid 1: valid).

BIT6 : The overtravel signal of each axis is (0:normally open 1:normally closed) is valid;

BIT7 : Overtravel of each axis (0: invalid 1: valid);

K	2	4	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT 0 : X-axis hard limit overtravel (0: valid 1: invalid);

BIT 1 : Z-axis hard limit overtravel (0: valid 1: invalid);

BIT2 : 3-axis hard limit overtravel (0: valid 1: invalid);

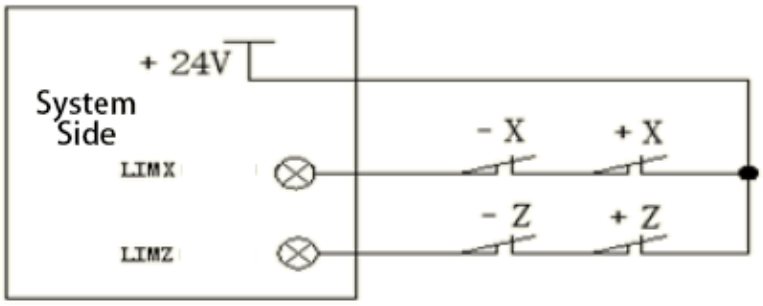
BIT3 : 4-axis hard limit overtravel (0: valid 1: invalid).

BIT4 : 5-axis hard limit overtravel (0: valid 1: invalid).

Only one limit switch is required for each axis hard limit, and the positive and negative alarm of the hard limit is judged by the axis movement direction.

External connection of the machine

Hard limit travel alarm connection diagram:



Steps to set the soft limit:

1、 Set the status parameter P177.1 to 1 (the soft limit is valid before returning to zero).

2、 Then enter the maximum (small) stroke machine coordinates in the positive (negative) direction of the X axis into the data parameter P045 and the data parameter P047 respectively

3、 Enter the maximum (small) stroke machine coordinates in the positive (negative) direction of the Z axis into the data parameter P046 and the data parameter P048, respectively

4、 ENTER THE MAXIMUM (SMALL) STROKE MACHINE COORDINATES IN THE POSITIVE (NEGATIVE) DIRECTION OF THE 3TH AXIS INTO THE DATA PARAMETER P192 AND THE DATA PARAMETER P195 respectively

5、 ENTER THE MAXIMUM (SMALL) STROKE MACHINE COORDINATES IN THE POSITIVE (NEGATIVE) DIRECTION OF THE 4TH AXIS INTO THE DATA PARAMETER P193 and data parameter P196 respectively

6、 ENTER THE MAXIMUM (SMALL) STROKE MACHINE COORDINATES IN THE POSITIVE (NEGATIVE) DIRECTION OF THE 5TH AXIS INTO THE DATA PARAMETER P194 AND THE DATA PARAMETER P197 respectively

Status parameters:

177.1==1 Soft limit before mechanical zero (0: invalid 1: valid);
177.2==1 When issuing an overtravel command, alarm at overtravel (0:front 1:after);
177.3==0 Zero return mode soft limit (0: effective 1: invalid);
197.0==0 Whether the X-axis shields the soft limit alarm (0:No1:Yes)
197.1==0 Whether the Z-axis shields the soft limit alarm (0:No1:Yes)

197.2==0 Whether 3-axis shielded soft limit alarm (0:No1:Yes)

197.3==0 4-axis shielded soft limit alarm (0:No1:Yes)

197.4==0 Whether 5-axis shielded soft limit alarm (0:No1:Yes)

1	7	7	****	****	****	****	BIT3	BIT2	BIT1	BIT0

BIT1 : Soft limit before mechanical zero (0: invalid 1: valid);

BIT2 : When the overtravel command is issued, alarm is given in the overtravel (0:front 1:after);

BIT3 : Soft limit in the zero return mode (0: effective 1: ineffective);

1	9	7	****	****	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Whether the X-axis shields the soft limit alarm (0:No1:Yes)

BIT1 : Whether the Z-axis shields the soft limit alarm (0:No1:Yes)

BIT2 : 3-axis shielded soft limit alarm (0:no 1:yes)

BIT3 : 4-axis shielded soft limit alarm (0:no 1:yes)

BIT4 : 5-axis shielded soft limit alarm (0:no 1:yes)

Data parameters:

0	4	5	X-axis forward maximum stroke (default: 9999.9999).
0	4	6	Z-axis forward maximum travel (default: 9999.9999).
0	4	7	X-axis negative maximum travel (default: -9999.9999).
0	4	8	Z-axis negative maximum travel (default: -9999.9999).

1	9	2	3TH AXIS POSITIVE MAXIMUM STROKE (DEFAULT: 9999.9999).
1	9	3	4 TH-AXIS POSITIVE MAXIMUM STROKE (DEFAULT: 9999.9999).
1	9	4	5 TH-AXIS POSITIVE MAXIMUM STROKE (DEFAULT: 9999.9999).
1	9	5	3TH AXIS NEGATIVE MAXIMUM STROKE (DEFAULT: -9999.9999).
1	9	6	4TH axis negative maximum stroke (default: -9999.9999).
1	9	7	5TH axis negative maximum stroke (default: -9999.9999).

Note: The rotating shaft is recommended to shield the soft limit alarm.

2.3.3 The machine is returned to zero

Relevant signals

DECX: X-axis deceleration signal

DECZ: Z-axis deceleration signal

DECY: 3-axis deceleration signal

DEC4: 4-shaft deceleration signal

DEC5: 5-shaft deceleration signal

Signal diagnostics

Signal	DECX	DECZ	DEC3	DEC4TH	DEC5TH
Diagnostic address	X0.3	X1.3	X2.3	X0.6	X3.7
Interface pins	CN61. 04	CN61. 12	CN61. 32	CN61.07	CN61.44

Note description	X-axis zero deceleration signal	Z-axis zero deceleration signal	3-axis zero deceleration signal	4-axis zero deceleration signal; Note that the address is multiplexed with the lubrication detection signal, and K16.6=0 when using 4-axis zeroing	5-axis zero deceleration signal; Pay attention to the address and spindle external magnification switch, M89K7 detection signal, macro input #1007 multiplexing; Three functions cannot be used at the same time. When K17.5=1, the 5th axis zero switch is invalid

Control parameters

Status parameter

006.5==1 Zero mode selection stop (0:rear 1:front);

007.0==1 1st axis zero return (0:none 1: Yes) one turn signal (X-axis);

007.1==1 2nd axis zero return (0:none 1:Yes) one turn signal (Z axis);

007.2==1 3rd axis return to zero (0:none 1:Yes) one turn signal (3 axes);

007.3==1 4th axis return to zero (0:none 1:Yes) one turn signal (4 axis);

007.4==1 5th axis return to zero (0:none 1:Yes) one turn signal (5 axis);

012.0==1 After powering on, before returning to the zero point of the machine, manual fast movement (0: invalid 1: valid);

181.0==0 Select the (x) axis to return to zero in the direction of (0: positive direction 1: negative direction) back to zero;

181.1==0 Select the (Z) axis to return to zero as (0: positive direction 1: negative direction) to zero;

181.2==0 Select the (3) axis to zero in the direction of (0: positive direction 1: negative direction) back to zero;

181.3==0 Select the (4) axis back to zero direction as (0: positive direction 1: negative direction) back to zero;

181.4==0 Select the (5) axis to return to zero as (0: positive direction 1: negative direction);

0	0	6	****	****	BIT5	****	****	****	****	****

BIT5 : Zero mode selection stop (0:rear 1:front).

0	0	7	****	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : 1st axis returns to zero (0:none 1:Yes) and a turn signal (X-axis).

BIT1 : 2nd axis zero return (0:none 1:Yes) one turn signal (Z-axis).

BIT2 : 3rd axis return to zero (0:none 1:Yes) one turn signal (3 axis).

BIT3 : 4th axis returns to zero (0:none 1:Yes) and one turn signal (4-axis).

BIT4 : 5th axis return to zero (0:none 1:Yes) One turn signal (5 axis).

0	1	2	****	****	****	****	****	****	****	BIT0

BIT0 : After powering on, before returning to the zero point of the machine, manual fast movement (0: invalid 1: valid).

1	8	1	****	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Select the (x) axis to return to zero in the direction of (0:positive direction 1: negative direction).

BIT1 : Select the (Z) axis to return to zero in the direction of (0:positive direction 1: negative direction).

BIT2 : Select the (3) axis to return to zero in the direction of (0: positive direction 1: negative direction).

BIT3 : Select the (4) axis to zero as (0: positive direction 1: negative direction).

BIT4 : Select the (5) axis to return to zero in the direction of (0: positive direction 1: negative direction).

PLC parameters

K22. 3==0 The 5-axis deceleration signal is (0:NC 1:NO) is valid

K22.4==0 X-axis deceleration signal is (0: normally closed 1: normally open) is valid;

K22.5==0 Z-axis deceleration signal is (0: normally closed 1: normally open) active;

K22.6==0 The 3-axis deceleration signal is (0: normally closed 1: normally open) is valid;

K22. 7==0 The 4-axis deceleration signal is (0:NC 1:NO) active

K	2	2	BIT7	BIT6	BIT5	BIT4	BIT3	****	****	****

BIT3 : 5-axis deceleration signal is (0:NC 1:NO) active

BIT4 : X-axis deceleration signal is (0: normally closed 1: normally open) active

BIT5 : Z-axis deceleration signal is (0:NC 1:NO) active

BIT6 : 3-axis deceleration signal is (0:NC 1:NOR) active

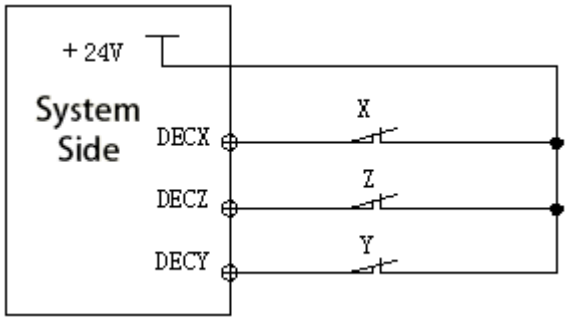
BIT7 : 4-axis deceleration signal is valid for (0:NC 1:NOR).

Data parameters

0	3	3	The low speed of the X and Z zero mechanical zero points (default value: 40).
1	1	3	The high-speed speed of the X and Z axes back to the mechanical zero point (default: 4000).
1	7	4	3TH AXIS RETURNS TO THE LOW SPEED OF THE MECHANICAL ZERO POINT (DEFAULT: 40).
1	7	5	4 TH-AXIS RETURNS TO THE LOW SPEED OF THE MECHANICAL ZERO POINT (DEFAULT: 40).
1	7	6	5TH-AXIS RETURNS TO THE MECHANICAL ZERO POINT AT LOW SPEED (DEFAULT: 40).
1	7	7	3TH AXIS RETURNS TO THE HIGH SPEED OF THE MECHANICAL ZERO POINT (DEFAULT: 4000).
1	7	8	4TH AXIS RETURNS TO THE HIGH SPEED OF THE MECHANICAL ZERO POINT (DEFAULT: 4000).
1	7	9	5TH AXIS RETURNS TO THE HIGH SPEED OF THE MECHANICAL ZERO POINT (DEFAULT: 4000).

Note: The acceleration and deceleration time constant when returning to zero is the number parameter No. 314 [acceleration and deceleration S type before cutting feed / zero acceleration and deceleration time constant] generally does not need to be adjusted, and this parameter can be reduced when the deceleration distance needs to be reduced.

Diagram of the external **connection of** the machine

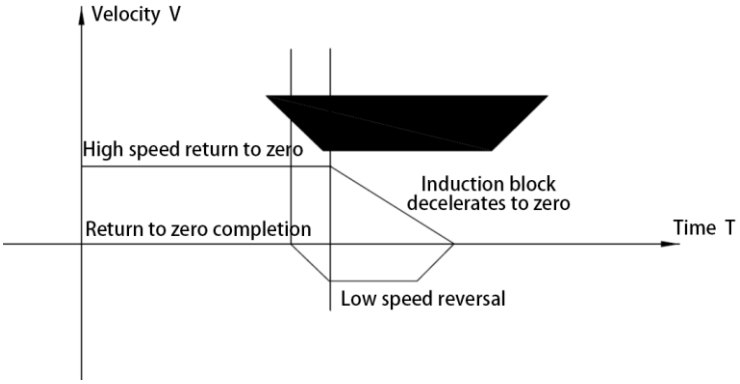


- **New back to zero control (version 2021):**
  - **Stop front zero (position parameter 6 5=1, it is recommended to use zero before the stop, and there is no AB method before the stop)**

1) There is no turn signal before the stop (bit parameter 7.0-7.4=0 no turn signal).

When using the stop to zero before and selecting the zero return method without a turn signal, it is consistent with the previous version of zero return;

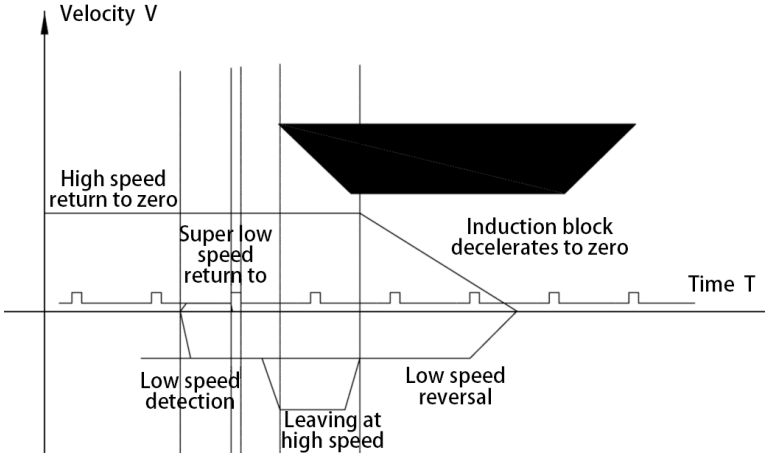
Description of the return to zero action:



No turn signal stop before zeroing

2) There is a turn signal back to zero in front of the stop (bit parameter 7.0-7.4=1 has a turn signal).
When using the stop to zero before and selecting the zeroing method with a rotation signal, it will change from the previous version of zeroing;

Description of the return to zero action:



There is a turn before the signal stop returns to zero

Description of the signal returning to zero before the new stop:

New zero high-speed to find the stop, after decelerating to zero, return to zero low-speed reverse to leave the stop, after leaving the stop, move the set set turn signal distance at zero high-speed speed (when the set distance is 0, do not execute the high-speed part), and then drop back to low speed to find a turn signal, find a turn signal, then move the set number of pulses, and finally reverse transfer back to 0.05 of the zero low speed speed The speed doubles the signal again, stops after detecting the one revolution signal, and completes the return to zero.

New parameters:

Number parameter 324 Zero detection reserved pulse number (default 10).

Number parameter 325 X-axis zero off the stop to detect a turn signal distance

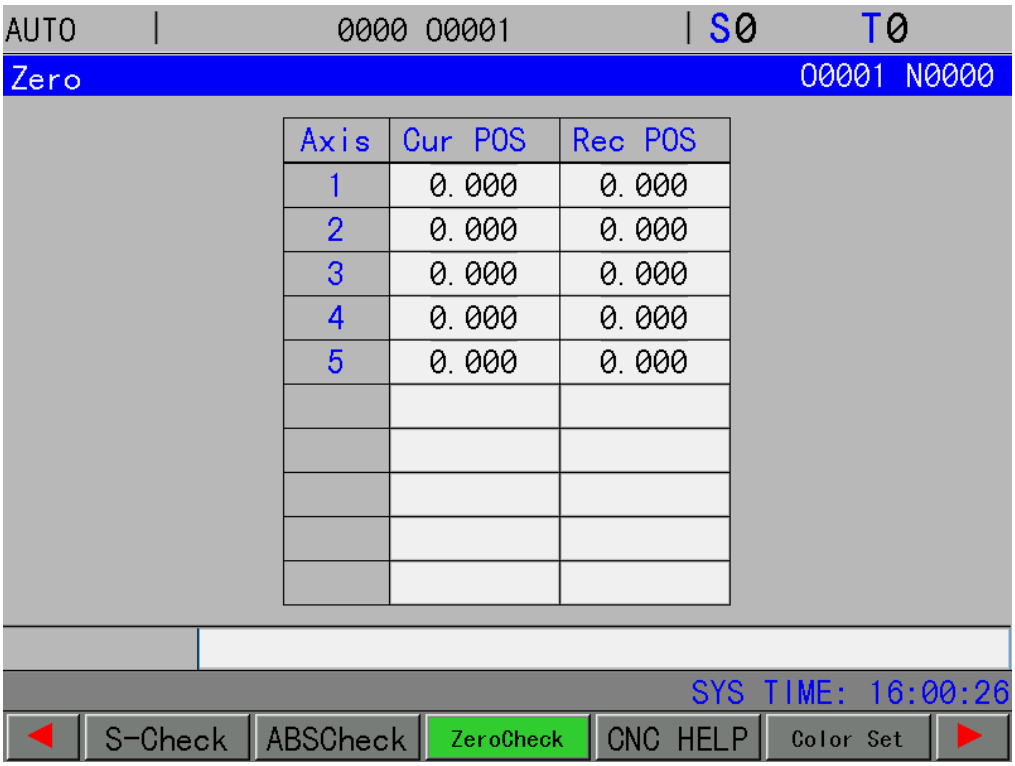
Number parameter 326 Z axis returns to zero and leaves the stop to detect a turn signal distance

NUMBER PARAMETER 327 3TH AXIS ZERO OFF THE STOP TO DETECT A TURN SIGNAL DISTANCE

NUMBER 328 4TH AXIS ZERO AWAY FROM THE STOP TO DETECT A REVOLUTION SIGNAL DISTANCE

NUMBER 329 5TH AXIS ZERO OFF THE STOP DETECTS THE SIGNAL DISTANCE OF ONE REVOLUTION

When using a turn signal to zero inaccuracy, it should generally be a critical state for the motor one turn signal and the stop position, at this time the number parameter 325-329 axis can be modified to leave the stop to detect the distance of the one turn signal, when the pitch is 8/9 in the case of 10, 3/4 in the case of pitch 5 (the position of each zero point away from the stop can be detected on the diagnostic < zero point detection >) ;



At the same time, the zero detection function can be set:

Number parameter 323 Zero detection range mm

The bit parameter 181.6 zero detection function (0:No 1:Yes) is valid

Bit 181 7 Zero detection function (0: detection 1: self-learning).

Function usage: (only the signal is valid in the zero mode before the stop)

When using the zero detection function, the bit parameter 1 81.6=1, first open the zero detection function self-learning bit parameter 181. 7=1, set the number of parameters of the zero error detection range 3 No. 23, first after the correct zeroing of each axis is completed, Then set the zero detection function to the detection parameter 181.7=0; After the subsequent zeroing, the zeroing accuracy of each axis will be detected, and if the set zeroing error parameter 323 is exceeded, it will automatically return to zero, and if it returns to zero3 When the error value is exceeded, the alarm returns to zero to exceed the error value.

✧ **Use a one-turn signal to return to zero as a deceleration signal (generally only used in a 1:1 rotating shaft).**

Number parameter 324 Zero back detection reserved pulse number (default 10).

Parameter 198.0 When the X-axis returns to zero (0:No 1:Yes), a turn signal is used to slow down to zero

Parameter 198.1 When the Z-axis returns to zero (0:No 1:Yes), a revolution signal is used to slow down to zero

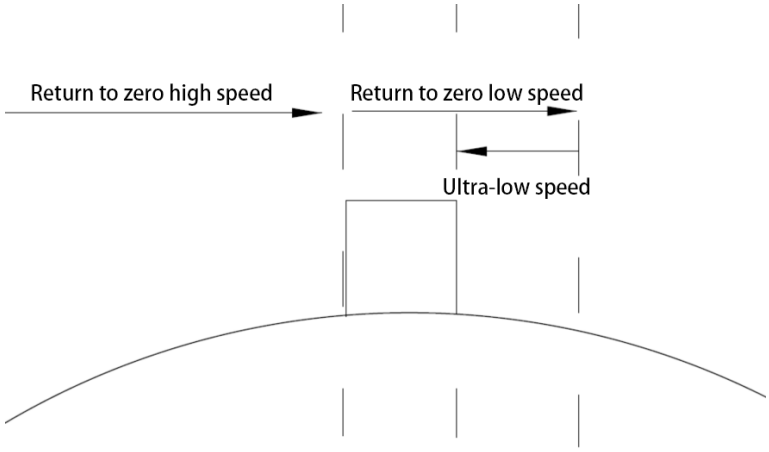
PARAMETER 198.2 WHEN THE 3TH AXIS RETURNS TO ZERO (0:No 1:YES), A REVOLUTION SIGNAL IS USED TO SLOW DOWN TO ZERO

PARAMETER 198.3 4 WHEN THE TH-AXIS RETURNS TO ZERO (0:No 1:YES), A REVOLUTION SIGNAL IS USED TO SLOW DOWN BACK TO ZERO

PARAMETER 198.4 5TH AXIS TO ZERO (0:No 1:Yes) USE A REVOLUTION SIGNAL TO SLOW DOWN TO ZERO

When a turn signal is selected to decelerate, the zero reduction switch is not detected, and the one turn signal is directly used as the deceleration signal;

Zero back action:



Action Description:

First look for a turn signal at high speed, move the number of pulses at low speed after detecting a turn signal, and then reverse the ultra-low speed to find a turn signal to stop, and return to zero to complete.

Note: When using a rotation signal as a deceleration signal to return to zero, the zero error value is not detected;

✧ **G28 back to reference point control**

When the system default parameter machine tool has not returned to zero, when the G 28 reference point is executed, each axis is looking for the zero switch to zero at the zero speed, and after the system is zeroed, when the first reference point of the G28 is executed, each axis returns to the first reference point position at G0 speed.

bit parameter 164.1 [G28 command when reference point is not established (0: use block 1: alarm)] (default 0).

When the machine tool is not returned to zero, but the parameter is 164.1=1, the command G28 command when the system alarms.

After version 2021, the software can be set to find the stop back to zero every time the G 28 command is executed;

Bit parameter 208.0 X-axis G28 back to the reference point (0:no 1:Yes) every time the stop is used

Parameter 208.1 Z-axis G28 back to the reference point (0:no 1:Yes) every time the stop is used

PARAMETER 208.2 3TH AXIS G28 BACK REFERENCE POINT (0:No 1:YES) EVERY TIME THE STOP IS USED

POSITION 208.3 4TH AXIS G28 BACK TO THE REFERENCE POINT (0:NO 1:YES) EVERY TIME THE STOP IS USED

PARAMETER 208.4 5TH AXIS G28 BACK TO THE REFERENCE POINT (0:No 1:YES) EVERY TIME THE STOP IS USED

✧ **The zero position offset is used**

When the machine tool needs to return to the command position, you can use the zero grid offset function, use the method: first clear the grid offset of the axis that needs to be offset to zero (number parameters 114, 115, 189, 190 , 191), set the correct gear ratio for each axis, perform the machine zeroing, wait for the machine to complete the zeroing, and the manual/handwheel moves the axis that needs to be offset to the required position, and record The current machine coordinate values for this axis are entered into the grid offset of the axis (number parameters 114, 115, 189, 190, 1911) completed; The next time the axis returns to zero, the axis first returns to the zero position, and after reaching the position, it moves to the offset position at a high-speed speed of zeroing, the zero return is completed, and the machine coordinates are cleared.

Number parameter 114 X-axis machine zero offset

Number parameter 115 Z-axis machine zero offset

Number parameter 189 3th axis machine zero offset

Number parameter 190 4th axis machine zero offset

Number parameter 191 5th axis machine zero offset

✧ **Manually return to the reference point control after the reference point is established for memory**

The reference point is established (zero return completed) and the mechanical zero point memory is set (bit parameter 1 64.0=1), at which time the manual zero return speed can be selected (bit parameter 164.3) G 0 Fast or zero high speed for each axis.

Bit parameter 164 0 Mechanical zero point (0: no memory 1: memory).

Bit parameter 164 3 After the reference point is established for memory, the reference point is manually returned to the reference point as (0:G0 fast 1:zero high-speed) speed

Note: Absolute values are set to remember zero or do not use absolute values (bit parameter 11 0-11.4) Memory zero is also controlled

✧ **The use of the reference point can be returned without returning to the mechanical zero point**

After the absolute value system is connected to the memory zero point, it can directly return to the zero point, but in the case of not absolute value, when the zero switch is not installed or the one turn signal is not used to decelerate, the parameter parameter No. 11 and bit parameter 164 that need to be set manually reset to the mechanical zero point need to be set;

Bit 11 0 The X-axis (0:Yes 1:No) reads absolute values

Bit 11 1 The Z-axis (0:Yes 1:No) reads absolute values

Bit 11 2 The 3rd axis (0:Yes 1:No) reads absolute values

Bit 11 3 The 4th axis (0:Yes 1:No) reads absolute values

Bit 11 4 The 5th axis (0:Yes 1:No) reads absolute values

Bit parameter 164 0 Mechanical zero point (0: no memory 1: memory).

When absolute values (bit parameter 1 74.0=0) are not used, set bit parameters 1 1.0-11.4 When the corresponding parameter of the axis is 1 and does not read the absolute value, set the bit parameter 164.0 to 1 to remember the zero point, and when manually returning to zero, the axis that is set not to read the absolute value will not Find the zero switch, directly return to the zero position of the setting machine tool, there is no axis that does not read the absolute value, and the zero find zero switch action will be performed.

Example: 3-axis XZY, not an absolute value system (bit parameter 174.0=0) setting, set the bit parameter 11.0=0, 11.1=0、11.2=1、164.0 =1； At this time, when performing the manual zero return or return to reference point action, the X Z axis returns to zero to find the zero switch to zero, and the Y axis directly returns to the set mechanical zero point position.

Note: In the absolute value (174.0=1) setting, the parameter 1 **1.0-11.4 setting parameter means different, that is, the absolute value of the motor shaft must be set to 0** The absolute value function is **effective, do not set the axis of the absolute value function** to **1**, **when it is set to zero after setting to zero, you need to find the zero switch to return to zero.**

Example: 3-axis XZY, absolute value system (174.0=1) setting, set bit parameters 1 1.0=0, 11 .1=0、11.2=1、164.0 =1； At this time, when performing the manual zero return or return to the reference point action, the X Z axis directly returns to the set mechanical zero point position, and the Y axis returns to zero to find the zero switch to return to zero.

2.3.4 Tool change control

The standard ladder diagram supports 4 kinds of tool holder control logic; Select which tool holder is suitable by setting the corresponding control position of the K0 11 parameter. Select the tool change method by combining Bit 0 and Bit1.

K11. 1=0，K11. 0=0: Suitable for ordinary electric knife holder, tool change mode B (suitable for Changzhou knife holder).

K11. 1=0，K11. 0=1: Suitable for Yantai knife holder AK31 series (6, 8, 10, 12 stations).

K11. 1=1，K11. 0=0: Suitable for Taiwan Liuxin hydraulic tool holder (8, 10, 12 stations).

K11. 1=1，K11. 0=1: Servo turret

Note: Version 2021 adds bit parameter 1 78.6 [Tool change instruction T(0:No 1:Yes) can be executed with other instructions].

Note: Version 2021 adds bit parameter 186.1 [Run the tool change instruction T caller O9101 (0:invalid 1: valid)].

When the T command is selected to run bit parameter 178.6=1 together with other instructions, if the move instruction is specified, the knife is executed first and then moved;

Example: T0101 G0 X50 Z50;

First perform 01 knife patch, X50 Z50 is 01 knife complement coordinates, then perform the tool change action and move to X50 Z50.

When the T command is selected to call the O9101 program bit parameter 186.1=1, if other instructions are specified, the knife is executed first, then other instructions are executed, and finally O9101 is executed subroutines and tool change actions;

Example: T0101 G0 X50 Z50;

First perform 01 knife patch, X 50 Z50 is 01 knife complement coordinates, then move to X50 Z50, and finally perform the tool change action and O9101 subroutine.

Note: The number parameter 84=1 is set for the row tool.

2.3.4.1 Ordinary electric tool holders

Relevant signals (standard PLC program definition for ordinary electric tool holders).

Signal type	symbol	Signal interface	address	Signal function	remark
Input signal	T01	CN61. 16	X1.7	Tool position signal 1	
	T02	CN61. 29	X2.0	Tool position signal 2	
	T03	CN61. 30	X2.1	Tool position signal 3	
	T04	CN61. 31	X2.2	Tool position signal 4	
	T05	CN61. 08	X0.7	Tool position signal 5	Address multiplexed with external feed multiplier
	T06	CN61. 09	X1.0	Tool position signal 6	Address multiplexed with external feed multiplier
	T07	CN61. 10	X1.1	Tool position signal 7	Address multiplexed with external feed multiplier
	T08	CN61. 11	X1.2	Tool position signal 8	Address multiplexed with external feed multiplier
	TCP	CN61. 35	X2.6	Tool holder locking signal	
Output signal	TL+	CN62. 15	Y1.6	Tool holder forward rotation signal	
	TL-	CN62.16	Y1.7	Tool holder reversal signal	

Note 1: When using an electric tool holder, some electric tool holders need to pull up a 2K resistor between +24V and the tool position signal;

Note 2: When using a 6 or 8-station electric tool holder, an external feed multiplier switch cannot be used.

Control parameters

PLC parameters

K11.0 ==0 Tool change selection 0 (00: Way B 01: AK31 turret 10: Liuxin Hydraulic 11: Servo turret).

K11.1 ==0 Tool Change Option 1 (00: Mode B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

K11.2 ==1 The tool position signal is (0: normally open 1: normally closed) active (the tool holder can be adjusted non-stop).

K11.3 ==0 Normal tool holder locking signal (0: Do not detect 1: Detect).

K11.4 ==0 The tool holder locking signal is (0:NC 1:NORMALLY open) active

K11.5 ==0 Tool position signal at the end of normal tool holder change (0: no detection 1: detection).

K	1	1	****	****	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Tool Change Selection 0 (00: Mode B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

BIT1 : Tool Change Option 1 (00: Method B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

BIT2 : The tool position signal is (0: normally open 1: normally closed) active (the tool holder can be adjusted non-stop).

BIT3 : Normal tool holder locking signal (0: not detected 1: detected).

BIT4 : Tool holder locking signal is (0:NC 1:NORMALLY open) active

BIT5 : Tool position signal at the end of a normal tool holder change (0: no detection 1: detection).

Data parameters

0	7	8	The maximum time limit for moving the most tool positions when changing tools (default: 15000).
0	8	2	Tool holder forward rotation reverse locking delay time (default: 0).
0	8	3	Tool holder locking*TCP signal alarm time (default: 500) not received
0	8	4	Select [Change the number of knives to 1] (default: 4).
0	8	5	Tool holder reverses locking time (default: 1000).

Principle of tool change B method:

1) After performing the tool change operation, the system outputs the tool holder forward rotation signal TL+ and begins to detect the tool in place signal, after detecting the tool in place signal, turn off the TL+ output, delay the data parameter No082 set the time and output the tool holder reversal signal TL-. Then check the locking signal TCP, when receiving this signal, delay the time set by the data parameter No085, close the turret reversal signal (TL-);
2) If the Bit 5 of K011 is set to 1 (check the tool position signal at the end of the tool change), confirm whether the current tool position input signal is consistent with the current tool number after the end of the tool holder reversal time, if it is inconsistent, the system will generate an alarm;
3) The tool change process is over.
4) When the system outputs the turret reversal signal, if the system does not receive a TCP signal within the time set by the data parameter No083, the system will generate an alarm and turn off the turret signal.
5) If the tool holder does not have a tool holder locking signal, the Bit3 (CTCP) of K 011 can be set to 0, and the tool holder locking signal is not detected.

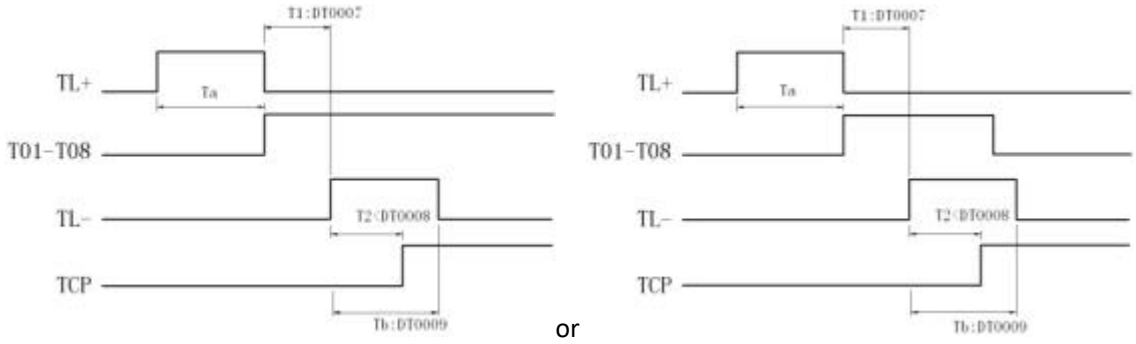


Figure 11 Timing diagram of tool change mode B

When the tool change principle is the same and the signal is inconsistent, the data in D data D 0-D9 can be adjusted to correspond to different tool positions; D 0 is the total number of knife positions, D 1 is the knife No. 0, D2 is the No. 1 knife, D 3 is the size 2 knife, D 4 is the size 3 knife, and D 5 is No. 4 knife, D 6 is No. 5 knife, D7 is No. 6 knife, D8 is the 7th knife, D 9 is the 8th knife; The default electric tool holder signal of the system is a one-to-one corresponding model, and the default parameters D 0=9, D 1=0, D2=1, D 3=2 ， D4=4， D5=8， D6=16， D7=32， D8=64， D9=128；

2.3.4.2 AK31 electric turret

Related signals (Yantai AK31 turret standard PLC program definition).

Signal type	symbol	Signal interface	address	Signal function	remark
Input signal	T01	CN61.16	X1.7	AK31 tool position BIT0	
	T02	CN61.29	X2.0	AK31 tool position BIT1	
	T03	CN61.30	X2.1	AK31 tool position BIT2	
	T04	CN61.31	X2.2	AK31 tool position BIT3	
	Gating	CN61. 33	X2.4	Select the signal (normally open sensor).	The address is multiplexed with a three-bit switch function
	Pre-indexing	CN61. 34	X2.5	Pre-indexed signal in place (normally open sensor).	The address is multiplexed with a three-bit switch function
	TCP	CN61.35	X2.6	Tool holder locking signal	
Output signal	TL+	CN62.15	Y1.6	Turret forward rotation signal	
	TL-	CN62.16	Y1.7	Turret reversal signal	
	brake	CN62.29	Y2.0	Turret brake output	
	Pre-	CN62.30	Y2.1	Turret pre-	

	indexing			indexing output	

Note: When **Yantai AK31 tool holder is selected, the three-position switch function must be turned off K14.5=0**

Control parameters

PLC parameters

K11.0 ==1 Tool change selection 0 (00: Mode B 01: AK31 turret 10: Liuxin Hydraulic 11: Servo turret).

K11.1 ==0 Tool Change Option 1 (00: Mode B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

K11.2 ==0 The tool position signal is (0: normally open 1: normally closed) active (the tool holder can be adjusted non-stop).

K	1	1	****	****	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Tool Change Selection 0 (00: Mode B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

BIT1 : Tool Change Option 1 (00: Method B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

BIT2 : The tool position signal is (0: normally open 1: normally closed) active (the tool holder can be adjusted non-stop).

Data parameters

0	8	4	Select [Change the number of knives to 1] (default: 8).

Tool change AK31 turret principle:

- Tool change process

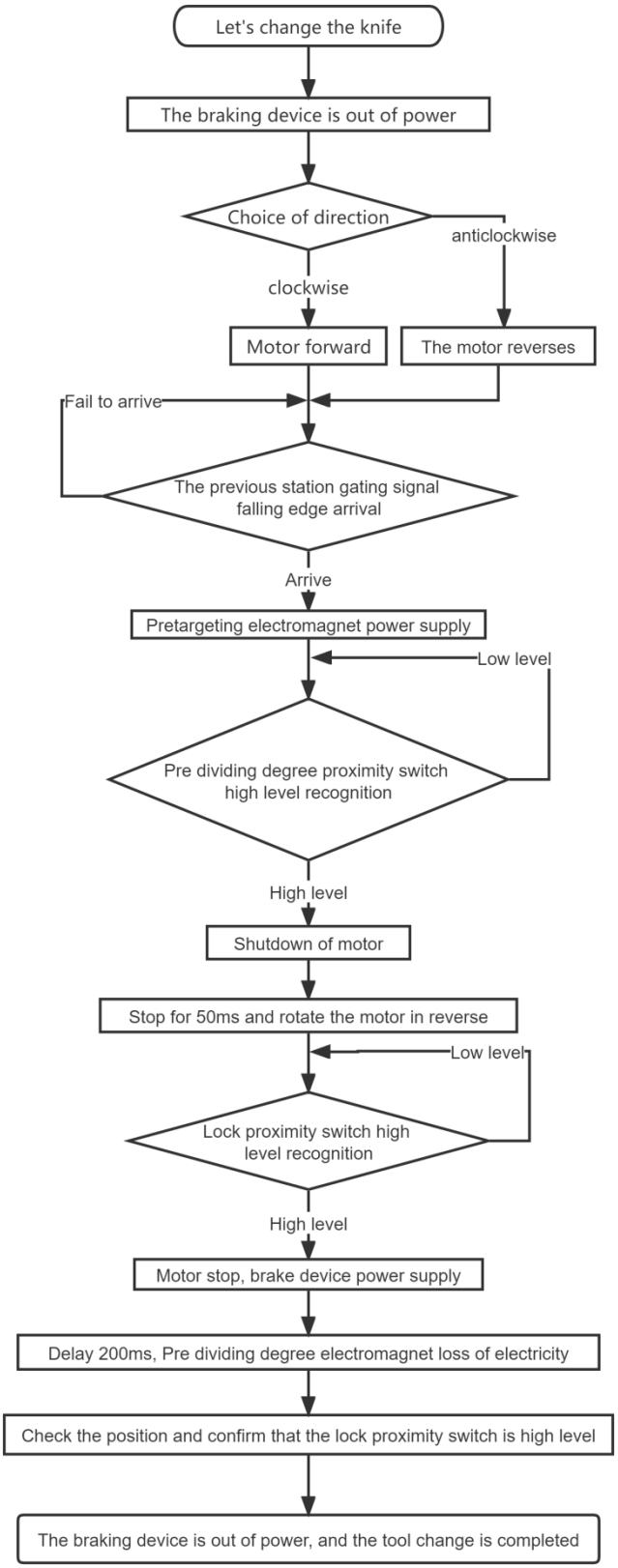
1) Confirm the disconnect turret brake TZD signal.
2) The system judges the shortest path according to the target tool number and the current tool number, selects the rotation direction of the output according to the principle of nearest tool selection, and the output is a forward signal (TL+) or a reverse signal (TL—), and the tool table starts to rotate for tool selection.
3) During the rotation process, the system decodes according to the input of the tool position coding signal T1~T4 to identify the current tool number of the tool table. When rotating to the previous station of the target tool number, the jump of the tool table selection signal signal begins to be detected. On the falling edge of the selected signal signal at the station before the target tool number, the system outputs the tool table pre-indexing electromagnet signal, and the tool table pre-indexing electromagnet is powered by the power supply.
4) When the input signal of the tool holder pre-indexing proximity switch is detected as high, the tool holder rotation output signal (TL+ or TL—) is turned off and the motor stops.
5) With a delay of 50ms, the system outputs a signal (TL—or TL+) in the opposite direction of rotation, and the turret rotates in the opposite direction.
6) When the input signal of the tool table locking proximity switch is high, the rotation signal (TL—, TL+) is turned off and the motor stops. Then the system outputs the tool table brake signal TZD, and the motor brake device is energized.
7) With a delay of 200ms, the output signal of the tool table pre-indexing electromagnet is turned off, and the tool table pre-indexing electromagnet loses power.

8) Check the current tool number again to confirm whether the current tool position coding signal is consistent with the target tool number.

9) Double-check that the locking proximity switch signal is high.

10) If the above steps are correct, turn off the tool holder brake signal TZD and complete the tool change.

Tool change flowchart



AK31 tool holder tool change flow chart

2.3.4.3 Liuxin hydraulic turret

Relevant signals (defined by Liuxin hydraulic turret standard PLC program).

Signal type	symbol	Signal interface	address	Signal function	remark
Input signal	T01	CN61.16	X1.7	Sensor A	
	T02	CN61.29	X2.0	Sensor B	
	T03	CN61.30	X2.1	Sensor C	
	T04	CN61.31	X2.2	Sensor D	
		CN61.33	X2.4	Sensor E	The address is multiplexed with a three-bit switch function
	TCP	CN61.35	X2.6	Sensor F	
Output signal	TL+	CN62.15	Y1.6	Turret forward rotation signal	So1 B
	TL-	CN62.16	Y1.7	Turret reversal signal	
	loosen	CN62.29	Y2.0	The turret loosens the output	So1 A
	Lock	CN62.30	Y2.1	Turret locking output	

Note: When **Liuxin hydraulic turret is selected, the three-position switch function must be turned off K14.5=0**

Note: Hydraulic turrets for different signals can be matched **by modifying the D data sheet**

Control parameters

PLC parameters

K11.0 ==0 Tool change selection 0 (00: Way B 01: AK31 turret 10: Liuxin Hydraulic 11: Servo turret).

K11.1 ==1 Tool change option 1 (00: Method B 01: AK31 turret 10: Liuxin Hydraulic 11: Servo turret).

K11.2 ==0 The tool position signal is (0: normally open 1: normally closed) active (the tool holder can be adjusted non-stop).

K	1	1	****	****	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Tool Change Selection 0 (00: Mode B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

BIT1 : Tool Change Option 1 (00: Method B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

BIT2 : The tool position signal is (0: normally open 1: normally closed) active (the tool holder can be adjusted non-stop).

T	4	0	Turret hydraulic lock in place delay (default 0).

T	4	1	The turret hydraulic release delay is changed to 100ms, which can be increased if there is a stutter when the tool change starts to rotate

Data parameters

0	8	4	Select [Change the number of knives to 1] (default: 8).
1	5	3	The ladder number (changed to 2) is currently used

- Position and signal correspondence table

8 seats:

8-station D data sheet modification

D10=9,D11=0,D12=2,D13=8,D14=1,D15=4,D1 6=7,D17=13,D18=11,D19=14;

	1	2	3	4	5	6	7	8
A			●		●	●	●	
B	●				●		●	●
C				●	●	●		●
D		●				●	●	●
E	●	●	●	●	●	●	●	●

10 seats

10-station D data sheet modification

D10=11,D11=0,D12=2,D13=8,D14=1,D15=4,D 16=7,D17=13,D18=11,D19=14,D20=3,D 21=12;

	1	2	3	4	5	6	7	8	9	10
A			●		●	●	●		●	
B	●				●		●	●	●	
C				●	●	●		●		●
D		●				●	●	●		●
E	●	●	●	●	●	●	●	●	●	●

12 seats

12-station D data sheet modification

D10=13,D11=0,D12=1,D13=4,D1 4=2,D15=9,D16=5,D17= 6,D18=11,D19=13,D20=7,D21=14,D2 2=10,D23=8；

	1	2	3	4	5	6	7	8	9	10	11	12
A	●			●	●		●	●	●			
B			●			●	●		●	●	●	
C		●			●	●		●	●	●		
D				●			●	●		●	●	●
E	●	●	●	●	●	●	●	●	●	●	●	●

- Signal description

Sensor A, B, C, D: only for tool position detection, do not do any action start signal

Sensor E: Each time a knife is inducted, the cutterhead stops rotating and locks the start signal, when the cutterhead rotates to the required position, Sensor E senses, that is, the cutterhead rotation solenoid valve is de-

energized, so that the cutterhead stops rotating, and the solenoid valve of cutterhead locking is activated to ensure that the cutterhead is locked.

Sensor F: Release / lock confirmation signal, Sensor F has no sense, that is, the cutterhead has been released and disengaged, then the cutterhead rotation can be started, Sensor F senses, that is, the cutterhead has been locked, and the tool change action is completed at this time.

Sol A: Control the cutterhead to loosen the lock

Sol B: Controls the cutterhead forward and reverse

- Description of the tool change process

Example: Change from No. 1 knife to No. 4 knife

Step 1: Sol A energized (cutterhead loosened)

Step 2: Confirm that Sensor F is not inductive, Sol B is energized, and the hydraulic motor is rotating

Step 3: Start detecting the tool position signal (Note: Sensor E will sense at the 1st, 2nd, and 3rd tool positions, but when the tool position 4 is not reached, no locking action is made), when 3 When the number of tool position signal is confirmed, the Sensor E preparatory action should be set, so that when the cutterhead turns to the No. 4 tool position, Sensor E senses and controls Sol B is de-energized, the cutterhead stops rotating while Sol A is controlled to lock the cutterhead

Note: For different hydraulic turret control logic may be inconsistent, you can modify the parameters according to the hydraulic turret control logic, such as the inconsistency of the tool position signal, you can modify the D parameter value corresponding, for the turret that does not need the E signal to stop, you need to short the E signal (X2.4) to the system +24V.

Note: This logic is not suitable for counting hydraulic turrets, which require an updated special ladder diagram.

2.3.4.4 Servo turrets

Relevant signals (defined by Wenchang servo turret standard PLC program).

Signal type	symbol	Signal interface	address	Signal function	remark
Input signal	T01	CN61.16	X1.7	D01	Tool position output signal
	T02	CN61.29	X2.0	D02	Tool position output signal
	T03	CN61.30	X2.1	D03	Tool position output signal
	T04	CN61.31	X2.2	D04	Tool position output signal
		CN61.34	X2.5	D05	Tool position output signal
		CN61.33	X2.4	S9	The turret releases the signal
	TCP	CN61.35	X2.6	S8	Turret locking signal
		CN61.37	X3.0	Wenchang Dota does not pick up	Turret selection in place (reserved).
Output		CN62.15	Y1.6	MD0	Turret servo mode selection

signal		CN62.16	Y1.7	MD1	
	loosen	CN62.29	Y2.0	The turret loosens the output	Turret hydraulic solenoid output
	Lock	CN62.30	Y2.1	Turret locking output	
		CN62.06	Y0.5	Wenchang Dota does not pick up	Selection trigger (reserved).
		CN62.08	Y0.7	DI6	Servo enable start
		CN62.09	Y1.0	DI0	Tool position selection output
		CN62.10	Y1.1	DI1	Tool position selection output
		CN62.11	Y1.2	DI2	Tool position selection output
		CN62.12	Y1.3	DI3	Tool position selection output

Note: When **a servo** turret **is selected, the three-position switch function must be turned off K14.5=0**

Note: When **a servo turret is selected, the output of spindle gear** Y1.0-Y1.3 **is invalid**

Note: When **the servo turret is selected**, the spindle stops the output of Y0.5 **and the output of the spindle brake Y0.7 is invalid**

Control timing: the tool change starts to output **Y1.6 MD0** and Y **1.7 MD1** and **servo enable Y0.7, and** the **output turret is released** after **the delay T042 time**

After the turret is released into place, the T044 output Y **0.5** triggers the tool selection and **disconnection Y1.7MD1, and the turret is locked after the tool selection is in place.**

Control parameters

PLC parameters

K11.0 ==1 Tool change selection 0 (00: Mode B 01: AK31 turret 10: Liuxin Hydraulic 11: Servo turret).

K11.1 ==1 Tool change option 1 (00: Method B 01: AK31 turret 10: Liuxin Hydraulic 11: Servo turret).

K11.2 ==0 The tool position signal is (0: normally open 1: normally closed) active (the tool holder can be adjusted non-stop).

K11.7 Servo turret cutters (0: invalid 1: valid).

K	1	1	****	****	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Tool Change Selection 0 (00: Mode B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

BIT1 : Tool Change Option 1 (00: Method B 01: AK31 Turret 10: Liuxin Hydraulic 11: Servo Turret).

BIT2 : The tool position signal is (0: normally open 1: normally closed) active (the tool holder can be adjusted non-stop).

T	4	0	Turret hydraulic lock in place delay (default 0).
T	4	1	Turret hydraulic release into place delay (default 0).
T	4	2	Turret Number/Enable Output Post-Delay Output Release (default 0).

T	4	4	The tool selection delay is triggered when the turret is released (default 0).

Data parameters

0	8	4	Select [Change the number of knives to 1] (default: 8).
1	5	3	The ladder number is currently used (changed to 3).

Tool change principle:

Signal description: Mode switching function definition

state	MD0		MD1		Description of the option	remark
1	Short	1	Short	1	Torque reduction	Before switching any mode, you must first switch the state 1 mode, then switch the desired mode, and the servo enable is turned on before switching the desired mode
2	Short	1	Open	0	Trigger by knife selection	
3	Open	0	Short	1	Origin triggering	
4	Open	0	Open	0	Emergency stop	

The tool selection position signal defines DI

Select the knife position	DI3	DI2	DI1	DI0	
1	0	0	0	0	The choice of knife positions is binary and so on, with a maximum of 16 knives available
2	0	0	0	1	
3	0	0	1	0	
4	0	0	1	1	
5	0	1	0	0	
6	0	1	0	1	
7	0	1	1	0	
8	0	1	1	1	

The tool position feedback signal defines DO

Tool position feedback	DO5	DO4	DO3	DO2	DO1	Tool number output position = DO value minus 4, for example, No. 1 knife position D0 = 5-4 = 1; the tool number feedback
1	0	0	1	0	1	
2	0	0	1	1	0	
3	0	0	1	1	1	
4	0	1	0	0	0	

5	0	1	0	0	1	and so on
6	0	1	0	1	0	
7	0	1	0	1	1	
8	0	1	1	0	0	

Tool change process:

1) Determine whether to change the knife;
2) Output status 1 MD0=1 MD1=1, output servo enable to start DI6, turret released, output tool selection signal DI0-DI3;
3) After the turret is loosened into place, the delayed output state is 2 MD0=1 MD1=0, the turret rotates and selects the tool, and the output turret clamps after the knife is in place;
4) After the turret is clamped, delay to determine whether the knife number is consistent, complete the consistent tool change, switch to state 1 MD0=1 MD1=1, disconnect the servo to enable DI6 and the tool selection trigger;
5) When the tool change alarm, the mode switches to state 1 MD0=1 MD1=1, the turret is clamped, the servo is disconnected to enable DI6 and the tool selection is triggered.

Delta (A2) turret servo setting parameters [parameters are generally set before the turret leaves the factory]:

Mode selection P1-01 = 0011, select the turret mode

P1-44 Electronic gear ratio molecule

P1-45 Electronic gear ratio denominator

P2-52 indexing total stroke

P5-92=2 Choose the nearest knife

P5-96 total tool position

The interval angle of each knife P2-52/P2-96

Simple gear ratio method: When the turret reduction ratio is 1:20, there are two ways to set it:

1）P 1-44=20 numerator, P *1-45=1 denominator, P2-52 = number of pulses in one turn of the motor;*

2）P1-44=1 numerator, P *1-45=1 denominator, P2-52=number of pulses in one turn of the motor*20;*

When the turret reduction ratio is not 1:X_, similar to *3:20, it is recommended to use the first setting:*

1）P 1-44=20 numerator, P *1-45=3 denominator, P2-52=number of pulses in one turn of the motor;*

Turret zeroing tool control (incremental turret servo up to A2).

In the zero mode, press the [Tool Change Button] for 2 seconds, and the turret will automatically return to zero to compare the tool.

Knife comparison process:

1) *First switch state 1 MD0=1 MD1=1, servo enable output DI6, turret release;*
2) *After releasing in place, the switching state is 3 MD0=0 MD1=1, and the servo rotates;*
3) *When the servo turret rotates to the No. 1 knife position, the turret is clamped;*
4) *After the turret is clamped, the switching state is 1 MD0=1 MD1=1, and the servo is cut off to enable DI6;*

[Ladder diagram version V2.26 or later adds absolute servo turret tool comparison function].

Turret to knife 1st way:

Drive control is a knife (absolute turret servo up to A2 drive).

1) Loosen the turret

2) Rotate the turret to the No. 1 knife position
3) Lock the turret
4) Turret drive settings:
   a) Press the MODE key until P0-00 is displayed
   b) Press SHIFT until P2-00 appears
   c) Press U P (▲) until P2-69 is displayed
   d) Press the SET key and set P 2-69=, either U P (▲) or D OWN(▼). 1 [Use absolute encoder motor].
   e) Press the SET key to save
      //Settings using absolute encoder motors only need to be saved once
   f) Press U P (▲) until P2-08 is displayed
   g) Press the SET key and set P 2-08= with U P(▲) or D OWN(▼). 271
   h) Press the SET key to save
   i) Press U P (▲) until P2-71 is displayed
   j) Press the SET key and set P 2- with UP (▲) or DOWN (▼) 71=1
   k) Press the SET key to save

At this point, the absolute zero position is set, and the servo turret position is the No. 1 knife position at this time.

Turret compared to knife 2nd way:

The system controls the knife (other turret servo knife with the absolute value of the function of directly setting the current position to No. 1 knife No. 1).

1) control the turret to turn to knife No. 1 and lock it;
2) Open the servo tool function K11.7=1;
3) Switch the system mode to [mechanical zeroing mode];
4) Press and hold the [Tool Change Button] for 2 seconds, the system prompts the turret to return to zero and release;
5) Wait for about 1 0 seconds, when the system alarms [A9.0 Turret Zero Successful], the turret is successfully set to the current position as No. 1, and the system displays 1 Horn knife; If the system alarms [A9.1 turret reset to zero is not successful, please return to zero], the turret setting is unsuccessful, check whether the drive setting is correct.
6) After the turret return to zero is completed, remember to turn off the servo tool comparison function K11.7=0;

2.3.5 Cooling pump control

Relevant command signals (defined by standard PLC programs).

Signal type	symbol	Signal interface	address	Function description	remark
Output signal	M08	CN62.1	Y0.0	Cooling output	
Instruction	M08			Coolant on	

format	M09			Coolant off	

PLC parameters

K10.1==0 Spindle lubrication cooling output at the end of the program (0: off 1: hold);

NOTE: Resetting will stop cooling.

K	1	0	****	****	****	****	****	****	BIT1	****

BIT1 : Spindle lubrication cooling output at the end of the program (0: off 1: hold);

Data parameters

0	8	0	M code execution duration (ms) (default: 1).

Function description (standard PLC program definition).

After the CNC is powered on, M09 is valid, that is, the M08 output is invalid. M08 is executed, M08 output is effective, cooling pump open; Execute M09, cancel M08 output, and turn off the cooling pump.

2.3.6 Lubrication control

Relevant command signals (defined by standard PLC programs).

Signal type	symbol	Signal interface	address	Function description	remark
Output signal	M32	CN62. 2	Y0.1	Lubricating output	
Instruction format	M32			Lubricate on	
	M33			Lubricating off	

Control parameters

Data parameters

1	1	2	Lubrication on time (lubrication is not limited by time when set to 0) Unit: milliseconds

0	8	0	M code execution duration (ms) (default: 1).

PLC parameters

K10.1==0 Spindle lubrication cooling output at the end of the program (0: off 1: hold);

K16.2==1 Turn on when automatic lubrication is effective (0:no 1:Yes) output lubrication;

NOTE: Resetting will stop lubrication.

K	1	0	****	****	****	****	****	****	BIT1	****

BIT1 : Spindle lubrication cooling output at the end of the program (0: off 1: hold);

K	1	6	****	****	****	****	****	BIT2	****	****

BIT2 : Turn on when automatic lubrication is effective (0:no 1:Yes) output lubrication;

T	1	3	Automatic lubrication output time (0~65535ms) (set in number parameter 112 setting).

T	5	3	Automatic lubrication interval time (0~65535s) unit: seconds

- Feature description

1) When DT13 is not zero, automatic lubrication is effective, and the lubrication will be output after the time set by DT 53 every interval (the time set by DT 13); Manual and command can also turn on or off the lubrication output at the time set by DT13 (the timer will restart after this operation);
2) When automatic lubrication is effective, if K16.2 is set to 1, the system will output the lubrication as soon as it is powered on, and the output time is the time set by DT13, and if K16.2 is set to 0, it will need to pass after power-up Thelubrication does not start until after the time set by DT 53.
3) When DT13=0, manual lubrication is effective, if the parameter No.112=0, the output will not be automatically turned off, if not 0, the output time is reached The lubrication output will be automatically turned off after the time set by N0.112;
4) When DT53=0, the lubrication output is closed after entering DT13, and the output is no longer spaced; When DT53 is not 0, the lubrication output is closed after entering DT13, and the output is in the output after the DT53 interval output time;

Lubrication detection signal diagnostics

Diagnostic address	X0.6
Interface pins	CN61.07
Note description	lubrication detection signal; The address is multiplexed with the 4-axis zero deceleration signal, and K16.6=1 when using the lubrication detection signal

PLC parameters

K16.1==0 The warning signal of insufficient lubricant is (0: normally open 1: normally closed) is valid;

K16.6==1 Low lubricant warning prompt (0: invalid 1: valid);

0	7	9	Insufficient lubricant detection delay Unit: milliseconds

2.3.7 Chuck Control

Relevant signals (defined by standard PLC programs).

DIQP: Chuck controls the input signal

DOQPJ: Chuck clamping

DOQPS: The chuck is released

NQPJ: Inner (outer) chuck clamped (loosened) in place

WQPJ: The inner (outer) chuck is loosened (clamped) into place

Signal diagnostics

Signal	DIQP	WQPJ	NQPJ	DOQPJ	DOQPS
Diagnostic address	X0.2	X1.5	X1.6	Y1.4	Y1.5
Interface pins	CN61. 03	CN61. 14	CN61. 15	CN62. 13	CN62. 14
remark	Normally open	Normally open (address and shift in place signal multiplexing)		M12	M13
Note description	External chuck control	Chuck clamping signal	Chuck release signal	Chuck clamping output	The chuck releases the output

Note: The chuck release clamping in place signal and spindle shift 1, 2 gears in place signal address multiplexing, when using the shift in place signal, the chuck release clamping in place signal is invalid.

Control parameters

PLC parameters

K12.0==1 Chuck control function (0: invalid 1: valid);

K12.1==0 Chuck clamping before spindle start (0: check 1: do not check);

K12.2==0 Chuck (0: Wild Card 1: Inner Card) control mode

K12.3==0 (0: Do not check 1: Check) chuck in place signal

K12.4==0 Reset release chuck (0: invalid 1: valid).

K12.5==0 Control chuck at low spindle speed (0: invalid 1: effective).

K	1	2	****	****	****	****	BIT3	BIT2	BIT1	BIT0

BIT0 : Chuck control function (0: invalid 1: valid).

BIT1 : Chuck clamping before spindle start (0:check 1:No check).

BIT2 : Chuck (0: Wild Card 1: Inner Card) control mode

BIT3 : (0: Do not check 1: Check) Chuck-in signal

BIT4 : Reset release chuck (0: invalid 1: Valid).

T	1	8	Chuck output hold time

T18>0: Chuck clamping and release signals are pulse outputs, pulse width set by T18

=0: Chuck clamping and release signals are level outputs

T	2	1	The spindle stops and the chuck operation enables a delay

T	4	3	Chuck-in signal detection timing (default 6000) unit: milliseconds

D	9	9	Spindle zero-speed output range (r/min) (default 5).

Data parameters

0	8	0	M code execution duration (ms) (default: 1).

- Feature description

1) When the chuck control is invalid (K12.0=0), executing the chuck control M command will alarm;
2) When checking the chuck clamping (K12.1=0), the spindle cannot be started without the chuck clamping,

and the chuck must not be released after the spindle is started;

3) K12.2 is used to select whether the chuck clamping output is Y1.4 or Y1.5 (when K12.2=0, the clamping output is Y1.4);
4) When K12.3=0, the M code set by the delay parameter is considered to be complete after the execution time, when K12.3=1, you need to detect the chuck in place signal before the operation is considered complete, if the signal is not received within 6S, it will alarm ;
5) When T 0 18 is not zero, the output of the chuck will be turned off after the time set by T 018;
6) K15.1 is set to 1, and when the spindle shift detects a position signal, it does not check the chuck in place signal.
7) The program cannot manually control the chuck when it is running, but manually controls the chuck in the paused state.
8) When the chuck is interlocked with the spindle (K12.1=0) when the chuck is controlled with the input signal X0.2, the spindle is stopped and the time set by T021 is delayed The feedback speed of the spindle encoder is less than or equal to D99 control to be effective.
9) When the chuck and the spindle are not interlocked when the chuck is controlled with input signal X0.2 (K 12.1=1), the manual control chuck is not associated with the spindle state [ladder diagram version V2.24 The above version has].
10) When the chuck is interlocked with the spindle (K 12.1=0), when the spindle needs low speed, the chuck control can be controlled when the spindle needs low speed, the chuck control is effective when the spindle is low speed (K12.5=1), when the spindle feedback speed is lower than D99 set speed, The chuck loose clamp can be controlled, and the control chuck release system alarm when the spindle feedback speed is higher than D 99 [ladder diagram version V2.24 or later version has].

    Usage examples:

    M12;//chuck clamping

    M3 S200;//D99 set 300, the chuck can be controlled when the spindle feedback is less than 300

...

...

M13;// Release the chuck, the spindle also rotates at a speed of 2 00; If the speed of feedback is greater than 300 at this time, the chuck release alarm is performed

...// There can be no spindle rotation command execution in the middle of the way

...

M12;//chuck clamping

Note: Under the premise that the chuck and the spindle are interlocked, the spindle rotation command (M 3/M4) or manually control the spindle rotation must be in the chuck clamping state before the system alarms.

2.3.8 Tailstock Control

Relevant signals (defined by standard PLC programs).

DOTWJ: Tailstock input output signal

DOTWS: Tailstock retreat output signal

DITW: Tailstock control input signal

Signal diagnostics

Signal	DITW	DOTWJ	DOTWS
Diagnostic address	X0.4	Y2.5	Y2.6
Interface pins	CN61.05	CN62.34	CN62.35
remark	Normally open	M10	M11
Note description	External tailstock control	Tailstock in	Tailstock retreat

Control parameters

PLC parameters

K13.0==1 Tail shaft control function (0: invalid 1: valid).

K13.1==0 spindle rotation and tailstock advance and retreat (0: interlock 1: non-interlocking);

K13.4==0 Reset release tailstock (0: invalid 1: valid).

K	1	3	****	****	****	****	****	****	BIT1	BIT0

BIT0 : Tail shaft control function (0: invalid 1: valid).

BIT1 : Spindle rotation and tailstock advance and retreat (0: interlock 1: not interlocked).

BIT4 : Reset release tailstock (0: invalid 1: valid).

Data parameters

0	8	0	M code execution duration (ms) (default: 1).

1) The tailstock cannot be manually controlled when the program is running, and the tailstock can be manually controlled in the paused state.
2) When using the input signal X0 4When the tailstock and the spindle are interlocked during the control of the tailstock operation (K 13.1=0), the control is only effective when the spindle stops.
3) When using the input signal X0 4When the tailstock and the spindle are not interlocked during the control of the tailstock operation (K 13.1=1), the manual control of the tailstock is not associated with the spindle state [Ladder diagram version V2.24 and later has].

2.3.9 Tricolor lamps

Relevant signals (defined by standard PLC programs)

CLPY: Tricolor light - yellow light

CLPG: Tricolor - Green light

CLPR: Tricolor - Red light

Signal diagnostics

Signal	CLPY	CLPG	CLPR
Diagnostic address	Y2.2	Y2.3	Y2.4
Interface pins	CN62.31	CN62.32	CN62.33
Note description	Yellow light	green light	red light
remark	normal	Running status	Alarm status

2.3.10 Macro variable input and output

The address relationship between macro variable #1**000~#1007 and input port X**
Relevant signals (defined by standard PLC programs)

Macro variables	#1007	#1006	#1005	#1004	#1003	#1002	#1001	#1000
Diagnostic address	X3.7	X3.6	X3.5	X3.4	X3.3	X3.2	X3.1	X3.0
Interface pins	CN61.44	CN61.43	CN61.42	CN61.41	CN61.40	CN61.39	CN61.38	CN61.37
remark	Macro input address and each axis hard limit overtravel, M89K0-K7 detection signal, external spindle magnification switch, 5-axis zero signal multiplexing, please pay attention to the selection of use							

In the ladder diagram of V 2.17 **or later**, you can select the **input macro** #1000**-#1007 port, and you can select the input signal as normally open/normally closed**

K030. 0 M89/macro #1000-#1007 Detection selection (00:X3 01:X2 10:X1 11:X0)
K030.1 M89/macro #1000-#1007 Detection selection (00:X3 01:X2 10:X1 11:X0)
K30.0=0 K30.1=0 Select 0 0 (X3.0-X3.7).
K30.0=1 K30.1=0 Select 0 1 (X2.0-X2.7).
K30.0=0 K30.1= 1 Select 10 (X1.0-X1.7).
K30.0=1 K30.1= 1 Select 11 (X0.0-X0.7).

K031.0 M89 K0/Macro #1000 heartbeat (0: normally open 1: normally closed).
K031.1 M89 K1/macro #1001 heartbeat (0:NO 1:NC).
K031.2 M89 K2/macro #1002 heartbeat (0:NO 1:NC).
K031.3 M89 K3/macro #1003 heartbeat (0: normally open 1: normally closed).
K031.4 M89 K4/macro #1004 heartbeat (0:NO 1:NC).
K031.5 M89 K5/macro #1005 heartbeat (0:NO 1:NC).
K031.6 M89 K6/macro #1006 heartbeat (0:NO 1:NC).
K031.7 M89 K7/macro #1007 heartbeat (0:NO 1:NC).

The address relationship between the macro variable #1100~#1107 and the output port Y
Relevant signals (defined by standard PLC programs)

Macro variables	#1107	#1106	#1105	#1104	#1103	#1102	#1101	#1100
Diagnostic address	Y2.7	Y1.3	Y1.2	Y1.1	Y1.0	Y0.7	Y0.6	Y0.5
Interface pins	CN62.36	CN62.12	CN62.11	CN62.10	CN62.09	CN62.08	CN62.07	CN62.06
remark	Macro output address and M89I0-I7 output signal, spindle stop, spindle brake, spindle clamping, spindle shift output multiplexing, please pay attention to the selection of use.							

Control parameters

PLC parameters

K028.0==1 (0: spindle stop 1: M89 I0 custom/macro output #1100) Output Y0.5 is valid

K028.1==1 (0: Spindle clamping 1 : M89 I 1 Custom/macro output #1101) Output Y0.6 is valid

K028.2==1 (0: Spindle brake 1: M89 I2 Custom/macro output #1102) Output Y0.7 is valid

K028.3==1 (0: spindle 1 gear 1: M89 I3 custom/macro output #1103) Output Y1.0 is valid

K028.4==1 (0: spindle 2 gears 1 : M89 I4 custom/macro output #1104) Output Y1.1 is valid

K028.5==1 (0: spindle 3 gears 1: M89 I5 custom/macro output #1105) Output Y1.2 is valid

K028.6==1 (0: spindle 4 gears 1: M89 I6 custom/macro output #1106) Output Y1.3 is valid

K028.7==1 (0: Brake output 1: M89 I 7 Custom/macro output #1107) Output Y2.7 is valid

K027.0==1 (0:M89I0Custom 1:Macro output #1100)Output Y0.5 is valid

K027.1==1 (0:M89I1Custom 1:Macro output #1101)Output Y0.6 is valid

K027.2==1 (0:M89I2Custom 1:Macro output #1102)Output Y0.7 is valid

K027.3==1 (0:M89I3Custom 1:Macro output #1103)Output Y1.0 is valid

K027.4==1 (0:M89I4Custom 1:Macro output #1104)Output Y1.1 is valid

K027.5==1 (0:M89I5Custom 1:Macro output #1105)Output Y1.2 is valid

K027.6==1 (0:M89I6Custom 1:Macro output #1106)Output Y1.3 is valid

K027.7==1 (0:M89I7Custom 1:Macro output #1107)Output Y2.7 is valid

K	2	7	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : (0:M89I0Custom 1:Macro output #1100) Output Y0.5 valid

BIT1 : (0:M89I1Custom 1:Macro output #1101) Output Y0.6 valid

BIT2 : (0:M89I2Custom 1:Macro output #1102) Output Y0.7 valid

BIT3 : (0:M89I3Custom 1:Macro output #1103) Output Y1.0 is valid

BIT4 : (0:M89I4Custom 1:Macro output #1104) Output Y1.1 is valid

BIT5 : (0:M89I5Custom 1:Macro output #1105) Output Y1.2 is valid

BIT6 : (0:M89I6Custom 1:Macro output #1106) Output Y1.3 is valid

BIT7 : (0:M89I7Custom 1:Macro output #1107) Output Y2.7 valid

K	2	8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : (0: Spindle Stop 1: M89 I0 Custom/Macro Output #1100) Output Y0.5 is valid

BIT1 : (0: Spindle clamping 1 : M89 I1 Custom/macro output #1101) Output Y0.6 valid

BIT2 : (0: Spindle brake 1: M89 I2 Custom/macro output #1102) Output Y0.7 valid

BIT3 : (0: spindle 1 stop 1: M89 I3 custom/macro output #1103) output Y1.0 Effective

BIT4 : (0: spindle 2 gears 1 : M89 I4 custom/macro output #1104) output Y1.1 Effective

BIT5 : (0: spindle 3 gears 1: M89 I5 custom/macro output #1105) output Y1.2 Effective

BIT6 : (0: spindle 4 gears 1: M89 I6 custom/macro output #1106) output Y1.3 Effective

BIT7 : (0: Brake output 1: M89 I 7 Custom/macro output #1107) Output Y2.7 is valid

- **Function description:**

Program Editor:

G65 H81 P50 Q#1000 R1;//Program jumps to N50 segment when #1000=1, #1000=1 when X3.0 is switched on with +24V;

G65 H01 P#1100 Q1;// #1100=1 outputs Y0.5, when #1100=1 outputs the corresponding Y address;

N60 G00 X0 Z0;

G65 H01 P#1100 Q0;// #1100=0 closes output Y0.5, when #1100=0 closes the corresponding Y address;

N50 G00 X50 Z50;

2.3.11 M89 custom detection output

- **Programming format description:**

① M89 K_ J_ R_ P_ I_ Q _

K_: The heartbeat selects K0—K7

J_ : Wait detection time in milliseconds

R_ : Repeat output interval in milliseconds

P_ : Number of repeated outputs The range P0 is output 1 time, P1 is 2 repetitions, P2 is 3 repetitions, and so on

I_ : Select to open the output address I0—I7

Q_ : Select to turn off the output address Q0—Q7

Note: The output addresses of I/Q on and off correspond one-to-one.

M89 output I_, wait for detection K_, no detection within J_ time K_ turn off the output I_, turn on the output after R_ time has elapsed I_ alarm when no K_ is detected within the P_number of cycles, and turn off the output at the same time;

If the M89 code is completed within P_ of the K_ is detected within the number of cycles, the Q_ output is turned off at the same time, and if no Q_ is filled in, it remains I_;

If I_=Q_, turn off the I_ output when M89 is complete; If I_ ≠Q_, keep the I_ output and turn off the Q_ output.

② M89 K_ J_

When M89 does not detect K_ within J_ waiting time, an alarm is generated;

When M89 waits for K_ to be detected within J_ time, the M89 code is complete;

③ M89 I_

M89 output I_ hold

④ M89 Q _

M89 shutdown output Q_

⑤ M89 I_ J_ Q _

M89 output I_ elapsed time J_ Turn off the output Q_;

If the Q_ is not filled in, the M89 output I_ elapsed time J_ turns off the output;

If the elapsed time is I_ = Q_J_ turns off the output;

If I_ ≠Q_, keep the I_ output after elapsed time J_ and turn off the Q_ output.

⑥ M89 K_

When M89 waits for a K_ to be detected, the M89 code completes;

⑦ M89 K_ J_ I_

M89 output I_ wait for K_ to be detected, K_ detected within time J_, M89 code complete;

If no K_ is detected within the time J_, the system generates an alarm;

When no J_ or J=0 is written, it waits for the detection K_ signal until the K_ signal is detected, and no alarm is generated;

⑧ M89 K_ J_ Q _

M89 closes output Q_ waits for K_ to be detected, K_ detected within time J_, M89 code completes;

If no K_ is detected within the time J_, the system generates an alarm;

When no J_ or J=0 is written, it waits for the detection K_ signal until the K_ signal is detected, and no alarm is generated;

M89 L_ Minimum Hold Time for Signal Detection When the M89 K detection function is turned on, if there is no L programming, the code will be completed as soon as there is a signal, and when there is L, the code can only be completed when the signal is greater than the L editing time;

All edited formats with K can use L to detect duration.

Note: When K0-K7 is not written after M89**, the M89 code is completed directly;**

The address relationship between the M89K0—K7 heartbeat and the input port X

Relevant signals (defined by standard PLC programs)

M89	K7	K6	K5	K4	K3	K2	K1	K0
Diagnostic address	X3.7	X3.6	X3.5	X3.4	X3.3	X3.2	X3.1	X3.0
Interface pins	CN61.44	CN61.43	CN61.42	CN61.41	CN61.40	CN61.39	CN61.38	CN61.37
remark	M89K0-K7 detection signal and each axis hard limit overtravel, macro input, external spindle magnification switch, 5-axis zero signal multiplexing, please pay attention to the choice of use							

In the ladder diagram of **V2.17 or later**, the **input M89K0-K7 port can be selected, and the input signal can be selected as normally open/normally closed**

K030. 0 M89/macro #1000-#1007 Detection selection (00:X3 01:X2 10:X1 11:X0)

K030.1 M89/macro #1000-#1007 Detection selection (00:X3 01:X2 10:X1 11:X0)

K30.0=0 K30.1=0 Select 0 0 (X3.0-X3.7).

K30.0=1 K30.1=0 Select 0 1 (X2.0-X2.7).

K30.0=0 K30.1= 1 Select 10 (X1.0-X1.7).

K30.0=1 K30.1= 1 Select 11 (X0.0-X0.7).

K031.0 M89 K0/Macro #1000 heartbeat (0: normally open 1: normally closed).

K031.1 M89 K1/macro #1001 heartbeat (0:NO 1:NC).

K031.2 M89 K2/macro #1002 heartbeat (0:NO 1:NC).

K031.3 M89 K3/macro #1003 heartbeat (0: normally open 1: normally closed).

K031.4 M89 K4/macro #1004 heartbeat (0:NO 1:NC).

K031.5 M89 K5/macro #1005 heartbeat (0:NO 1:NC).

K031.6 M89 K6/macro #1006 heartbeat (0:NO 1:NC).

K031.7 M89 K7/macro #1007 heartbeat (0:NO 1:NC).

The address relationship between the M89I0—**I7/Q0—Q7 output/shutdown signal and the output port Y**

Relevant signals (defined by standard PLC programs)

M89	I7/Q7	I6/Q6	I5/Q5	I4/Q4	I3/Q3	I2/Q2	I1/Q1	I0/Q0
Diagnostic address	Y2.7	Y1.3	Y1.2	Y1.1	Y1.0	Y0.7	Y0.6	Y0.5
Interface pins	CN62.36	CN62.12	CN62.11	CN62.10	CN62.09	CN62.08	CN62.07	CN62.06
remark	M89I0-I7 output signal address and macro output, spindle stop, spindle brake, spindle clamping, spindle shift output multiplexing, please pay attention to choose to use.							

Note: Not in program zero, mechanical zero mode or program operation, you can manually control the output or shutdown of I0-I7/Q0-Q7 separately**;**

The corresponding button of control I0-I7/Q0-Q7 is the number **0-7 of the PLC interface to expand the control interface.**

Control parameters

PLC parameters

K029.0==0 Disconnect the M89 I0 output when reset (0:Yes 1:No).

K029.1==0 Disconnect the M89 I1 output when reset (0:Yes 1:No).

K029.2==0 disconnects the M89 I2 output when reset (0:Yes 1:No).

K029.3==0 Disconnect the M89 I3 output when reset (0:Yes 1:No).

K029.4==0 Disconnect the M89 I4 output when reset (0:Yes 1:No).

K029.5==0 Disconnect the M89 I5 output when reset (0:Yes 1:No).

K029.6==0 Disconnect the M89 I6 output when reset (0:Yes 1:No).

K029.7==0 Disconnect the M89 I7 output when reset (0:Yes 1:No).

K028.0==1 (0: spindle stop 1: M89 I0 custom/macro output #1100) Output Y0.5 is valid

K028.1==1 (0: Spindle clamping 1: M89 I1 custom/macro output #1101) Output Y0.6 is valid

K028.2==1 (0: Spindle brake 1: M89 I2 custom/macro output #1102) Output Y0.7 valid

K028.3==1 (0: spindle 1 stop 1: M89 I3 custom/macro output #1103) Output Y1.0 is valid

K028.4==1 (0: spindle 2 gears 1 : M89 I4 custom/macro output #1104) Output Y1.1 is valid

K028.5==1 (0: spindle 3 gears 1: M89 I5 custom/macro output #1105) Output Y1.2 is valid

K028.6==1 (0: spindle 4 gears 1: M89 I6 custom/macro output #1106) Output Y1.3 is valid

K028.7==1 (0: Brake output 1: M89 I7 custom/macro output #1107) Output Y2.7 is valid

K027.0==0 (0:M89I0Custom 1:Macro output #1100)Output Y0.5 is valid

K027.1==0 (0:M89I1Custom 1:Macro output #1101)Output Y0.6 is valid

K027.2==0 (0:M89I2Custom 1:Macro output #1102)Output Y0.7 is valid

K027.3==0 (0:M89I3Custom 1:Macro output #1103)Output Y1.0 is valid
K027.4==0 (0:M89I4Custom 1:Macro output #1104)Output Y1.1 is valid
K027.5==0 (0:M89I5Custom 1:Macro output #1105)Output Y1.2 is valid
K027.6==0 (0:M89I6Custom 1:Macro output #1106)Output Y1.3 is valid
K027.7==0 (0:M89I7Custom 1:Macro output #1107)Output Y2.7 is valid

K	2	9	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Disconnects the M89I0 output when reset (0:Yes 1:No).
BIT1 : Disconnect the M89I1 output on reset (0:Yes 1:No).
BIT2 : Disconnects the M89I2 output on reset (0:Yes 1:No).
BIT3 : Disconnects the M89I3 output on reset (0:Yes 1:No).
BIT4 : Disconnect the M89I4 output on reset (0:Yes 1:No).
BIT5 : Disconnect the M89I5 output on reset (0:Yes 1:No).
BIT6 : Disconnect the M89I6 output on reset (0:Yes 1:No).
BIT7 : Disconnect the M89I7 output on reset (0:Yes 1:No).

K	2	7	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : (0:M89I0Custom 1:Macro output #1100) Output Y0.5 valid
BIT1 : (0:M89I1Custom 1:Macro output #1101) Output Y0.6 valid
BIT2 : (0:M89I2Custom 1:Macro output #1102) Output Y0.7 valid
BIT3 : (0:M89I3Custom 1:Macro output #1103) Output Y1.0 is valid
BIT4 : (0:M89I4Custom 1:Macro output #1104) Output Y1.1 is valid
BIT5 : (0:M89I5Custom 1:Macro output #1105) Output Y1.2 is valid
BIT6 : (0:M89I6Custom 1:Macro output #1106) Output Y1.3 is valid
BIT7 : (0:M89I7Custom 1:Macro output #1107) Output Y2.7 valid

K	2	8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : (0: Spindle Stop 1: M89 I0 Custom/Macro Output #1100) Output Y0.5 is valid
BIT1 : (0: Spindle clamping 1: M89 I1 custom/macro output #1101) Output Y0.6 is valid
BIT2 : (0: Spindle brake 1: M89 I2 Custom/Macro Output #1102) Output Y0.7 valid
BIT3 : (0: spindle 1 stop 1: M89 I3 custom/macro output #1103) Output Y1.0 valid
BIT4 : (0: spindle 2 gears 1 : M89 I4 custom/macro output #1104) Output Y1.1 is valid
BIT5 : (0: spindle 3 gears 1: M89 I5 custom/macro output #1105) Output Y1.2 is valid
BIT6 : (0: spindle 4 gears 1: M89 I6 custom/macro output #1106) Output Y1.3 valid
BIT7 : (0: Brake output 1: M89 I7 custom/macro output #1107) Output Y2.7 is valid

2.3.12 M90, M91 program segment loop instructions

- Programming format description:

  M91 C_;// Loop program segment starts, C_ number of cycles
  ;
  ;
  M90;// End of loop segment

Example:
T0101;
M3 S1000;
G0 X32 Z5;
M91 C5; The loop program segment starts, 5 times (loop N10-N20 program segments).
N10 G01 X30 Z0 F500;
G01 Z-20;
G01 X20 Z-40;
G0 X32;
N20 Z0;
M90; // End of loop segment

2.3.13 M92, M93 program jump

M92 conditional jump instruction:

- Programming Format:
  M92 K_ N_ ;
  M92 L_ N_ ;

K_ Input high; (Range K0--K7 corresponds to #1000--#1007=1, #1000--#1007 Corresponding input signal reference 2.3.10)
L_ Input low; (Range L0--L7 corresponds to #1000--#1007=0)
N_ Jump program segment number;
When the conditions are met, jump to the N_ paragraph;

Example:
M92 K0 N10;//When #1000=1(X3.0=1), the program jumps to segment N10; The instructions for G65 H81 P10 Q#1000 R1 are the same
G0 X50 ;
N10 G0 X30 ;
G0 X0;
M92 L0 N10;// When #1000=0(X3.0=0), the program jumps to N10 segment G65 H81 P10 Q#1000 R0 with the same instructions

M93 Unconditional Jump Instruction:

- Programming Format:
  M93 N_ ;
  N_ Jump program segment number;
  Jump to N_ when running to M93 N_;

Example:
M93 N10;//Jump to N10 segment
G0 X50;
N10 G01 X30;

When running to the M93 N10 segment, the program jumps to the N10 segment and does not execute G0 X50.

2.3.14 User-defined output

Relevant signals (defined by standard PLC programs)

Diagnostic address	Y0.2	Y3.0	Y3.1	Y3.2	Y3.5	Y3.6	Y3.7
Interface pins	CN62.03	CN62.37	CN62.38	CN62.39	CN62.42	CN62.43	CN62.44
Note description	Guard door output M34/M35	Custom K4 output M76/M77	Chip removal output M36/M37	Work light output M38/M39	Custom K1 output M70/M71	Custom K2 output M72/M73	Custom K3 output M74/M75
remark	Emergency STOP reset selects the output to be turned off when the system is powered on						

Note: K017 0 Automatic **output of the work light when the system is powered on (0: invalid 1: valid).**

NOTE: The reset disconnect output can be set

K032.0 Reset (0:No 1:Yes) Disconnect the guard gate output M34

K032.1 Reset (0:No 1:Yes) Disconnect the chip conveyor output M36

K032.2 Reset (0:No 1:Yes) Disconnect the work lamp output M38

K032.3 Reset (0:No 1:Yes) Disconnect K1 output M70

K032.4 Reset (0:No 1:Yes) Disconnect K2 output M72

K032.5 Reset (0:No 1:Yes) Disconnect K3 output M74

K032.6 Reset (0:No 1:Yes) Disconnect K4 output M76

Data parameters

0	8	0	M code execution duration (ms) (default: 1).

2.3.15 Three-position switch function

Signal diagnostics

Diagnostic address	X2.4	X2.5
Interface pins	CN62.33	CN62.34
Note description	Three-position switch 1	Three-position switch 2
remark	The three-position switch signal is repeated with the turret input signal address, so pay attention to the choice of use	

Control parameters

PLC parameters

K14.5==1 Three-position switch function (0: invalid 1: valid).

K	1	4	****	****	BIT5	****	****	****	****	****

BIT5： Three-position switch function (0: invalid 1: valid).

- **Function description:**

The three-position switch is two normally open contacts

The switch hits the left for neutral;

The switch hits the middle for the program pause;

The switch is hit to the right for the program to pause the spindle stop gear;

When the program is paused by the three-digit switch pause function during program operation, the program continues to run when the three-digit switch is turned to neutral again.

Three-position switch 2 is neutral when turned on to 24V

When the three-position switch 1 is switched on with 24V, the spindle stop program is suspended

The program pauses when 1/2 of the three-position switch is disconnected from 24V

2.3.16 External feed rate switch

Signal diagnostics

Diagnostic address	X0.7	X1.0	X1.1	X1.2
Interface pins	CN61.08	CN61.09	CN61.10	CN61.11
Note description	External magnification switch A	External magnification switch F	External magnification switch B	External magnification switch E
remark	The external magnification switch signal is repeated with the 5-8 tool position input signal address of the ordinary electric tool holder, pay attention to the selection and use			

Control parameters

PLC parameters

K010.3==0 feed rate (0: magnification can be adjusted 1: fixed at 100%)

K016.0==1 External feed multiplier switch (0: invalid 1: valid).

K	1	0	****	****	****	****	BIT3	****	****	****

BIT3： Feed rate (0: magnification can be adjusted 1: fixed at 100%)

K	1	6	****	****	****	****	****	****	****	BIT0

BIT0： External feed multiplier switch (0: invalid 1: valid).

- Feature description

1) When K10.3 is set to 1, the cutting feed ratio is fixed at 100%, and the feed rate adjustment is invalid.
2) The adjustment buttons on the panel will have no effect when an external feed rate switch is selected
3) When the total number of knife sets of ordinary tool holders is greater than 4, the external feed rate cannot be selected, otherwise an alarm No. 1031 will appear.
4) When tapping or tapping, the feed multiplier cannot be adjusted.

2.3.17 External spindle magnification switch

Signal diagnostics

Diagnostic address	X3.4	X3.5	X3.6	X3.7
Interface pins	CN61.41	CN61.42	CN61.43	CN61.44
Note description	External spindle switch A	External spindle switch F	External spindle switch B	External spindle switch E
remark	External spindle magnification switch address and M89K4-K7 detection signal, 5-axis return signal multiplexing, 5-axis overtravel signal, please pay attention to choose to use			

Control parameters

PLC parameters

K017.5==1 External magnification switch for spindle (0: invalid 1: valid).

K	1	7	****	****	BIT5	****	****	****	****	****

BIT5 : Spindle external magnification switch (0: invalid 1: valid).

- **Feature description**

1) The adjustment buttons on the panel will have no effect when an external feed rate switch is selected
2) When tapping or tapping, the feed multiplier cannot be adjusted.

2.3.18 G31 jump function

Signal diagnostics

Diagnostic address	X2.7
Interface pins	CN61.36
Note description	G31 jump function
remark	K24.7 selects the sense level

Relevant parameters

K024.7==0 G31 jump signal is (0:NC 1:DEAD) valid and valid

K	2	4	BIT7	****	BIT5	****	****	****	****	****

- **Function description**

1) Code format: G31 X/U_ Z/W_ F_;
2) Code function: During the execution of the code, if an external jump signal (X2.7) is entered, the execution of the code is interrupted and the next program segment is executed. This function can be used for dynamic measurement of workpiece dimensions (e.g. grinding machines), tool measurement, etc.
3) Code description: Non-modal G-code (group 00);

4) It is consistent with the G01 code address format and is similar to the use;
5) The tip radius compensation needs to be revoked before using the code;
6) In order to ensure the accuracy of the stop position, the feed speed should not be set too large.
7) Lines for subsequent segments when the jump occurs:
8) The next segment of the G31 is incremental coordinate programming, see Figure 3-13

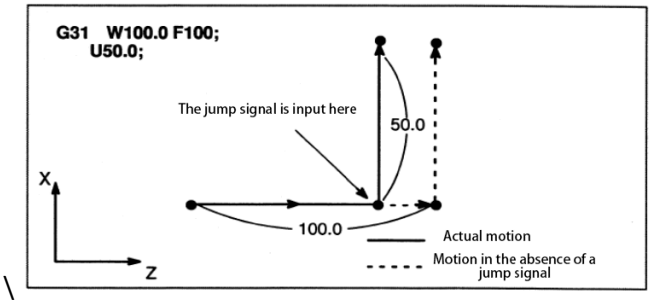


Figure 3-13

9) The next program segment of G31 is the programming of absolute coordinates of 1 axis, see Figure 3-14

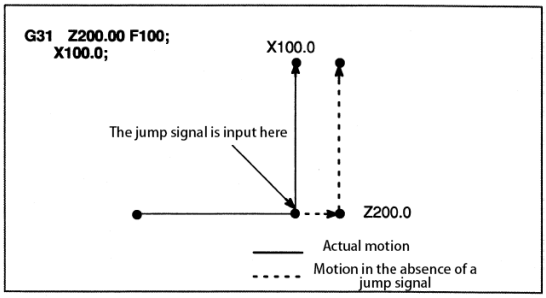


Figure 3-14

10) The next program segment of the G31 is the programming of absolute coordinates of the 2 axes, see Figure 3-15

Program: G31 Z200 F100

G01 X100 Z300

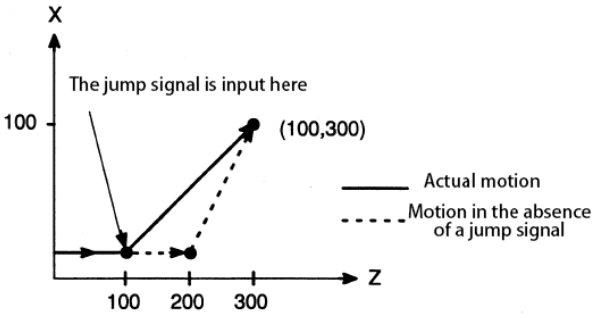


Figure 3-15

Action: When the jump signal changes to "1", the CNC processes as follows:

While the program segment is executing jump code G31, the CNC stores the current absolute coordinate position of each axis. The CNC stops the movement of the G31 code and starts the execution of the next program segment, and the jump signal detects not its rising edge, but its state. Therefore, if the jump signal is

"1", it is considered that its jump condition is immediately met**.**

Note: To ensure stop position accuracy, the feed speed of the G31 should be as low as possible.

2.3.19 Brake output

Signal diagnostics

Diagnostic address	Y2.7
Interface pins	CN62.36
Note description	Brake output
remark	The output address is multiplexed with the macro output #1107 and M89 I7 output addresses, please pay attention to select to use

Relevant parameters

K028.7==0 (0: Brake output 1: M89 I7 custom/macro output #1107) Output Y2.7 is valid

K	2	8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT7 : (0: Brake output 1: M89 I7 custom/macro output #1107) Output Y2.7 is valid

- Function description:

After the system is ready to start up, open the brake with a delay of 1 second, and immediately disconnect the brake output when the emergency stop or drive alarm is triggered;

2.3.20 Protective door function

Diagnostic address	X0.0
Interface pins	CN61.1
Note description	Protective door detection signal
remark	

Relevant parameters

K014.2==1 Guard door function (0: invalid 1: valid).

K014.3==1 The protective door detection signal is (0:NORMALLY open 1:NC) is valid

K014.4==0 Spindle when the protective door is open (0: closed 1: not closed).

K	1	4	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT2 : Protective door function (0: invalid 1: valid).

BIT3 : The protective door detection signal is (0:NO 1:NC) active

BIT4 : Spindle when the guard door is open (0: closed 1: not closed).

- **Function description:**

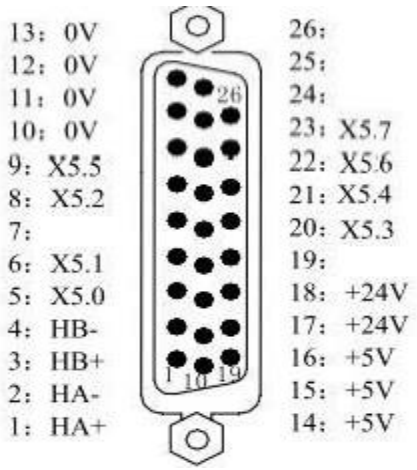
Start the program with the protective door open, system alarm A2.0 [the protective door is not closed,

automatic operation is not allowed];

When the door is opened during program operation, the program is paused, the cooling is closed, and the spindle can choose whether to close or not.

2.4 Handwheel connection setup instructions

2.4.1 Handwheel Interface Definition



CN31 handwheel connector (26-pin pin).

Signal	illustrate
HA + 、HA -	Handwheel A phase signal
HB + 、HB -	Handwheel Phase B signal
X5.0	X-handwheel axle selection
X5.1	3 handwheel axle selection
X5.2	Z-handwheel axle selection
X5.3	4-axis handwheel axle selection
X5.4	5-axis handwheel axle selection
X5.5	Increment X1
X5.6	Increment X10
X5.7	Increment X100
+24V	DC power supply 24V
+5V	DC power supply 5V
0V	DC power supply 0V

Control parameters

Status parameter

013.0==0 The coordinates increase when the X-axis handwheel (0: forward 1: counterclockwise) rotates

013.1==0 The coordinates increase when the Z-axis handwheel (0:forward 1:counterclockwise) rotates

013.2==0 The coordinates increase when the 3-axis handwheel (0:forward 1:counterclockwise) rotates

013.3==0 The coordinates increase when rotating clockwise on the 4-axis handwheel (0:forward 1:counterclock).

013.4==0 The coordinates increase when rotating clockwise on the 5-axis handwheel (0:forward 1:counterclock).

013.7==1 The handwheel wheel rotation displacement (0:No 1:Yes) runs in full

Note: Bit parameter 13.6 [Handwheel test cut (0:No 1:Yes) can be run in reverse].

0	1	3

BIT7	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : X-axis handwheel (0:forward 1:counterclockwise) increases when the coordinates are rotated clockwise

BIT1 : Z-axis handwheel (0:forward 1:counterclockwise) increases when the coordinates are rotated clockwise

BIT2 : 3TH AXIS HANDWHEEL (0:FORWARD 1:COUNTER) INCREASES THE COORDINATES WHEN ROTATING

CLOCKWISE

BIT3： 4TH AXIS HANDWHEEL (0: FORWARD 1: COUNTER) INCREASES THE COORDINATES WHEN ROTATING CLOCKWISE

BIT4： 5TH AXIS HANDWHEEL (0:FORWARD 1:COUNTER) INCREASES THE COORDINATES WHEN ROTATING CLOCKWISE

BIT7： Handwheel wheel rotation displacement (0:no 1:Yes) runs in full

Data parameters

3	3	3

Maximum clamping speed for incomplete operation of the handwheel (default: 2000).

PLC parameters

K3.4==0 External handwheel axle selection (0: valid 1: invalid)

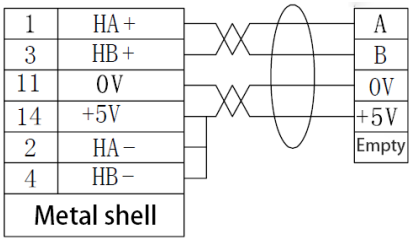
K	0	3

****	****	****	BIT4	****	****	****	****

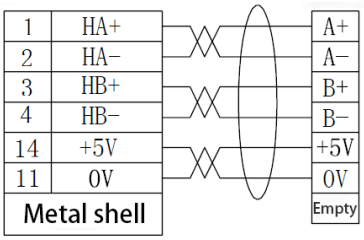
BIT4： External Hand Axle Selection (0: valid 1: invalid).

External signal connection of the machine

(CN31) handwheel (CN31) handwheel



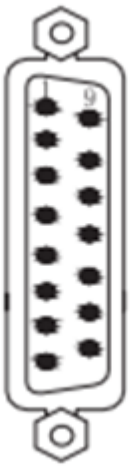
Single-ended method



Differential connection

2.5 The spindle is connected to the spindle encoder

2.5.1 Encoder interface definition



Foot size	name	illustrate
1	dangling	
11、14、15	GND	Power supply 0V
3	#PCS	Encoder phase C negative pulse
4	PCS	Encoder phase C forward pulse
5	#PBS	Encoder phase B negative pulse
6	PBS	Encoder phase B forward pulse
7	#PAS	Encoder A phase negative pulse
8	PAS	Encoder A phase forward pulse
12	TH5IO5V	Power supply 5V
13	TH5IO5V	Power supply 5V

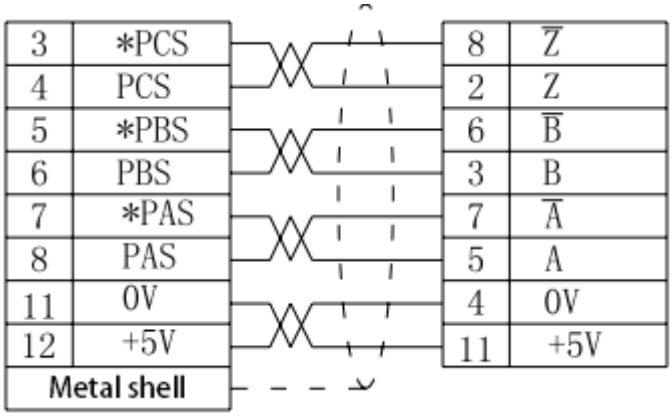
CN21 Encoder interface(15-pin).

2.5.2 The spindle is connected to the encoder

The connection between the lathe system and the spindle encoder is shown in the figure below, and the twisted pair is used when connecting. (Take the light of Changchun.)

ZLF-12-102.4BM-C05D encoder for example):

Lathe system Changchun Yiguang 1024 encoder

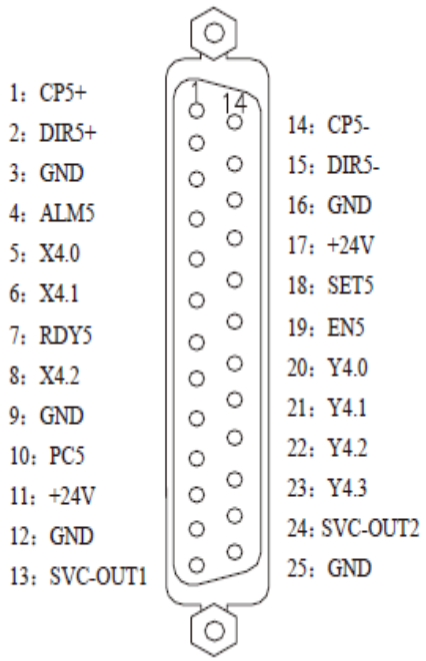


Data parameters

0	7	0	Number of spindle encoder lines (default: 1024).
1	1	0	Encoder to spindle gear ratio parameter: number of spindle gears (default: 1).
1	1	1	Encoder to spindle gear ratio parameter: number of encoder gears (default value: 1).

Note: The encoder and spindle must be connected with a 1:1 timing pulley when threading.

2.5.3 Spindle Interface Definition



CN15 5th axis spindle interface

Foot size	address	definition
3、9、6	0V	Power supply 0V
11、17	+24V	Power supply +24V
1	CP5+	The spindle pulses a positive signal
2	DIR5+	Positive signal in the direction of the spindle
4	ALM5	Spindle drive alarm
5	X4.0	The spindle is directed to the signal in place
6	X4. 1	Speed Arrival/2nd Spindle Alarm
7	RDY5	The spindle is ready for signaling
8	X4.2	retain
9	GND	Power supply 0V terminal
10	PC5	Spindle zero signal
11	+24V	The power supply is +24V
12	GND	The spindle analog voltage is 0V
13	SVC-OUT1	Spindle analog voltage output 1
14	CP5 -	The spindle pulses the negative signal
15	DIRD -	Negative signal in the direction of the spindle
19	EN5	Enable signal
20	Y4.0	Spindle directional output
21	Y4.1	Pulse spindle enable/spindle forward rotation
22	Y4.2	Spindle position control output
23	Y4.3	The spindle is reversed
24	SVC-OUT2	Spindle analog voltage output 2
25	GND	The spindle analog voltage is 0V

Note 1: X4.0-X4.2 detection +24V on-off is effective; The spindle alarm signal detects that 0V on and off is effective

Note 2: Y4.1 is a signal output by both forward and reverse pulse spindle and position mode, in order to facilitate the connection of full pulse control spindle enable function.

Note 3: Y4.1 is the composite output point, which can be enabled for the pulse spindle **or the spindle forward output by K 17.2 selection function, and enabled for the pulse spindle when K17.2=0; K17.2=1 forward rotation of the spindle (the function is the same as Y0.3 M03 output, M05 off).**

Note 4: Y 4.3 is the main axis reverse (the function is the same as Y0.4 M04 output, M05 off).

Note 5: The PC5 zero signal is valid with 0 **V, and no resistor is required for wiring (the other 4 feed axes PC signal is valid with 24V);**

2.5.4 Spindle Control

Relevant signals (defined by standard PLC programs).

Signal type	symbol	Signal interface	addr ess	Signal function	remark
Input signal	nALM_M	CN15.04		Spindle abnormal alarm input	This signal has a valid 0V input
Output signal	M03	CN62. 04	Y0.3	The spindle rotates counterclockwise (forward rotation).	Y4.1 function selects forward rotation
	M04	CN62. 05	Y0.4	The spindle rotates clockwise (reverses).	Y4.3 Functional reversal
	M05	CN62.06	Y0.5	The spindle stops	Address multiplexing, please note the option to use
	SPZD	CN62.08	Y0. 7	Spindle brake	Address multiplexing, please note the option to use
	GND	CN15.12		The spindle analog voltage is 0V	
	SVC_OUT1	CN15. 13		Spindle analog voltage output	
Instructio n format	M03			The spindle rotates counterclockwise (forward rotation).	
	M04			The spindle rotates clockwise (reverses).	
	M05			The spindle stops	

Note: Spindle stop output address Y0.5 and macro output #1100, M89 I0 output address multiplexing K28.0 selection; spindle brake output address Y0.7 and macro output #1102, M89 I2 output address multiplexing K28.2 selection;

Note 2: In spindle 1 mode, spindle magnification controls spindle 1.

NOTE 3: The reset button stops spindle rotation, K10.1 [spindle lubrication cooling output at the end of the program (0: off 1: hold)].

Control parameters

Status parameter

001.4==1 Spindle speed (0: switching control 1: analog voltage control).

009.7==1 Spindle alarm signal (0:high 1:low) level alarm (disconnected from 0V).

0	0	1	****	****	****	BIT4	****	****	****	****

BIT4 : Spindle speed (0: switching control 1: analog voltage control).

0	0	9	BIT7	****	****	****	****	****	****	****

BIT7 : Spindle alarm signal (0:high 1:low) level alarm (on and off with 0V).

Data parameters

0	2	1	Spindle analog voltage output voltage offset offset compensation value

			(default value: 0).
0	3	7	Corresponds to the maximum speed of the first gear (M41) of the spindle [Set the maximum speed of the spindle] (default: 6000).
0	7	0	Spindle encoder line speed (default: 1024).
0	7	5	Maximum spindle speed (default: 6000).
0	8	0	M code execution duration (ms) (default: 1).
0	8	7	Spindle brake delay output time (ms) (default: 0).
0	8	9	Spindle brake output time (ms) (default: 50).
1	0	8	Spindle jog time (default: 3000) unit: milliseconds
1	0	9	Rotation speed when the spindle is jogged (default: 40).
1	1	0	Encoder to spindle gear ratio: the number of spindle end gear teeth (default: 1).
1	1	1	Encoder to spindle gear ratio: the number of gear teeth at the encoder end (default: 1).
3	7	4	The spindle speed value (default: 300) is set at the power of the system

- **Spindle jog function:**

  In the spindle analog voltage control state, turn on the [spindle jog] function, and then manually select the spindle forward/reverse; The spindle rotates or reverses according to the speed set by parameter 109, and stops after the time set by parameter 108.

Note: If you choose the pulse control spindle speed mode, you can choose the 3rd axis or **4th axis or 5th axis shaft mouth pulse control spindle, pay attention to the selection;**

Number parameter 375 The minimum speed when the feed shaft is the pulse spindle and the square axle of the car is stopped (default 1).

Parameter 178.2 The feed shaft stops the position before starting when the simulated spindle stops (0:no 1:Yes).

Bit 178 1 Whether axis 3 is set to simulate the spindle (0:No 1:Yes).

Parameter 006.4 Whether the 4th axis is set to the analog spindle (0:no 1:Yes).

Bit 178 0 Whether axis 5 is set to analog spindle (0:No 1:Yes).

Bit 178 5 The 3rd axis is the (0:1:2nd) spindle selected when simulating the spindle

bit parameter 006 3 The 4th axis is the (0:1 1:2nd) spindle selected when simulating the spindle

Bit 178 4 The 5th axis is the (0:1 1:2nd) spindle when simulating the spindle

If the 3rd axis and the 4th axis and the 5th axis are both selected pulse spindle position parameters 1 78.1 = 1 sum 6.4=1 and 178.0=1, both select the first spindle position parameter 178.5 =0 and 6.3=0 and 178.4=0, the spindle rotation command is initiated M3/M4, the three axes emit the same pulse to control the spindle; So pay attention to the choice of use.

The function of the second spindle of the 5th axis is not standard, and the function is retained;

The standard ladder diagram of the 4th axis 2nd spindle function is written in the 4th axis power head function, and M53/M can be used after the parameters are opened 54/M55 control;

The standard ladder diagram of the 3rd axis and the 2nd spindle function is written in the 3rd axis power head function, and the parameters can be controlled by M 50/M51/M52 after opening;

Bit 178 2 (when the feed shaft does pulse spindle stop (0:no 1:yes) stop in the position before starting) parameter role:

When stopping at the start bit is not selected, 178.2=0, the stop position of the **pulse spindle is random, but the stop position corresponds to the coordinate position displayed by the system;**

Select 178.2=1 at the start**, and the pulse spindle stop position will stop the coordinate position before starting; The minimum speed of the stop has a number of parameters 375 control.**

The control pulse spindle gear ratio will be changed to feed shaft gear ratio control;

The gear ratio of the pulse spindle of the **fifth** shaft is **148/151;**

The gear ratio of the pulse spindle of the fourth shaft is 147/150;

The gear ratio of the pulse spindle in the third shaft is 146**/149;**

The gear ratio calculation is consistent with the feed shaft algorithm, for example, the **number of encoder lines of the spindle motor is 2500**, **and the rotation shaft goes in one turn 360,**

Numerator/denominator = [**2500*4]/[360*1000]=10/360;**

Under the normal gear ratio of the pulse spindle 1/36, the maximum pulse output frequency is 6 000r/min, if the spindle needs to be greater than 6 000r/min, the system gear can be magnified by 2 times than the denominator, and the driven molecule can be magnified by 2 times, so that the output can be 12000r/min, and so on.

Note: The maximum spindle speed of the lathe system is 9999r/min.

Note: After the power head or pulse spindle stops, the corresponding shaft will switch back to the feed shaft, and the feed shaft command can be executed.

Note: When the system only uses 3 axes including the C axis, the 3rd axis can be selected as the C axis, and the pulse port is issued by the 5th axis.

Number parameter 2No. 25 [Axis name definition for axis 3 (3:A 4:B 5:C Other:.] Y)] ;

NUMBER 50 [5TH AXIS PORT PULSE SENT (3:3TH 4:4TH OTHER: 5TH)].

2.5.5 Spindle speed switching control

Relevant signals (defined by standard PLC programs).

S01~S04: spindle speed switching control signal, standard PLC program definition of S01~S04 signal interface for multiplexing interface, S01~S04 Shared interface with M41~M44.

Control logic (standard PLC program definition).

When the CNC is powered up, the S1 ~ S4 output is invalid. Execute any code in S01, S02, S03, S04, the corresponding S signal output is valid and maintained, while canceling other S The output of the signal. When executing the S05—S07 code, cancel the output of S1 ~ S4, S1 ~ S4 Only one output is valid at a time.

Signal diagnostics

Signal	S1	S2	S3	S4
Diagnostic address	Y1.0	Y1.1	Y1.2	Y1.3
Interface pins	CN62. 09	CN62. 10	CN62. 11	CN62. 12
Note description	Spindle 1st gear	Spindle 2nd gear	Spindle 3 gears	Spindle 4 gears
remark	The spindle gear output address is multiplexed with the macro output #1103--#1106, M89 I3-I6 output address, please pay attention to the selection and use			

Control parameters

Status parameter

001.4==0 Spindle speed (0: switching control 1: analog voltage control).

0	0	1	****	****	****	SPTY	****	****	****	****

BIT4 : Spindle speed (0: switching control 1: analog voltage control).

Data parameters

0	8	1	Code execution time (default: 1).

PLC parameters

K015.4==0 Delayed disconnect output after spindle shift (0: invalid 1: valid).

K028.3==0 (0: spindle 1 stop 1: M89 I3 custom/macro output #1103) Output Y1.0 is valid

K028.4==0 (0: spindle 2 gear 1 : M89 I4 custom/macro output #1104) Output Y1.1 is valid

K028.5==0 (0: spindle 3 gears 1: M89 I5 custom/macro output #1105) Output Y1.2 is valid

K028.6==0 (0: spindle 4 gears 1: M89 I6 custom/macro output #1106) Output Y1.3 is valid

K	1	5	****	****	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT4 : Delayed disconnect output after spindle shift (0: invalid 1: valid).

K	2	8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : (0: Spindle Stop 1: M89 I0 Custom/Macro Output #1100) Output Y0.5 is valid

BIT1 : (0: Spindle clamping 1: M89 I1 custom/macro output #1101) Output Y0.6 is valid

BIT2 : (0: Spindle brake 1: M89 I2 Custom/Macro Output #1102) Output Y0.7 valid

BIT3 : (0: spindle 1 stop 1: M89 I3 custom/macro output #1103) Output Y1.0 valid
BIT4 : (0: spindle 2 gears 1 : M89 I4 custom/macro output #1104) Output Y1.1 is valid
BIT5 : (0: spindle 3 gears 1: M89 I5 custom/macro output #1105) Output Y1.2 is valid
BIT6 : (0: spindle 4 gears 1: M89 I6 custom/macro output #1106) Output Y1.3 valid
BIT7 : (0: Brake output 1: M89 I7 custom/macro output #1107) Output Y2.7 is valid

Note: When K15.4=1 [delay disconnect output after spindle shift is completed (0: invalid 1: valid)], the gear output is disconnected by 0.8 seconds **after the spindle shift is completed.**

2.5.6 Automatic spindle shift control

Relevant signals (defined by standard PLC programs).

M41 ~ M44: Spindle automatic shift output signal, when spindle analog control (0 ~ 10V analog voltage output) is selected, it can support 4 gears of spindle automatic shift control.

M41I, M42I: Spindle automatic shift 1st and 2nd gear shift in place signal, can support 2 gear shift in place detection function.

Signal diagnostics

Signal	M41I	M42I	M41	M42	M43	M44
Diagnostic address	X1.5	X1.6	Y1.0	Y1.1	Y1.2	Y1.3
Interface pins	CN61.14	CN61. 15	CN62. 09	CN62. 10	CN62. 11	CN62. 12
Note description	1 stop in place	2 stops in place signal	Spindle 1st gear	Spindle 2nd gear	Spindle 3 gears	Spindle 4 gears
remark	The presence signal and chuck in place signal address are multiplexed, and when the detection shift is in place, the chuck in place detection is invalid		The spindle gear output address is multiplexed with the macro output #1103--#1106, M89 I3-I6 output address, please pay attention to the selection and use			

Control parameters

Status parameter

001.4==1 Spindle speed (0: switching control 1: analog voltage control).

0	0	1

****	****	****	SPTY	****	****	****	****

BIT4 : Spindle speed (0: switching control 1: analog voltage control).

Data parameters

0	6	5

Spindle shift time 1 (default: 1000) The timing of the spindle shift off the original gear time

0	6	6

Spindle shift time 2 (default: 1000) The delay from the output of the new gear of the spindle to the end

PLC parameters

K015.0==1 Spindle automatic shift function (0: invalid 1: valid).

K015.1==0 (0: Do not check 1: Check) Shift in place signal

K015.2==1 The automatic shift 1 and 2nd gears in place signal is (0:normally open 1:normally closed) is valid

K015.3==0 Spindle gear (0:No 1:Yes) Power-down memory

K015.4==0 Delayed disconnect output after spindle shift (0: invalid 1: valid).

K015.5==0 spindle forward rotation signal when spindle automatic gear change (0:no 1:Yes).

K028.3==0 (0: spindle 1 stop 1: M89 I3 custom/macro output #1103) Output Y1.0 is valid

K028.4==0 (0: spindle 2 gear 1 : M89 I4 custom/macro output #1104) Output Y1.1 is valid

K028.5==0 (0: spindle 3 gears 1: M89 I5 custom/macro output #1105) Output Y1.2 is valid

K028.6==0 (0: spindle 4 gears 1: M89 I6 custom/macro output #1106) Output Y1.3 is valid

K	1	5	****	****	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Spindle automatic shift function (0: invalid 1: valid).

BIT1 : (0: Do not check 1: Check) Shift in place signal

BIT2 : Automatic gear shift 1 and 2nd gear in place signal is (0: normally open 1: normally closed) is valid

BIT3 : Spindle gear (0:No 1:Yes) Power-down memory

BIT4 : Delayed disconnect output after spindle shift (0: invalid 1: valid).

BIT5 : Spindle forward rotation signal when spindle automatic gear shifting (0:No 1:Yes).

K	2	8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : (0: Spindle Stop 1: M89 I0 Custom/Macro Output #1100) Output Y0.5 is valid

BIT1 : (0: Spindle clamping 1: M89 I1 custom/macro output #1101) Output Y0.6 is valid

BIT2 : (0: Spindle brake 1: M89 I2 Custom/Macro Output #1102) Output Y0.7 valid

BIT3 : (0: spindle 1 stop 1: M89 I3 custom/macro output #1103) Output Y1.0 valid

BIT4 : (0: spindle 2 gears 1 : M89 I4 custom/macro output #1104) Output Y1.1 is valid

BIT5 : (0: spindle 3 gears 1: M89 I5 custom/macro output #1105) Output Y1.2 is valid

BIT6 : (0: spindle 4 gears 1: M89 I6 custom/macro output #1106) Output Y1.3 valid

BIT7 : (0: Brake output 1: M89 I7 custom/macro output #1107) Output Y2.7 is valid

T	4	5	Spindle automatic shift timing ms (default: 10000) time after the time arrives without a detection signal alarm

Data parameters

0	3	7	Corresponds to the maximum speed of the first gear (M41) of the spindle (default value: 6000).

0	3	8	Corresponds to the maximum speed of the second gear (M42) of the spindle (default value: 6000).

0	3	9	Corresponds to the maximum speed (default: 6000) in the third gear (M43) of the spindle

0	4	0	Corresponds to the maximum speed of the spindle in the fourth gear (M44) (default: 6000).

0	6	5	Spindle shift time 1 (default: 1000) The timing of the spindle shift off the original gear time

0	6	6	Spindle shift time 2 (default: 1000) The delay from the output of the new gear of the spindle to the end
0	6	7	The output voltage (mV) when the spindle is shifting gears (default: 100).

Note: When changing gears, the output can choose a fixed analog voltage MV or select the output target gear to fix the speed r/min.
Parameter 179.6 [Spindle automatic shift output (0:**parameter 6** No. 7 is fixed voltage **1:**No. **7 No. 7 is fixed speed)].**
Parameter 1 79.4 [Spindle shift instruction M41-M44 when executed (0:**Yes 1:No) shifts gears with the spindle.] Output analog correlated].**

- **Function description:**

1) When the spindle speed is selected as analog voltage control mode (the Bit4 bit of the status parameter NO.001 is set to 1), and the status parameter K0015.0 is set to 1, the spindle automatic gear shift function is effective; when the spindle automatic gear shift function is invalid, the CNC will alarm when M41~M44 is executed. M41, M42, M43, M44 are valid only one at a time.
2) Spindle automatic gear shift function is used to control the automatic switching of spindle mechanical gear, CNC executes the S□□□□ code, according to the current M4n control gear corresponding parameters (M41~M44 corresponding to data parameters NO.037~NO.040) to calculate the analog voltage output to the spindle servo or inverter, control the actual speed of the spindle and the speed of the S code is consistent.
3) When the parameter K0015.3 is 0, the spindle gear is not remembered, and the M41 output is re-powered; when the parameter K0015.3 is 1, the spindle gear is remembered, and the state when the power is turned off will be maintained when the power is re-powered.
4) Execute any code in M41, M42, M43, M44, and output analog voltage to the spindle servo or inverter according to the value (unit: millivolts) set by data parameter NO.067;
5) After the delay data parameter No. 065 (shift time 1), turn off the original gear output signal and output a new shift signal at the same time;
6) When the gear shift is 1 or 2 gears, and the parameter K0015.1 [(0: do not check 1 : check) shift in place signal] is 1, then turn 7), otherwise turn 8). ;
7) Check the input signal M41I and M42I in 1 or 2 gears, and turn 8 if the gear is in place); If the gear shift is not in place, the CNC has been waiting for the shift in place signal to pass the time T45 set time and the signal is not detected, then alarm;
8) Delay data parameter No066 (shift time 2), according to the current gear according to the data parameter NO.037~NO.040 (corresponding to 1~4 gears) set value output spindle analog voltage, shift end.
9) When K15.1=1 [(0:Do not check 1: Check) shift in place signal], the chuck in place signal Not checked;
10) M4 □ is performed when K15.5=1 [spindle forward rotation signal when spindle automatically shifts (0:no 1:yes)]. When the output gear is output at the same time, the spindle forward rotation is output, and the spindle forward rotation is disconnected after the gear shift is completed
11) When K15.4=1 [Delay disconnect output after spindle shift is completed (0:invalid 1: valid)], the delay

after spindle shifting is completed is 0.8 seconds Disconnect the gear output.

2.5.7 2nd spindle function

Relevant signals (defined by standard PLC programs).

Signal type	symbol	Signal interface	address	Signal function	remark
Input signal	ALM	CN15.06	X4.1	2nd spindle alarm signal	
Output signal	M63	CN62.40	Y3.3	The second spindle rotates counterclockwise (forward rotation).	
	M64	CN62.41	Y3.4	The second spindle rotates clockwise (reverses).	
	GND	CN15.25		The second spindle analog voltage 0V terminal	
	SVC_OUT1	CN15.24		2nd spindle analog voltage output	
Instruction format	M63			The second spindle rotates counterclockwise (forward rotation).	
	M64			The second spindle rotates clockwise (reverses).	
	M65			The spindle stops	

Note 1: In analog voltage control mode, the second spindle is active;

Note 2: In spindle 2 mode, spindle magnification controls spindle 2.

Control parameters

Status parameter

001.4==1 Spindle speed (0: switching control 1: analog voltage control).

196.4==1 Whether to activate the multi-spindle control function (0:No 1:Yes).

0	0	1	****	****	****	BIT4	****	****	****	****

BIT4 : Spindle speed (0: switching control 1: analog voltage control).

1	9	6	****	****	****	BIT4	****	****	****	****

BIT4 : Whether to activate the multi-spindle control function (0:no 1:Yes).

Data parameters

0	6	4	The second spindle corresponds to a maximum speed of 1 0 V (default: 6000).

Note: At the same time, it is controlled by the maximum speed of the spindle No. 75

0	7	5	Maximum spindle speed (default: 6000).

3	7	4	The spindle speed value (default: 300) is set at the power of the system

PLC parameters

K17.7==1 Multi-spindle function (0: invalid 1: valid)

The K17.3==0 2nd spindle alarm signal is valid with +24V (0: on 1: off).

K	1	7	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT7 : Multi-spindle function (0: invalid 1: valid).

2.5.8 Spindle clamping function

Signal diagnostics

Signal	Y0.6
Diagnostic address	CN62.07
Note description	Spindle clamping output
remark	M20 spindle clamping/M21 spindle loosening; The spindle clamping output address is multiplexed with the macro output #1101 and M89 I1 output addresses, please pay attention to the selection to use

Control parameters:

PLC parameters

K17.6==0 Spindle clamping when multispindle is active (0: 1st spindle 1: 2nd spindle)

K28.1==0 (0: spindle clamping 1: M89 I1 custom/macro output #1101) Output Y0.6 is valid

K21.5 Spindle clamping CS axis selection (00:5th 01:4th 10:3th 11: invalid) [Ladder version V 2.19]

K21.6 Spindle clamping CS axis selection (00:5th 01:4th 10:3th 11: invalid) [Ladder version V 2.19]

K	1	7	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT6 : Spindle clamping when multispindle is active (0: 1st spindle 1: 2nd spindle).

K	2	8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT1 : (0: Spindle clamping 1: M89 I1 custom/macro output #1101) Output Y0.6 is valid

- **Function description:**
  1) M20 and M21 are a pair of M commands that control spindle clamping and clamping loosening, which are used to clamp the spindle after positioning to avoid spindle rotation during drilling or tapping.
  2) M20 spindle clamping cannot be performed when the spindle is moved or rotated, and after the spindle is clamped, the spindle cannot be rotated or moved, otherwise the PLC will alarm.
  3) The spindle to be clamped when selecting spindle clamping by K17.6 setting is the first spindle or the second spindle, and should be set according to the actual situation.
  4) The standard ladder diagram can select the first axis to do CS axis (K21.5/K21.6), when K17.6=0 [When multiple spindles are valid, the spindle clamps (0: 1st spindle 1: 2nd spindle)], when the 1st spindle rotates or the spindle CS function indexing is performed, the system alarms the PLC Clamping

the spindle is not allowed when holding the A5.3 spindle when rotating or feeding; When the 1st spindle has been clamped and the 1st spindle rotation or spindle CS function indexing is performed, the system alarm PLC alarm A5.4 The spindle is clamped and rotation or feed is not allowed 。

5) When K17.6=1 [spindle clamping when multispindle is active, spindle clamping (0: 1st spindle 1: 2nd spindle)], the system alarms when M20 spindle clamping is performed during the rotation of the second spindle or the spindle CS function indexing PLC is not allowed to clamp the spindle when holding the A5.3 spindle when rotating or feeding; The 2nd spindle has been clamped, and when the 2nd spindle rotation or spindle CS function indexing is performed, the system alarm PLC alarm A5.4 spindle is clamped and rotation or feed is not allowed 。

Note: Added automatic loosening and clamping function (Version 2 **021,** [Ladder Version V2.19]**);**

Number parameter 216 [G83/G87 drilling blank] default 2

Number parameter 217 [Spindle clamping M code] default 20 [If you need to modify the corresponding spindle M code of the ladder diagram, this parameter also needs to be modified to the corresponding M code value].

Parameter 172.5 [Drill/Boring/Rigid Tapping/Cycle CS-axis clamping automatic (0:No 1:Yes) Valid] Default 0

When the C S axis is automatically released in the G83/G87/G85/G89 drilling cycle (edited with M20 instruction), the CS axis command is not moved in the punching instruction G83/G87, and the spindle clamping **instruction** needs to wait for the completion of the command before output; Instruction CS axis movement command needs to automatically loosen the spindle clamping;

G83 C100 Z-20 R5 F100 M20;//After the completion of M 21, after the completion of C100, execute M20;

C140 M20; // After the completion of the execution of M 21, after the completion of the execution of C100, execute M20;

G80;

Note: Open parameter 1 **72.5=1 [drilling/boring/rigid tapping/cycling spindle clamping automatic (0:no 1:Yes) effective]**, **when the C axis needs to be clamped and loosened in the cycle code, you can control the spindle clamping and loosening without editing the M20 code, The system automatically joins the execution of C coordinates first The system first executes the release** code M **21** after the completion of the **wait for the completion of the C coordinate, and executes the M20** clamping code after the coordinates are completed**; If M 20 is also edited when the parameter is turned on, M20 shall prevail.**

2.5.9 Multi-spindle function description

Relevant signals (defined by standard PLC programs).

Signal type	symbol	Signal interface	addr ess	Signal function	remark
Output signal	M03	CN62.04	Y0.3	The first spindle rotates counterclockwise (forward rotation).	Y4.1 function selects forward rotation
	M04	CN62.05	Y0.4	The first spindle rotates clockwise (reverses).	Y4.3 Functional reversal
	M05	CN62.06	Y0.5	The first spindle stops	

	GND	CN15.12		The first spindle analog voltage 0V terminal	
	SVC_OUT1	CN15.13		Analog voltage output of the first spindle	
	M63	CN62.40	Y3.3	The second spindle rotates counterclockwise (forward rotation).	
	M64	CN62.41	Y3.4	The second spindle rotates clockwise (reverses).	
	M65			The second spindle stops	
	GND	CN15.25		The second spindle analog voltage 0V terminal	
	SVC_OUT2	CN15.24		2nd spindle analog voltage output	

Related instructions

M03 The first spindle rotates
M04 The first spindle is reversed
M05 Spindle 1 stops
M63 2nd spindle forwards
M64 2nd spindle reversed
M65 2nd spindle stops
M20 spindle clamping output
M21 spindle clamp loosen output

- **Feature description**

1) After the multi-spindle control function is set effectively, the power-on defaults to the first spindle control;
2) Execute M03, M04, M05, the corresponding signal output of the first spindle, in this case, it will be set to the first spindle control, and the S command executed thereafter will change the speed of the first spindle. Similarly, if you execute M63, M64, M65, the corresponding signal output of the second spindle, which will be converted to the second spindle control, and the S command executed thereafter will change the speed of the second spindle.
3) Spindle switching is ineffective when rigid tapping.
4) The panel spindle manual forward, reverse, and spindle magnification buttons are only valid for the first spindle. When currently controlling the second spindle, the panel spindle manual control button can still control the first spindle.
5) The spindle magnification of the second spindle is fixed at 100%.
6) The panel spindle stop button can control the stop function of the 2-way spindle and the power head.

2.5.10 Spindle speed/position mode switching

Relevant signals (defined by standard PLC programs)

Signal type	symbol	Signal interface	address	Signal function	remark
Output signal	M14	CN15.20/22	Y4.0/Y4.2	Axis 1 directional output/switching position mode	
	M15			The first spindle switches the speed mode	Power-up default
	M29	CN15.22	Y4.2	The first spindle switches the position mode	Tapping mode
	M24	Feature reserved		The second spindle directs output/switches position mode	
	M25			The second spindle switches the speed mode	Power-up default

Related instructions

M14 The first spindle switches from speed control mode to Cs profile control mode;

The first spindle of the M15 switches from Cs profile control to speed control. The default power-up is the speed control mode.

Note: CS axis function can choose 3, 4, 5 axes, the axis must be set to the rotating axis, spindle clamping function when selecting clamping the first spindle, the standard ladder diagram to select the CS axis to judge the alarm.

Note: The switching of spindle speed/CS profile control is only effective if the spindle is selected as the rotary axis, and the Cs function of the spindle is active, and the corresponding spindle servo drive unit is the speed/position switching working mode.

Relevant parameters

Status parameter

001.4==1 Spindle speed (0: switching control 1: analog voltage control).

0	0	1

****	****	****	BIT4		****	****	****	****

BIT4 : Spindle speed (0: switching control 1: analog voltage control).

PLC parameters

K15.6==1 Emergency stop, spindle profile control when reset (0: not off 1: off).

K15.7==1 CS axis function (0: invalid 1: valid).

K20.3==0 Spindle quasi-stop signal (0: check 1: do not check).

K20.4==0 The spindle quasi-stop signal is (0:NO 1:NC) is valid

K20.5==1 Position output (Y4.2) after the spindle is quasi-stopped in place (0: do not switch 1: switch).

NOTE: K13.7 Chuck/tailstock (0:No 1:Yes) interlocks with spindle positioning

K	1	5

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT6 : Emergency stop, spindle profile control when reset (0: not off 1: off).

BIT7 : Cs axis function (0: invalid 1: valid).

K	2	0

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT3 : Spindle quasi-stop signal (0: check 1: Do not check).

BIT4 : The spindle quasi-stop signal is (0:NO 1:NC) is valid

BIT5 : Position output (Y4.2) after the spindle is quasi-stopped (0: do not switch 1: switch).

Note: When K20.3=1 spindle quasi-stop signal is not detected, spindle quasi-stop is completed through T066 time parameter setting:

T	6	6	Ignoring directional to in-place signal delay completion unit: milliseconds

T	1	4	Position mode output is switched after delaying the positioning output Unit: milliseconds

- **Function description:**

1) The spindle is operated by switching position mode in speed mode: M14 can be executed or switched by pressing [C/S key] on the panel in manual/handwheel mode.
2) Spindle switching step: Y4.0 spindle positioning is issued first, spindle completion (receiving spindle positioning completion signal) delay 8ms output spindle position Y4.2 (optional K20.5). When selecting K20.5==1 positioning to complete the switching position mode, the spindle positioning output is disconnected after the T014 setting time, and the M14 code can be executed (only the spindle positioning is in the spindle position mode output and the T014 setting time is output at the same time).
3) The spindle is switched from position mode to speed mode: M15 can be executed or switched by pressing [C / S key] on the panel under normal standby state;

Added parameters: K20.6 [M 14 command (0:Yes 1:No) reposition when spindle is in positioning/position mode].

K20.7 [CS-axis switching instruction completion (0: wait 1: do not wait) directional completion signal]

Bit parameter 187.4 [When running CS axis command does not switch position mode (0: alarm 1: wait)].

Number parameter 218 [Spindle positioning switching position mode instruction code (default 14)].

When the spindle is already in the positioning or position state, K20.6=1 does not need to be repositioned when the M14 instruction is executed, and the code is completed directly.

When waiting for completion in the spindle orientation instruction, you can set K20.7=1 not to wait for the code to complete, but when the subsequent program has the edit CS axis move instruction, it will wait for the spindle switching position to complete and issue the command, so K20.7 should be combined with bit parameter 187.4 and number parameter 218 is used together, for example:

Do not wait for the positioning completion signal K20.7=1, bit parameter 187.4=1 when running the CS axis command does not switch the position mode when waiting for the switching to complete otherwise run to C when the directional switching position is not completed Alarm when the S axis moves the command, select K20.7=1/bit parameter 187 4=1 hour parameter 2Number 18 must be equal to the switching instruction M code number.

M14;// Instantaneous code without waiting

G0X100Z100;// When moving the XZ axis at this time, it is possible that the spindle is still positioning

G0C100； // You must wait for the spindle to switch position mode after the move is complete

Related instructions

The M24 second spindle switches from speed control to Cs profile control (not standard).

The second spindle of the M25 switches from Cs profile control to speed control. The default power-up is the speed control mode. (Not standard).

Note: The switching of the speed control and Cs profile control of the second spindle is effective only when the 4th axis is selected as the rotary axis, and the Cs function of the 4th axis is effective, and the corresponding spindle servo drive unit is the speed/position switching working mode.

Related instructions

M29 Open tapping mode, flexible tapping or rigid tapping.

M20 spindle clamping output

M21 spindle clamp loosen output

Note: The rigid tapping function (open 3/4 case) is only available if the selected additional axis is a rotating axis.

Relevant parameters

Status parameter

001.4==1 Spindle speed (0: switching control 1: analog voltage control).

213.0==1 The spindle control mode is (0:follow 1:servo) [follow is flexible tapping, servo is rigid tapping].

Note: The tapping parameters in version 2021 rear parameter 196 are **invalid.**

0	0	1	****	****	****	BIT4	****	****	****	****

BIT4 : Spindle speed (0: switching control 1: analog voltage control).

2	1	3	****	****	****	****	****	****	****	BIT0

BIT0 : The spindle control mode is (0:Follow 1:Servo) when tapping

Data parameters

2	5	6	Linear acceleration and deceleration constant of the spindle and tapping shaft

2	5	9	The linear acceleration and deceleration constant of the spindle and tapping shaft during tool retraction

The tapping spindle gear ratio is the feed shaft gear ratio parameter

PLC parameters

K14.7==1 M29 Rigid tapping output spindle position mode Y4.2 (0: valid 1: invalid)

K	1	4	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT7 : M29 Rigid Tapping Output Spindle Position Mode Y4.2 (0: valid 1: invalid)

Added parameters (version2021).

Parameter 213.0 The spindle control mode is (0:Follow 1:Servo) when tapping

When 213.0 chooses to follow, the presence or absence of M29 commands are all flexible tapping, which is controlled by the forward and reverse rotation of the spindle; When selecting the servo, there is an M29 instruction for rigid tapping, and the tapping pulse port is selected through the parameters

Parameter 209.0 G84 rigid tapping whether to choose 3 axes as the spindle (0:no 1 yes).

Parameter 209.1 G84 rigid tapping whether to select the 4th axis as the spindle (0:no 1Yes).

Parameter 209.2 G84 rigid tapping whether to select the 5th axis as the spindle (0:no 1 is).
Parameter 209.3 G84 whether the spindle direction is reversed (0:no 1:Yes)
Parameter 209.4 G88 rigid tapping whether to choose 3 axes as the spindle (0:no 1 yes).
Position parameter 209.5 G88 rigid tapping whether to choose the 4th axis as the spindle (0:no 1 yes).
Parameter 209.6 G88 rigid tapping whether to select the 5th axis as the spindle (0:no 1 Yes).
Parameter 209.7 G88 whether the spindle direction is reversed (0:no 1:yes)

- Description of the rigid tapping function

1) Execute M29 only to switch the system to the rigid tapping state, and choose whether to switch the position mode for the spindle servo through K14.7;
   Note: When M29 selects switching position mode K**14.7, the system does not output positioning to switch CS** mode **directly to position mode.**
   If the system automatically disconnects the position mode output after the tapping is completed, if only the M29 is **edited to switch** to position mode **and no tapping action, you need to switch** back **to** the spindle speed mode with **M15.**
2) Before the M29 switchover, the spindle is allowed to be controlled in speed mode or Cs profile, and after returning from rigid tapping, the spindle returns to the control mode before switching.
3) When in a rigid tapping state, the shaft cannot be moved manually.
4) When there is a reset or emergency stop in the rigid tapping, the rigid tapping state is canceled.
5) When the spindle needs flexible tapping and the spindle needs indexing, K14.7=1 is required.

- **Description of the flexible tapping function**

Note: When the bit parameter 213.0=0 selects the tapping to follow, the programming instruction M29 is flexible tapping;

Note: When the tapping servo is selected for **bit parameter 213.0=1, the programming instruction has** M29 for rigid tapping and flexible tapping when **M29 is not edited;**

- **Tapping programming mode: For specific programming formats, see Appendix "Tapping Chapter"**
  M29 S_;//S_ tapping speed
  G84 Z-10 F1.5 //Z direction tapping
  G80;//End of tapping code

2.5.11 Pulse power head function

Relevant directives (standard ladder diagrams).

symbol	Pulse interface	Code features	remark
M50	CN12 (3TH AXIS INTERFACE).	The 3-axis pulse power head rotates forward	Start delay T054
M51		3-axis pulse power head reverse	
M52		The 3-axis pulse power head stops	
M53	CN14 (4TH-AXIS	The 4-axis pulse power head rotates forward	Start delay T055

M54	INTERFACE).	4-axis pulse power head reverse	
M55		The 4-axis pulse power head stops	

- **Programming Format:**

M3 S500;
M50 S1000;//3-axis power head forward rotation; alarm when K14.1=1;
G04 X3;
M52;// 3-axis power head stops
M53 S2000;//4-axis power head forward rotation; alarm when K14.1=1;
G04 X3;
M55;//4-axis power head stops
M5;//Spindle stop

Relevant parameters:

Status parameters:

001.4==1 Spindle speed (0: switching control 1: analog voltage control).

006.3==1 Select when the 4th axis is set as a simulated spindle (0: 1st spindle 1: 2nd spindle) (4 axes as the power head).

006.4==1 Whether axis 4 is set as an analog spindle (0:no 1:Yes).

178.1==1 Whether axis 3 is set as an analog spindle (0:no 1:Yes).

178.5==1 Selection when axis 3 is set as analog spindle (0: 1st spindle 1: 2nd spindle).

196.4==1 Whether to activate the multi-spindle control function (0:No 1:Yes)

0	0	1	****	****	****	BIT4	****	****	****	****

BIT4 : Spindle speed (0: switching control 1: analog voltage control).

0	0	6	****	****	****	BIT4	BIT3	****	****	****

BIT3 : Selected when axis 4 is set as analog spindle (0: 1st spindle 1: 2nd spindle).

BIT4 : Whether axis 4 is set as an analog spindle (0:no 1:Yes).

1	7	8	****	****	BIT5	****	****	****	BIT1	****

BIT1 : Whether the 3 axes are set as analog spindles (0:no 1:Yes).

BIT5 : 3 axis is selected when set as analog spindle (0: 1st spindle 1: 2nd spindle).

1	9	6	****	****	****	BIT4	****	****	****	****

BIT4 : Whether to activate the multi-spindle control function (0:no 1:Yes).

Data parameters

Note: Subject to the maximum speed of the spindle No. 75 (not subject to the maximum speed limit of the second spindle of the No. 64)

0	7	5	Maximum spindle speed (default: 6000).
0	3	6	The maximum speed of the second pulse spindle (power head) (default: 3000).
3	4	5	Acceleration and deceleration time constant of 3-axis power head (default: 200).
3	4	6	4-axis power head acceleration and deceleration time constant (default: 200).

Note: The time constant setting is too small, and the motor is prone to vibration.

3	7	4	The spindle speed value (default: 300) is set at the power of the system

The standard ladder diagram of the 4th axis and the second spindle function is written in the 4th axis power head function, and the parameters can be controlled by M 53/M 54/M55 after opening;

The standard ladder diagram of the 3rd axis and the 2nd spindle function is written in the 3rd axis power head function, and the parameters can be controlled by M 50/M51/M52 after opening;

Bit 178 2 (when the feed shaft does pulse spindle stop (0:no 1:yes) stop in the position before starting) parameter role:

When stopping at the start bit is not selected, 178.2=0, the stop position of the **pulse spindle is random, but the stop position corresponds to the coordinate position displayed by the system;**

Select 178.2=1 at the start**, and the pulse spindle stop position will stop the coordinate position before starting; The minimum speed of the stop has several parameters 174 control.**

The control pulse spindle gear ratio will be changed to feed shaft gear ratio control;

The gear ratio of the pulse spindle of the fourth shaft is 147/150;

The gear ratio of the pulse spindle in the third shaft is 146**/149;**

The gear ratio calculation is consistent with the feed shaft algorithm, for example, the **number of encoder lines of the spindle motor is 2500**, **and the rotation shaft goes in one turn 360,**

Numerator/denominator = [**2500*4]/[360*1000]=10/360;**

Under the normal gear ratio of the pulse spindle 1/36, the maximum pulse output frequency is 6 000r/min, if the spindle needs to be greater than 6 000r/min, the system gear can be magnified by 2 times than the denominator, and the driven molecule can be magnified by 2 times, so that the output can be 12000r/min, and so on.

Note: The maximum spindle speed of the lathe system is 9999r/min.

Note: The maximum speed of the power head can be set to the number of parameters 36;

PLC parameters

K014.0==1 Impulse power shaft function (0: invalid 1: valid).

K014.1==0 The power head (0:No 1:Yes) can rotate at the same time as the spindle

The K021.2 3TH/4TH power head (0:No 1:Yes) can run simultaneously

K021.3==0 3-axis do power head (0: effective 1: invalid).

K021.4==0 4-axis power head (0: valid 1: invalid).

K	1	4	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Impulse power shaft function (0: invalid 1: active).

BIT1 : The power head (0:No 1:Yes) can rotate at the same time as the spindle

K	2	1	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT2 : 3TH/4TH power head (0:no 1:yes) can run simultaneously

BIT3 : 3 axes do the power head (0: effective 1: invalid).

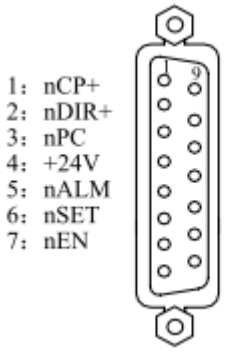
BIT4 : 4 axes do power head (0: effective 1: invalid).

- **Function description:**

1) When using the 3-axis or 4-axis interface as the power head in the case of open 3-axis and 4-axis, the corresponding additional shaft should be set as a rotary axis:
   3/4 Rotation axis parameters:
   Status parameters:
   187.0=1 3 axes are the axis of rotation; 188.0=1 When the 3 axes are the axis of rotation, the absolute coordinate cycle is valid; 188.2=1 When the 3 axis is the axis of rotation, the relative coordinate cycle is valid;
   189.0=1 4 axes are the axis of rotation; 190.0=1 When the 4th axis is the axis of rotation, the absolute coordinate cycle is valid; 190.2=1 When the 4 axis is the axis of rotation, the relative coordinate cycle is effective;
2) After the power head or pulse spindle stops, the corresponding shaft will switch back to the feed shaft, and the feed shaft command can be executed.

2.6 Connection of the drive unit

2.6.1 Driver interface definition



Signal	Explain
nCP+、nCP-	Command pulse signal
nDIR+、nDIR-	Command direction signal
nPC	Zero signal
nALM	Drive alarm signal
nEN	Axis enable signal
nSET	Pulse stop signal

CN11, CN12, CN13**, CN14 (15-pin hole)** interfaces

2.6.2 Axis control enable

Relevant parameters:

Status parameters:

014.5==0 Enables each axis via G39 signal (0:No 1:Yes).

0	1	4

****	****	BIT5	BIT4	****	****	****	****

BIT5 : Each axis is enabled via G39 signal (0:no 1:yes).

Note 1: When it is 0, the axis control enable is always issued;

Note 2: When it is 1, the axis control can be triggered by the G39 signal and controlled by PLC;

PLC parameters: (valid when 014.5=1)

K025.0==0 Emergency Stop (0:Yes 1:No) turns off X-axis enable

K025.1==0 Emergency Stop (0:Yes 1:No) turns off Z-axis enable

K025.2==0 Emergency Stop (0:Yes 1:No) turns off Y-axis enable

K025.3==0 Emergency Stop (0:Yes 1:No) turns off 4-axis enable

K025.4==0 Emergency Stop (0:Yes 1:No) turns off 5-axis enable

K	2	5

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Emergency Stop (0:Yes 1:No) Off X-axis enable

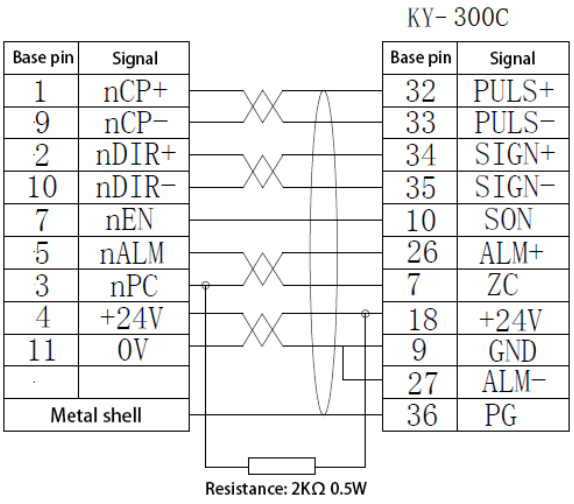
BIT1 : Emergency Stop (0:Yes 1:No) turns off Z-axis enable

BIT2 : Emergency Stop (0:Yes 1:No) turns off Y-axis enable

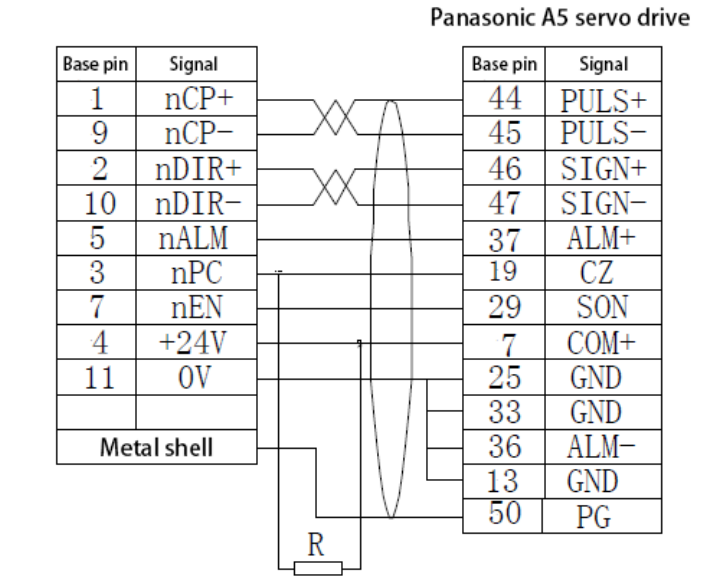
BIT3 : Emergency Stop (0:Yes 1:No) Off 4-axis enable

BIT4 : Emergency Stop (0:Yes 1:No) Off 5-axis enable

2.6.3 Connection diagram of the system to the KY-300C drive



2.6.4 Connection diagram between the system and Panasonic A5 driver:



Note: Since the return reference point signal PC is active at high level and the Panasonic Z-phase output signal CZ is low level, a resistor should be connected in parallel (resistance is 2.2KΩ 0.5W).

Note: Resistor R is 2K/0.5W;

Drive parameters:

Pr0.00 Direction of rotation

PR0.01 Control Mode Setting (0: Position Mode)

Pr0.05=1 command pulse input to select 0--1, select optocoupler or long-line drive input; (long drive for high speed, optocoupler for low speed) 44/45, 46/47 with long drive; 3/4,5/6 with low speed;

PR0.06 command pulse rotation direction setting;

PR0.07 Command pulse input mode setting 0--3,3: pulse + direction;

Pr0.08 Number of command pulses per 1 revolution;

PR0.09 command pulse molecule;

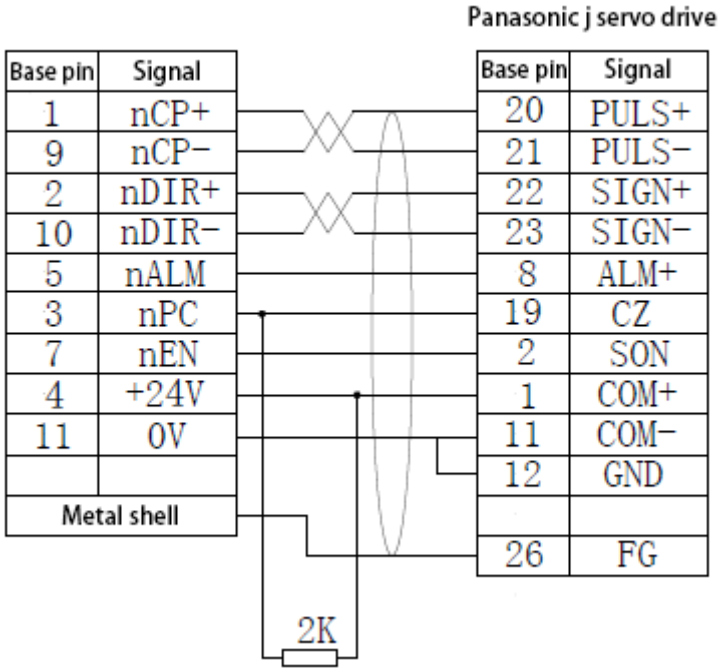
Pr0.10 command pulse denominator;

Pr1.00 position loop gain;

Pr1.01 velocity loop gain;

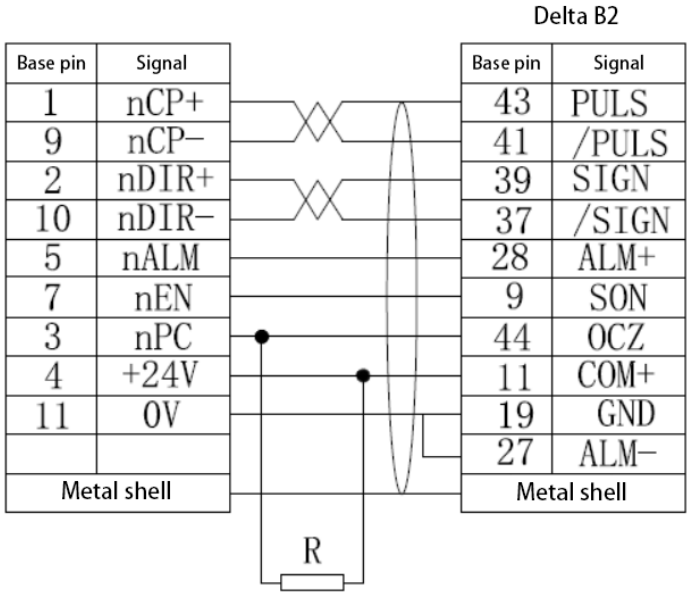
Pr1.02 velocity ring integral time constant;

2.6.5 Connection diagram of the system and Panasonic J-series



Note: Resistor R is 2K/0.5W;

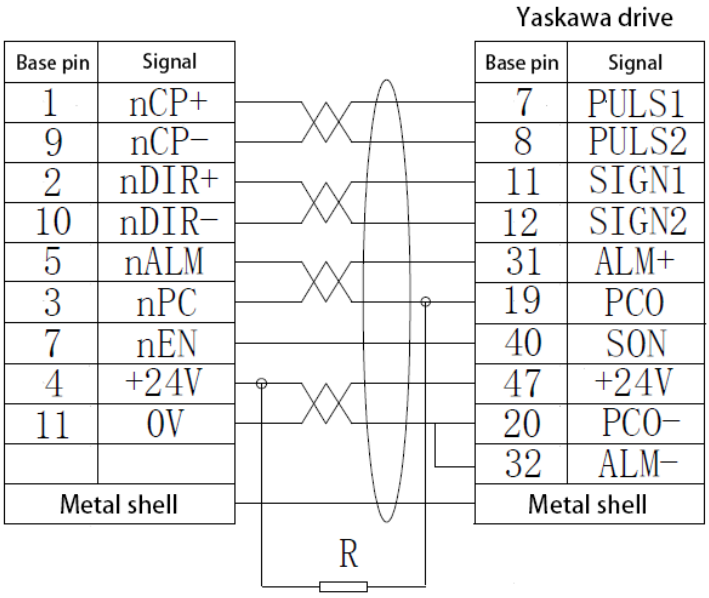
2.6.6 Connection diagram between the system and Delta B2:



Note: Since Delta driver's one-turn signal output is low and the system receives input signal is high, a 2.2KΩ 0.5W resistance is required to parallel the drive CZ output.

Note: Resistor R is 2K/0.5W;

2.6.7 Connection diagram between the system and Yaskawa 7 series:



Note: Resistor R is 2K/0.5W;

Drive parameters:

PN000 = N0010 Position control mode (1 bit is the control mode).

PN100 velocity loop gain

PN101 velocity ring integral constant

PN102 position loop gain

PN200 = N0000 Position Mode Pulse Receive Mode (Pulse + Direction Positive Logic).

= n0005 Position mode pulse receive mode (pulse + direction negative logic [direction negation]).

Pn20E = electronic gear ratio molecule

PN210 = Electronic gear ratio denominator

Motor encoder resolution: determined according to motor model; 7 series motor 2 to the 24th power = 16777072

Chapter III: Description of Common Parameters

3.1 Programming operation parameters

Status parameter

0	0	1	****	****	****	BIT4	BIT3	BIT2	****	****

BIT2 : (0:diameter 1:radius) programming

BIT3 : (0: single step 1: handwheel) mode

BIT4 : Spindle speed (0: switching control 1: analog voltage control).

0	0	3	****	****	****	BIT4	****	BIT2	****	****

BIT2 : Manual removal of mechanical coordinates (0:none 1:Yes) is valid

BIT4 : Tool offsets are performed in (0:move 1:coordinate offset).

0	0	4	****	****	****	BIT4	****	****	****	BIT0

BIT4 : Tool compensation values are expressed as (0:diameter 1:radius) values

0	0	5	****	BIT6	BIT5	BIT4	BIT3	****	****	BIT0

BIT0 : Modify the tool patch during machining (0:not supported 1:supported).

BIT3 : M02 begins with the cursor (0: does not return 1: return).

BIT4 : M30 cursor (0:No 1:Yes) returns to the beginning

BIT6 : Program editing (0:No 1:Yes) supports block deletion

0	0	7	****	****	BIT5	****	BIT3	BIT2	BIT1	BIT0

BIT5 : Between program segments and degree segments (0: smooth transition 1: accurate execution in place).

0	1	0	****	BIT6	BIT5	BIT4	****	****	****	****

BIT4 : M99 Number of workpieces (1: Yes 0: No) plus 1

BIT5 : Number of workpieces arrived, reset (1:Yes 0:No) cleared

BIT6 : M30 Number of workpieces (0:Yes 1 :No) plus 1

0	1	1	****	BIT6	****	****	****	****	****	****

BIT6 : System power on (0:Yes 1:No) to set the spindle speed

1	6	4	****	****	****	****	****	BIT2	BIT1	BIT0

BIT0 : Mechanical zero point (0: no memory 1: memory).

BIT1 : G28 command when reference point is not established (0: use stop 1: alarm).

BIT2 : Run the G28 external command without returning zero (0: no alarm 1: alarm).

1	7	2	****	****	****	****	****	****	BIT1	BIT0

BIT1 : Fast feed, when the fast feed multiplier is Fo (0: no stop 1: stop).

1	7	3	****	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Macro program public variable #100~#199, after reset (0: not cleared 1: cleared).

BIT1 : Macro program local variable #1~#50, after reset (0: not cleared 1: cleared).

BIT3 : Whether the machining time of the single piece is automatically cleared (0:no 1:Yes)

BIT4 : The number of processed parts is powered off (0: memory 1: no memory).

1	8	0	****	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Location & monitoring display (0: relative coordinates 1: remaining movement).

BIT1 : Press the [Edit] key to switch to the program interface (0:No 1:Yes).

BIT2 : Whether to switch to the alarm interface when an alarm occurs (0:no 1:Yes).

BIT6 : Press the reset button to return to the beginning of the program in (0:Edit 1:Other) mode

2	0	5	****	****	****	****	BIT3	BIT2	****	BIT0

BIT0 : Whether to automatically insert sequential numbers (0:no 1:Yes).

BIT2 : MDI interface after executing the program (0:no 1:Yes) deletes the program

BIT3 : Press the reset button (0:No 1:Yes) to delete the program under the MDI interface

Data parameters

0	8	4	The total number of knives is selected [row knife changed to 1] (default: 4) four-station electric tool holder
1	1	2	Lubrication opening time (lubrication is not limited by time when set to 0).
3	7	4	The spindle speed value (default: 300) is set at the power of the system

3.2 Feed shaft parameters

Status parameter

0	0	8	****	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : The direction signal is high when the X axis (0:negative 1:positive) is moving

BIT1 : The Z-axis (0:minus 1:positive) is high when moving

BIT2 : The direction signal is high when the Y-axis (0:negative 1:positive) is moving

BIT3 : 4th axis (0:negative 1:positive) direction signal is high when moving

BIT4 : 5th axis (0:minus 1:positive) direction signal is high when moving

0	0	9	BIT7	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : X-axis driver alarm signal is (0:high 1:low) level alarm

BIT1 : Z-axis driver alarm signal is (0:high 1:low) level alarm

BIT2 : Y-axis driver alarm signal is (0:high 1:low) level alarm

BIT3 : 4th axis driver alarm signal is (0:high 1:low) level alarm

BIT7 : The spindle alarm signal is (0:high 1:low) level alarm

1	7	2	****	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT7 : Whether the maximum control speed of the cutting feed is independent for each axis (0:No 1:Yes).

1	7	5	****	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : X axis movement direction button (0: negation 1: no negation).

BIT1 : Z axis movement direction button (0: negate 1: do not negate 1).

BIT2 : Y axis movement direction button (0: negation 1: no negation).

BIT3 : 4th axis movement direction button (0: negate 1: do not negate).

BIT4 : 5th axis movement direction button (0: negation 1: no negation).

1	8	7	****	****	BIT5	****	BIT3	BIT2	BIT1	BIT0

BIT0 : Set the Y-axis type (0: linear axis 1: rotation axis).

BIT1 : The type when the Y axis is set to the axis of rotation (0: axis of rotation A type 1: axis of rotation type B).

BIT2 : Set the Z-axis type (0: linear axis 1: rotation axis).

BIT3 : The type when the Z axis is set to the axis of rotation (0: axis of rotation A type 1: axis of rotation type B).

BIT5 : Cs axis function of the Y-axis (0: invalid 1: valid).

1	8	8	****	****	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : When the Y axis is the axis of rotation, the absolute coordinate loop function (0: invalid 1: valid).

BIT1 : When the Y axis is the axis of rotation (0: Nearby rotation 1: Rotate in the direction of the symbol).

BIT2 : Relative coordinate loop function when the Y axis is the axis of rotation (0: invalid 1: valid).

BIT3 : When the Z axis is a rotation axis, the absolute coordinate loop function (0: invalid 1: valid).

BIT4 : When the Z axis is the axis of rotation (0: Rotation nearest 1: Rotation in the direction of the symbol).

BIT5 : Relative coordinate loop function when the Z axis is the axis of rotation (0: invalid 1: valid).

1	8	9	****	****	BIT5	****	BIT3	BIT2	BIR1	BIT0

BIT0 : Set the 4th axis to (0: linear axis 1: rotation axis).

BIT1 : The type when setting the 4th axis as the axis of rotation (0: axis of rotation A type 1: axis of rotation type B).

BIT2 : Set the X-axis type (0: linear axis 1: rotation axis) P001.2=1 P004.4=1

BIT3 : Set the X-axis type (0: Axis of rotation A type 1: Axis of rotation type B).

BIT5: Cs axis function for 4th axis (0: invalid 1: valid).

1	9	0	****	****	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

When BIT0 : 4th axis is the axis of rotation, absolute coordinate loop function (0: invalid 1: valid).

BIT1 : When the 4th axis is the axis of rotation, (0: nearby rotation 1: rotation in the direction of the symbol).

When BIT2 : 4th axis is the axis of rotation, relative coordinate loop function (0: invalid 1: valid).

BIT3 : Absolute coordinate loop function (0: invalid 1: valid) when the X axis is the axis of rotation

BIT4 : When the X axis is the axis of rotation (0: Rotation nearest 1: Rotation in the direction of the symbol).

BIT5 : Relative coordinate loop function when the X axis is the axis of rotation (0: invalid 1: valid).

1	9	1	****	****	BIT5	****	****	****	BIT1	BIT0

BIT0 : Set the 5th axis to (0: linear axis 1: rotation axis).

BIT1 : The type when setting the 5th axis as the axis of rotation (0: axis of rotation A type 1: axis of rotation type B).

Cs axis function for BIT5 : 5th axis (0: invalid 1: valid).

1	9	2	****	****	****	****	****	BIT2	BIT1	BIT0

When the BIT0 : 5th axis is the axis of rotation, the absolute coordinate loop function (0: invalid 1: valid).

BIT1 : When the 5th axis is the axis of rotation, (0: nearby rotation 1: rotation in the direction of the symbol).

BIT2 : 5th axis is the axis of rotation, relative coordinate loop function (0: invalid 1: valid).

Data parameters

0	2	2	X-axis fast movement speed (radius value) (default: 5000).
0	2	3	Z-axis fast moving speed (default: 5000).

1	5	5	3TH AXIS FAST MOVING SPEED (DEFAULT: 5000).
1	5	6	4TH AXIS FAST MOVING SPEED (DEFAULT: 5000).
1	5	7	5TH AXIS FAST MOVING SPEED (DEFAULT: 5000).

0	2	7	The upper feed speed of X and Z axis positioning (default value: 8000).

0	3	1	Set the speed at 150% manual feed rate (default: 1260).
0	3	2	Fast movement speed with F0 (default: 400).
0	3	3	The X and Z axes return to the low speed of the zero point of the machine (default: 40).

0	3	4	X-axis backlash compensation amount (actual measurement) (default value: 0).
0	3	5	Z-axis backlash compensation amount (default value: 0).

1	0	7	Short shaft speed when thread tailing (0 is retailed by thread cutting speed) (default: 0).

1	1	3	The high-speed speed of the X and Z axes back to the zero point of the machine (default: 4000).

1	7	4	3TH AXIS RETURN TO ZERO LOW SPEED SPEED (DEFAULT: 40).
1	7	5	4TH AXIS RETURN TO ZERO LOW SPEED SPEED (DEFAULT: 40).
1	7	6	5TH AXIS RETURN TO ZERO LOW SPEED SPEED (DEFAULT: 40).

1	7	7	3TH AXIS RETURN TO ZERO HIGH SPEED (DEFAULT: 4000).
1	7	8	4TH AXIS RETURN TO ZERO HIGH SPEED SPEED (DEFAULT: 4000).
1	7	9	5TH AXIS RETURN TO ZERO HIGH SPEED SPEED (DEFAULT: 4000).

1	8	0	3TH AXIS DIRECTION CLEARANCE COMPENSATION AMOUNT (DEFAULT: 0).
1	8	1	4TH AXIS DIRECTION CLEARANCE COMPENSATION AMOUNT (DEFAULT: 0).
1	8	2	5TH AXIS DIRECTION CLEARANCE COMPENSATION AMOUNT (DEFAULT: 0).

3	4	2	X-axis cutting feed maximum control speed (default: 15000).
3	4	3	Z-axis cutting feed maximum control speed (default: 15000).
3	6	0	3TH AXIS CUTTING FEED MAXIMUM CONTROL SPEED (DEFAULT: 15000).
3	6	1	4TH AXIS CUTTING FEED MAXIMUM CONTROL SPEED (DEFAULT: 15000).
3	6	2	5TH AXIS CUTTING FEED MAXIMUM CONTROL SPEED (DEFAULT: 15000).

3.3 Acceleration and deceleration time parameters

Data parameters

0	2	4	When the X-axis is moving quickly, the S-shaped front acceleration and deceleration time is set (default: 100).
0	2	5	When the Z-axis is moving quickly, the S-shaped front acceleration and deceleration time is set (default: 100).
0	2	6	The acceleration and deceleration time constant of the stub shaft when the thread is retarded (default: 100).

0	2	9	Cutting feed and manual exponential post-acceleration and deceleration time settings (default: 60).

1	5	8	When the 3TH AXIS IS MOVING QUICKLY, THE ACCELERATION AND DECELERATION TIME CONSTANT VALUE (S-TYPE FRONT ACCELERATION AND DECELERATION) (DEFAULT VALUE: 100).
1	5	9	When the 4TH AXIS IS MOVING QUICKLY, THE ACCELERATION AND DECELERATION TIME CONSTANT VALUE (S-TYPE FRONT ACCELERATION AND DECELERATION) (DEFAULT VALUE: 100).
1	6	0	When the 5TH AXIS IS MOVING QUICKLY, THE ACCELERATION AND DECELERATION TIME CONSTANT VALUE (S-TYPE FRONT ACCELERATION AND DECELERATION) (DEFAULT VALUE: 100).

2	1	5	Stepped acceleration and deceleration time constant for each axis JOG feed (default: 120).

3	1	3	L-type time constant for acceleration and deceleration before cutting feed (default: 100).
3	1	4	S-type time constant for acceleration and deceleration before cutting feed (default value: 100).
3	1	5	L-type time constant for acceleration and deceleration after cutting feed (default: 60).
3	1	6	E-type time constant for acceleration and deceleration after cutting feed (default: 60).
3	1	7	Linear acceleration and deceleration time constant for each axis JOG feed (default: 100).
3	1	8	Exponential acceleration and deceleration time constant for each axis JOG feed (default: 120).

3.4 Gear ratio parameters and calculation

Data parameters

0	1	5	X-axis pulse output multiplication system [numerator] (default: 1).
0	1	7	X-axis pulse output frequency division system [denominator] (default: 1).

0	1	6	Z-axis pulse output multiplication system [molecule] (default: 1).
0	1	8	Z-axis pulse output divider system [denominator] (default: 1).

1	4	6	3TH AXIS PULSE OUTPUT MULTIPLICATION SYSTEM [MOLECULE] (DEFAULT: 1).
1	4	7	4TH AXIS PULSE OUTPUT MULTIPLICATION SYSTEM [MOLECULE] (DEFAULT: 1).
1	4	8	5TH AXIS PULSE OUTPUT MULTIPLICATION SYSTEM [MOLECULE] (DEFAULT: 1).
1	4	9	3TH axis pulse output frequency division system [denominator] (default: 1).
1	5	0	4TH axis pulse output frequency division system [denominator] (default: 1).
1	5	1	5TH AXIS PULSE OUTPUT FREQUENCY DIVISION SYSTEM [DENOMINATOR] (DEFAULT: 1).

Gear ratio calculation for 2500 wire speed motor direct screw:

$$\frac{\text{Numerator}}{\text{Denominator}} = \frac{10}{\text{Screw pitch}}$$

2500 wire speed motor connection lead screw with gear ratio calculation:

$$\frac{\text{Numerator}}{\text{Denominator}} = \frac{10}{\text{Screw pitch}} \times \frac{Z_M}{Z_D}$$

The 2500 line speed motor calculates the gear ratio of the rotating (indexing) shaft:

$$\frac{\text{Numerator}}{\text{Denominator}} = \frac{1}{36} \times \frac{Z_M}{Z_D}$$

Note: ZM: The number of teeth of the lead screw end gear

ZD: The number of teeth of the motor end gear

Chapter IV Description of other functions debugging

4.1 Spindle orientation function debugging (5th axis as an example).

Diagnostic signals (defined by standard PLC programs).

Signal	The spindle is oriented into place	Spindle directional output	Spindle position output
Diagnostic address	X4.0	Y4.0	Y4.2
Interface pins	CN15. 05	CN15. 20	CN15. 22
remark			

Note: M14 spindle positioning switching position mode; M15 spindle switching speed mode.

Control parameters

Status parameter

191.0==1 SET THE 5TH AXIS TO (0: LINEAR AXIS 1: AXIS OF ROTATION).

191.5==1 Cs axis function for 5TH axis (0: invalid 1: valid).

192.0==1 When the 5TH axis is the axis of rotation, the absolute coordinate loop function (0: invalid 1: valid);

192.1==1 When the 5TH axis is the axis of rotation (0: Nearby rotation 1: Rotation in the direction of the symbol).

192.2==1 When the 5TH axis is the axis of rotation, the relative coordinate loop function (0: invalid 1: valid).

1	9	1	****	****	BIT5	****	****	****	****	BIT0

BIT0 : SET THE 5TH AXIS TO (0: LINEAR AXIS 1: AXIS OF ROTATION).

BIT5 : Cs axis function for 5TH axis (0: invalid 1: valid).

1	9	2	****	****	****	****	****	BIT2	BIT1	BIT0

BIT0 : When the 5TH axis is the rotation axis, the absolute coordinate loop function (0: invalid 1: valid);

BIT1 : When the 5TH axis is the axis of rotation (0: nearby rotation 1: rotation in the direction of the symbol);

BIT2 : When the 5TH axis is the axis of rotation, the relative coordinate loop function (0: invalid 1: valid);

Data parameters

1	4	8	5TH AXIS PULSE OUTPUT MULTIPLICATION SYSTEM [MOLECULE] (DEFAULT: 1).
1	5	1	5TH AXIS PULSE OUTPUT FREQUENCY DIVISION SYSTEM [DENOMINATOR] (DEFAULT: 36).

Note: Direct connection spindle 148=1;151=36;(the number of motor encoder lines is 2500)

PLC parameters

K15.6==1 Emergency stop, spindle profile control when reset (0: not off 1: off).

K15.7==1 CS axis function (0: invalid 1: valid).

K20.3==0 Spindle quasi-stop signal (0: check 1: do not check).

K20.4==0 The spindle quasi-stop signal is (0:NO 1:NC) is valid

K20.5==1 Position output (Y4.2) after the spindle is quasi-stopped in place (0: do not switch 1: switch).

NOTE: K13.7 Chuck/tailstock (0:No 1:Yes) interlocks with spindle positioning

K	1	5	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT6 : Emergency stop, spindle profile control when reset (0: not off 1: off).

BIT7 : Cs axis function (0: invalid 1: valid).

K	2	0	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT3 : Spindle quasi-stop signal (0: check 1: Do not check).

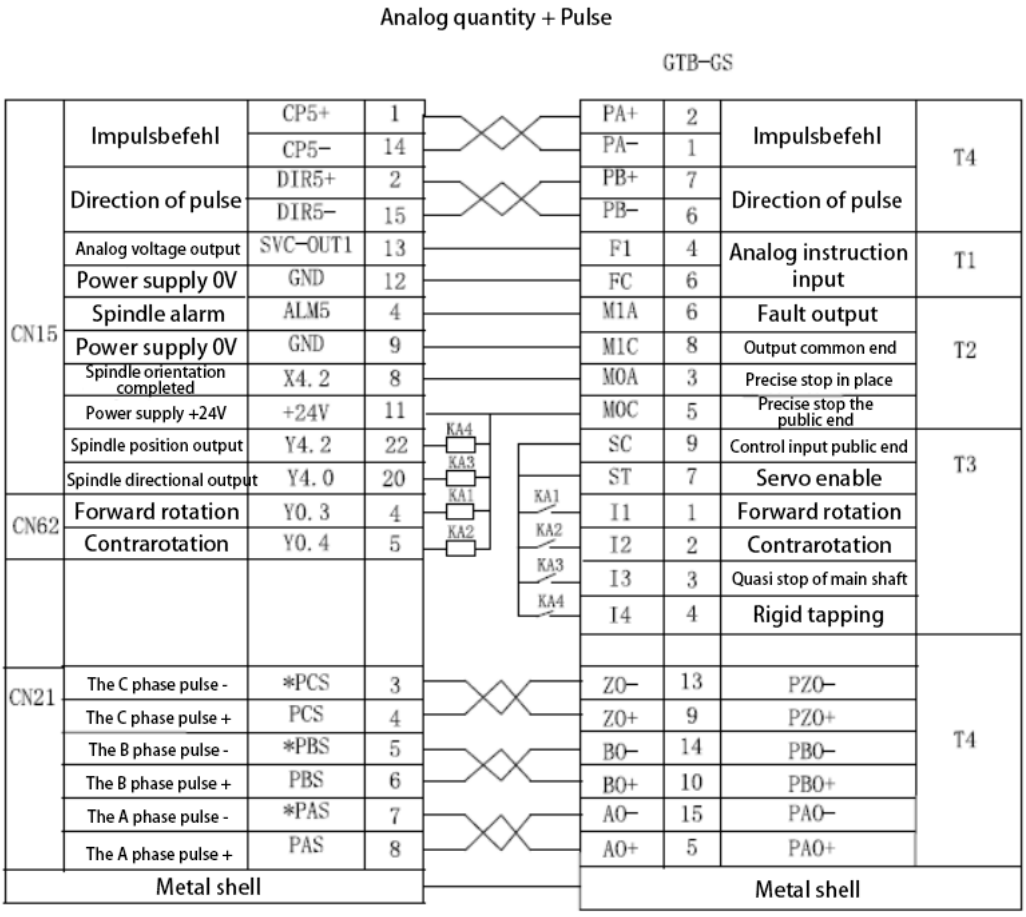
BIT4 : Spindle is in place with +24V (0: on 1: disconnected).

BIT5 : Position output (Y4.2) after the spindle is quasi-stopped (0: do not switch 1: switch).

Note: When K20.3=1 spindle quasi-stop signal is not detected, spindle quasi-stop is completed through T066 time parameter setting:

T	6	6	Ignoring directional to in-place signal delay completion unit: milliseconds

Lathe series with hypersynchronous drive link diagram



Added the ability to set the 3rd or 4th axis pulse to be sent from the 5th axis **port, with the same wiring as** the **5th axis wiring (**version **2021);**

In the case of only 3 axes open, the 3rd axis does CS axis control:

187.0==1 SETS THE 3TH AXIS TO (0: LINEAR AXIS 1: AXIS OF ROTATION).

187.5==1 3 S-AXIS FUNCTION FOR TH-AXIS (0: INVALID 1: VALID).

188.0==1 3When the TH axis is the axis of rotation, the absolute coordinate loop function (0: invalid 1: valid);

188.1==1 3When the TH axis is the axis of rotation (0: Nearest rotation 1: Rotation in the direction of the symbol).

188.2==1 3 When the TH axis is the axis of rotation, the relative coordinate loop function (0: invalid 1: valid).

NUMBER PARAMETER 225==5 [3TH AXIS NAME DEFINITION (3:A 4:B 5:C Other: Y)].

NUMBER PARAMETER 50==3 [SPINDLE PORT PULSE SENT (3:3TH 4:4TH OTHER: 5TH)].

NUMBER PARAMETER 146 3TH AXIS PULSE OUTPUT FREQUENCY DOUBLING COEFFICIENT (NUMERATOR).

NUMBER 149 3UTH AXIS PULSE OUTPUT DIVIDER FACTOR (DENOMINATOR).

In the case of only 4 axes open, the 4th axis does CS axis control:

189.0==1 SETS THE 4TH AXIS TO (0: LINEAR AXIS 1: AXIS OF ROTATION).

189.5==1 4 S-AXIS FUNCTION FOR THE 4TH AXIS (0: INVALID 1: VALID).

190.0==1 4 WHEN THE TH-AXIS IS THE AXIS OF ROTATION, THE ABSOLUTE COORDINATE LOOP FUNCTION (0: INVALID 1: VALID);

190.1==1 4When the TH axis is the axis of rotation (0: Nearby rotation 1: Rotation in the direction of the symbol).

190.2==1 4 When the TH axis is the axis of rotation, the relative coordinate loop function (0: invalid 1: valid).

Number parameter 226==5 [4TH axis name definition (3:A 4:B 5:C Other: Y)].

NUMBER PARAMETER 50==4 [SPINDLE PORT PULSE SENT (3:3TH 4:4TH OTHER: 5TH)].

Number parameter 148 4TH axis pulse output frequency doubling coefficient (molecule).

NUMBER PARAMETER 150 4TH AXIS PULSE OUTPUT DIVIDER FACTOR (DENOMINATOR).

When executing the spindle positioning switching position mode M 14 does not want to wait for the completion time of the M code, you can select the parameter not to wait for the spindle orientation completion signal, and you need to wait for the switching to complete when taking the CS axis command.

Added parameters: K20.6 [M 14 command (0:Yes 1:No) reposition when spindle is in positioning/position mode].

K20.7 [CS-axis switching instruction completion (0: wait 1: do not wait) directional completion signal]

Bit parameter 187.4 [When running CS axis command does not switch position mode (0: alarm 1: wait)].

Number parameter 218 [Spindle positioning switching position mode instruction code (default 14)].

When the spindle is already in the positioning or position state, K 20.6=1 does not need to be repositioned when the M14 instruction is executed, and the code is completed directly.

When waiting for completion in the spindle orientation instruction, you can set K20.7=1 not to wait for the code to complete, but when the subsequent program has the edit CS axis move instruction, it will wait for the spindle switching position to complete and issue the command, so K20.7 should be combined with bit parameter 187.4 and number parameter 218 is used together, for example:

Do not wait for the positioning completion signal K 20.7=1, bit parameter 187.4=1 when running the CS axis

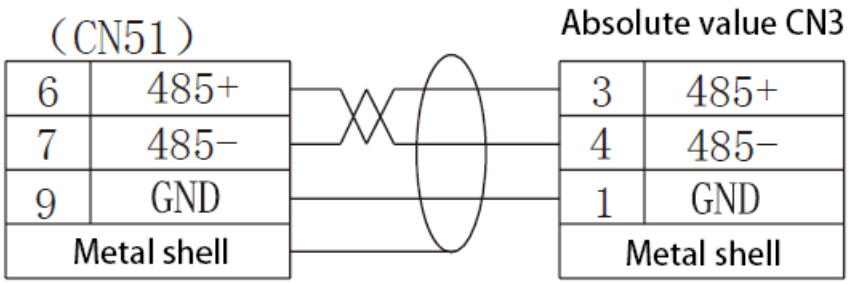
command does not switch the position mode when waiting for the switching to complete otherwise run to C when the directional switching position is not completed Alarm when the S axis moves the command, select K20.7=1/bit parameter 187 4=1 hour parameter 2Number 18 must be equal to the switching instruction M code number.

M14;// Instantaneous code without waiting

G0X100Z100;// When moving the XZ axis at this time, it is possible that the spindle is still positioning

G0C100； // You must wait for the spindle to switch position mode after the move is complete

4.2 With K300C absolute value driven debugging



The lathe series is connected to the KY300C absolute drive communication

Debugging steps:

1、 Check the communication cable connection first.

2、 Drive and motor adjustment:

Motor zeroing steps:

1） Modify the drive parameter PA-0 to 620, change PA-1 to (motor signal corresponds to motor code), return Wr (looks like ur), press [Enter] for 3 seconds, and display "Finish" completed. Restart the drive to see if the PA-67 is close to the motor rated current multiplied by 10.

2） Modify the drive parameters PA-0 to 620, PA-4 to 4, PA-53 to 0001, return to CO-mode, press [Enter] until A.2000 is displayed; Then return to PA-0 and change it to 510; Restart the driver.

3、 Drive parameter adjustment:

Drive parameter adjustment steps:

1） Eliminate drive alarm: If the drive reports alarm No. 42, you need to change PA-0 to 620, PA-1 to (corresponding to the motor code), return to WR mode and press [Enter]. More than 3 seconds until the "Finish" operation is successful and the power failure takes effect; "Error" is a failure or incorrect password) [WR mode looks like ur].

If the power on drive alarm number 40 change PA-99 to 1.

If the driver calls police number 44, change PA-0 to 620; PA-4 changed to 4; PA-53 changes to 0001, returns to co--mode, and presses [Enter] until A.2000 is displayed; Then return to PA-0 and change to

510.

2) Set the driving parameters:

Modify PA-0==510 and change PA-80 to (?) (X axis corresponds to 1, Z axis corresponds to 2, Y axis corresponds to 3, 4th axis corresponds to 4, and 5th axis corresponds to 5);

(PA81==2, PA-82==0, PA-84==0 driver defaults do not need to be changed).

3) Drive parameter saving: return to EE-mode, press [Enter] to enter EE-SET mode, hold down [Enter] until "Finish" appears; Restart the driver.

4、 System parameter modification:

To modify the status parameter:

003.2==1 Manual removal of mechanical coordinates is effective,

011.0==0 Axis 1 (0:Yes 1:No) reads the bus (X-axis).

011.1==0 Axis 2 (0:Yes 1:No) reads the bus (Z-axis).

011.2==0 Axis 3 (0:Yes 1:No) reads the bus (Y-axis).

011.3==0 4th axis (0:Yes 1:No) reads the bus (4th axis).

011.4==0 5th axis (0:Yes 1:No) reads the bus (5-axis).

164.0==1 Mechanical zero point memory;

174.0==1 Communication mode bus

177.0==1 Outside the no-go zone at the second line limit

177.1==1 The soft limit before returning to mechanical zero is valid

177.2==1 When an overtravel command is issued, alarm is issued after overtravel

177.3==0 The zeroing mode soft limit is valid

206.0==1 Stroke detection before moving

206.1==0 Reserved

206.2==1 Reserved

Note: 11.0~11.4 Change to 0 when using absolute values for each axis

0	0	3	****	****	****	****	****	BIT2	****	****

BIT2 : Manually clear mechanical coordinates (0: invalid 1: valid);

0	1	1	****	****	****	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 : Axis 1 (0:Yes 1:No) is the read bus (X-axis).

BIT1 : Axis 2 (0:Yes 1:No) is the read bus (Z-axis).

BIT2 : Axis 3 (0:Yes 1:No) is the read bus (Y-axis).

BIT3 : Axis 4 (0:Yes 1:No) is the read bus (4-axis).

BIT4 : Axis 5 (0:Yes 1:No) is the read bus (5-axis).

1	6	4	****	****	****	****	****	****	****	BIT0

BIT0 : Mechanical zero point (0: no memory 1: memory).

1	7	7	****	****	****	****	BIT3	BIT2	BIT1	BIT0

BIT1 : Soft limit before zero return (0: invalid 1: valid).

BIT2 : When the overtravel command is issued, alarm is issued in overtravel (0:front 1:after).

BIT3 : Zero return mode soft limit (0:no 1:Yes) is valid

2	0	6	****	****	****	****	****	****	****	BIT0

BIT0 : Stroke detection before moving (0:no 1:Yes).

To modify data parameters:

0	4	4	The baud rate of serial communication (default: 115200) **is changed to 19200**
1	6	4	Link coordinate alarm range (default value: 0.01) **Change to 0.1**
2	4	7	Leave (default: 0) **instead of 0**
2	4	8	Leave (default: 0) **instead of 0**

5、 Electronic gear ratio setting

System data parameters:

0	1	5	X-axis pulse output multiplication system [numerator] (default: 1).
0	1	7	X-axis pulse output frequency division system [denominator] (default: 1).
0	1	7	Z-axis pulse output multiplication system [molecule] (default: 1).
0	1	8	Z-axis pulse output divider system [denominator] (default: 1).
1	4	6	3TH AXIS PULSE OUTPUT MULTIPLICATION SYSTEM [MOLECULE] (DEFAULT: 1).
1	4	7	4TH AXIS PULSE OUTPUT MULTIPLICATION SYSTEM [MOLECULE] (DEFAULT: 1).
1	4	8	5TH AXIS PULSE OUTPUT MULTIPLICATION SYSTEM [MOLECULE] (DEFAULT: 1).
1	4	9	3TH axis pulse output frequency division system [denominator] (default: 1).
1	5	0	4TH axis pulse output frequency division system [denominator] (default: 1).
1	5	1	5TH AXIS PULSE OUTPUT FREQUENCY DIVISION SYSTEM [DENOMINATOR] (DEFAULT: 1).

Absolute gear ratio algorithm:

The number of pulses emitted by the encoder in one turn (10000) ÷ (L×1000); L is the screw pitch; When there is a reduction ratio, it is multiplied by the reduction ratio.

6、 Machine zero-clearing:

Press the [Location] button continuously until the [Current Location (Comprehensive Coordinates)] interface is displayed in the upper left corner of the system screen;

Press the [Machine Tool Zero Point] key, and then press the system panel letter [X/Z/Y/A/C] key, and the X and ,

Z, Y, A, C flash and press the [Cancel] key to clear the machine coordinates.

7、 Test run each axis

Move each axis manually or with a handwheel, shut down and restart.

Observe whether the system interface has alarms (the **drive coordinates of each axis are inconsistent with the system coordinates, press the reset button to update or communication errors**).

If there is no alarm, it means normal;

If there is a **prompt** "communication **error alarm"**, check whether the communication line is connected normally, the system parameter status parameter 174.0==1 communication mode bus, data parameters: P164==0.1, P44== 19200, whether the settings are correct; Whether the drive parameter PA-80 corresponds to the correct axis.

If there is a prompt **"**The driving coordinates of each axis **are inconsistent with the system** coordinates, press the reset button to update the alarm**"**, then the current position (comprehensive coordinates) record the coordinate values of each axis (machine tool coordinates), press the [Reset] key to update the coordinates, and observe whether the coordinate values of each axis of the current position (comprehensive coordinates) (machine tool coordinates) change by more than 0.1.

If the coordinates of individual axes change by more than 0.1, modify the system parameter status parameter 193.0~193.4 (each axis reads the absolute value coordinates (0:positive 1:negative) direction)). ; If it is 0, change to 1; If it is 1, change to 0; Turn off the power and restart, press [Reset] and the new coordinates, and then manually or handwheel to move each axis, shut down and restart, if there is no alarm indicates normal; If there is still an alarm, check whether the electronic gear ratio setting is normal.

Note: After adjusting normally, you need to change the direction of axis movement on the system status parameter 008.

After the above settings are normal, you can set the zero point of the machine tool again and set the soft limit of the machine tool;

Soft limit settings:

System data parameters

0	4	5	X-axis forward maximum stroke (default: 9999.9999).
0	4	6	Z-axis forward maximum travel (default: 9999.9999).
0	4	7	X-axis negative maximum travel (default: -9999.9999).
0	4	8	Z-axis negative maximum travel (default: -9999.9999).

1	9	2	3TH AXIS POSITIVE MAXIMUM STROKE (DEFAULT: 9999.9999).
1	9	3	4TH AXIS POSITIVE MAXIMUM STROKE (DEFAULT: 9999.9999).
1	9	4	5TH AXIS FORWARD MAXIMUM STROKE (DEFAULT: 9999.9999).
1	9	5	3TH AXIS NEGATIVE MAXIMUM STROKE (DEFAULT: -9999.9999).
1	9	6	4TH AXIS NEGATIVE MAXIMUM STROKE (DEFAULT: -9999.9999).
1	9	7	5TH AXIS NEGATIVE MAXIMUM STROKE (DEFAULT: -9999.9999).

4.3 Thread cutting

The spindle and encoder connections must be 1:1 timing belt connections with normal spindle speed feedback.

Spindle speed feedback settings:

Data parameters

The number of encoder lines setting parameter P070 is generally 1024/2500;

Encoder to spindle gear ratio parameters: number of spindle gears P110==1;

Encoder to spindle gear ratio parameters: encoder gear number P111==1;

0	7	0	Number of encoder lines

1	1	0	Encoder to spindle gear ratio parameter: number of spindle gears
1	1	1	Encoder to spindle gear ratio parameter: number of encoder gears

If there is no feedback from the spindle speed, the alarm is triggered when the thread command G32/G92/G76 is executed;

If the spindle speed feedback is abnormal, when executing the thread command of the thread, there will be rotten teeth or incorrect pitch;

Adjustment of spindle speed:

When the spindle speed is not correct, the data parameters can be adjusted

P037--P040: corresponding to the highest speed of 1--4 gears;

P075 : Corresponds to the maximum speed of the spindle;

If it is a stopless frequency conversion spindle, when the spindle speed is not right, it is generally only necessary to adjust P037==?

0	3	7	Corresponds to the maximum speed of the first gear (M41) of the spindle (default value: 6000).

0	3	8	Corresponds to the maximum speed of the second gear (M42) of the spindle (default value: 6000).

0	3	9	Corresponds to the maximum speed (default: 6000) in the third gear (M43) of the spindle

0	4	0	Corresponds to the maximum speed of the spindle in the fourth gear (M44) (default: 6000).

When the program runs to the thread command G32/G76/G92, the spindle speed is normal, but there is no alarm when the program execution is stopped, which may be wrong with the data parameter P219--P221;

P219==4; thread start waiting time;

P220==1; thread sampling waiting time;

P221==100; Number of spindle samples;

When the program runs to the thread command G32/G76/G92, the spindle speed is normal, but there is no alarm when the program is stopped, and the spindle encoder may not have a Z phase pulse signal input, and the 150 spindle Z can be diagnosed in CNC Pulse count view (one turn of normal spindle plus 1), encoder failure or encoder line failure when there is no data.

2	1	9	Thread start wait time (default: 4).

2	2	0	Thread sampling wait time (default: 1).

2	2	1	Number of spindle samples (default: 100).

Note: After the above parameters are set correctly, when there is still a problem with the turning thread, it may be caused by a problem in the processing process, such as material hardness, cutting amount, feed speed, etc.;

4.4 Single Segment of the Program

A single section of the program is valid in the automatic and input mode;

4.5 Program Skipping

When the program skip signal is valid, the program segment marked with "/" at the beginning of the segment is skipped and not executed. Program hopping is valid in the automatic, typed mode.

4.6 Machine Lock

Machine locks work in any way. When the program is running, the machine lock state cannot be switched.

K2.0 machine lock key (0:Yes 1:No) is valid

4.7 Secondary Lock

The auxiliary lock is valid in automatic mode and entry mode.

K2. 1 The secondary lock key (0:Yes 1:No) is valid

4.8 Test cut of the handwheel

In automatic effect.

When switching or turning off the handwheel test cutting function during program operation, the system can choose whether to pause K16.5 in the program;

The test cutting speed of the handwheel can be selected by bit parameters, and when the bit parameter is 3.6=0, when the cutting feed handwheel is cut, the feed speed is the F value edited by the program ;

Number parameter 7No. 7 [Hand wheel test cut maximum speed limit].

Parameter 1 3.6 [Handwheel test cut reverse (0:no 1:Yes) valid]; When the handwheel is selected to be effective when the handwheel is shaken counterclockwise, the system runs in reverse when the program runs in reverse to the beginning of the current segment; When the selection is invalid, only a clockwise shake of the handwheel is effective.

Number 2 No.34 [Handwheel test cut acceleration].

4.9 Select Stop

In the automatic, entry mode is valid, press the 

key to make the selection stop button indicator light on, it means to enter the selection stop state; At this time, when the program runs to the M01 instruction, it will be "paused". You need to press the 

key again before the program can continue.

K10.0 [Program running status skip key (0: valid 1: invalid)].

4.10 The feed rate is 0% fast rate adjustment

When the feed rate is adjusted to 0%, you can choose whether the fast multiplier is changed to F0;

K017. 1 [Fast multiplier (0:no 1:Yes) switch F0 at 0% feed magnification].

4.11 Manual Quick Move Control

Manual quick movement control can be selected in two ways, one is to light the fast move button and open the function (jog), and the other is to press and hold the fast move button to open the function (long press); The PLC parameter can be selected, K21.7 [Turn on manual quick movement control (0:jog 1:long press)].

Note: Some button boards do not support long press function, such as 1 000TC, 3000T-V; The specific use is selected according to the actual button pad.

Manual fast moving speed is separate from G0 fast moving speed:

Digital parameter 222 manual X-axis fast positioning speed

Digital parameter 223 manual Z-axis fast positioning speed

Digital parameter 229 manual 3rd axis fast positioning speed

Digital parameter 230 manual fourth axis fast positioning speed

Digital parameter 231 manual fifth axis fast positioning speed

4.12 M code retrieval program

M9000 ---- M9999 Adjustable programs O9000 ---- O9999 programs;

4.13 Memory of the use of knives

For parts processing, when the tool position is special, you can use the memory tool setting function; If the current position needs to be set by the tool X Z, but the tool is not good to measure the workpiece when it is here, you can first press the X axis record/Z axis record, and then remove the tool to measure the workpiece, and the measured data is directly input data according to the normal tool set.

Bit Parameter 1 4.6 [Memory knife function (0:off 1:on)].

Parameter 2.7 [Whether to hide the newly added cutter page when using 2 axes (0:No 1:Yes)]].

Appendix I. Parameter Search and Modification

To modify the parameter password: **769816 Press the Settings key + Page Up and Down (F1) key to enter the Change Password page**

1. How to find data parameters and status parameters:

Press the PAR key to enter the parameter interface, " F1 corresponding bit parameter, F2 corresponding number parameter" press the corresponding button to enter the corresponding page, you can press the P Q key + parameter number, and then press the IN key to find the parameter;

Or press the ⇧ , ⇩ , ⇦ , ⇨ key to find the parameter;

2. How to find PLC (K, T, C, D) parameters:

Press the PLC key to enter the PLC - interface, then press F3 to enter the PLC (K parameter page), and then press F3 to enter the PLC parameter page), " F1 corresponding K parameter, F2 corresponding T parameter, F3 corresponding D parameter page, F4 corresponding C parameter page";

You can press the P Q key + parameter number, and then press the IN key to find the parameter;

Or press the ⇧ , ⇩ , ⇦ , ⇨ key to find the parameter;

Appendix II: Alarms/Warnings

A000.0 Tool change time is too long

Alarm reason: When performing the tool change, the knife number was not found in the total time of the tool change of number parameter 78;

Handling: Press the [Reset button] to cancel the alarm and check whether the tool position signal is normal.

A000.1 When the tool change is complete, the tool holder is not in place alarm

Alarm reason: When the tool change is completed, the feedback signal of the tool holder is inconsistent with the tool number of the tool change instruction;

Handling: Press [Reset button] to cancel the alarm and change the knife again.

A000.2 Tool change not completed alarm

Alarm reason: There is an alarm or reset during the tool change;

Handling: Press the [Reset button] twice to cancel the alarm and change the knife again.

A000.3 Tool holder lock signal not received

Alarm reason: When performing tool change locking, the locking signal is not detected within the specified time; (Ordinary tool holder time number parameter: No. 83).

Handling: Press [Reset button] to cancel the alarm and change the knife again.

A000.5 Tool change error before system power failure

Alarm reason: When the execution of the tool change is not completed normally, the system is powered off;

Handling: Press [Reset button] to cancel the alarm and change the knife again.

A000.6 AK31 pre-indexing is not in place when changing tools

Alarm reason: Select AK31 tool holder, when performing tool change, no pre-indexing is detected within 4

seconds and released;

Handling: Press [Reset button] to cancel the alarm, check the pre-index sensor, and change the knife again.

A000.7 turret lock is not released

Alarm reason: Select Liuxin hydraulic tool holder, when performing tool change, the Sensor F signal is not detected within 4 seconds;

Handling: Press [Reset button] to cancel the alarm, check the Sensor F sensor, and change the knife again.

A001.0 The tailstock function is invalid and cannot execute M10 and M11 codes

Alarm reason: When the tailstock function is not turned on, execute the M10/M11 code;

Handling: Press [Reset button] to cancel the alarm.

A001.1 During spindle rotation, the tail shaft cannot be untailed

Alarm reason: the tailstock function is interlocked with the spindle function, and the tail shaft is retracted when the spindle rotates;

Handling: Press [Reset button] to cancel the alarm.

A001.3 Tailstock advance is not detected and spindle cannot be rotated

Alarm reason: the tailstock function is interlocked with the spindle function, and the tailstock does not advance to perform spindle rotation;

Handling: Press [Reset button] to cancel the alarm.

A001.4 A or B can have up to 8 knives

Alarm reason: The ordinary knife holder supports up to 8 knives, and the total number of knife positions in number parameter 84 is set to alarm when it is greater than 8;

Processing: Set the correct number of knives.

A001.5 End of life of the tool

Alarm reason: the service life of the tools in the tool group has been reached;

Handling: Press [Reset button] to cancel the alarm.

A001.6 External loop opening time is too long (normally open point) K20.0

Alarm reason: the external cycle starts a direct pass;

Handling: Check whether the wiring is correct and whether the input signal level selection is correct K20.0.

A001.7 External suspension opening time is too long (connected to normally closed point) K20.1

Alarm reason: external suspension one direct pass;

Handling: Check whether the wiring is correct and whether the input signal level selection is correct K20.1.

A002.0 The guard door is not closed and is not allowed to run automatically

Alarm reason: In automatic mode, the protective door is not closed to start the program;

Treatment: Close the protective door, if the protective door has been closed, check whether the signal input of the protective door is normal.

A002.2 Completed alarm for the number of processed pieces

Alarm reason: alarm when the number of processed pieces reaches the set number of pieces;

Handling: Press the [Reset button] to cancel the alarm, and at the same time need to know the number of processed pieces.

A002.3 When the spindle rotates, the chuck must not be released

Alarm reason: the chuck function is interlocked with the spindle function, and the chuck is released when the spindle rotates;

Handling: Press [Reset button] to cancel the alarm.

A002.4 When the spindle rotates, the clamping in place signal is invalid alarm

Alarm reason: the chuck function is interlocked with the spindle function to detect the chuck in place signal; When the spindle rotates, no chuck clamping signal is received

Handling: Press [Reset button] to cancel the alarm.

A002.5 The spindle must not be started when the chuck clamping signal is invalid

Alarm reason: the chuck function is interlocked with the spindle function to detect the chuck in place signal; Do not receive the chuck clamping in place signal, rotate the spindle;

Handling: Press [Reset button] to cancel the alarm.

A002.6 The chuck is released and the spindle must not be started

Alarm reason: the chuck function is interlocked with the spindle function; The chuck is not clamped, the spindle is rotated;

Handling: Press [Reset button] to cancel the alarm.

A003.0 The chuck function is invalid and the M12/M13 code cannot be executed

Alarm reason: When the chuck function is not turned on, execute the M12/M13 code;

Handling: Press [Reset button] to cancel the alarm.

A003.1 No chuck clamping/release signal detected

Alarm reason: When detecting the chuck release clamping signal, when performing chuck release or clamping, no signal in place was detected within the T043 time

Handling: Press [Reset button] to cancel the alarm.

A003.2 Liuxin turret did not find the target knife number

Alarm reason: After the turret rotates, the alarm is made when the knife number is not found within 8 seconds

Handling: Press [Reset button] to cancel the alarm.

A003.3 Liuxin turret did not receive cutterhead stop and lock start signals SensorE

Alarm reason: After the turret rotates, the SensorE signal is not signaled within 8 seconds;

Handling: Press [Reset button] to cancel the alarm.

A003.7 The total number of knives in the ordinary tool holder is greater than 4, and the external feed rate cannot be connected (address multiplexing)

Alarm reason: The ordinary tool holder T05-T08 signal is multiplexed with the external feed rate address

Processing: Pay attention to the selection to use

A004.1 is not currently in the spindle analog voltage control state and cannot perform the spindle jog function

Alarm reason: When the spindle switching amount is controlled, the spindle jog function is used

Handling: Press [Reset button] to cancel the alarm.

A004.2 M03, M04 code specified error

Alarm reason: The opposite command was executed in the forward or reverse rotation of the first spindle

Handling: Press [Reset button] to cancel the alarm.

A004.3 M63, M64 code specifies error

Alarm reason: The opposite command was executed in the forward or reverse rotation of the second spindle

Handling: Press [Reset button] to cancel the alarm.

A004.4 Spindle shift time is too long

Alarm reason: When executing the M41-M44 shift command, the gear shift was not completed within the T045 time

Handling: Press [Reset button] to cancel the alarm.

A004.5 Spindle speed/position switching time is too long

Alarm reason: When the spindle switches position or switching speed mode, the switch completion signal is not received within 8 seconds;

Handling: Press [Reset button] to cancel the alarm.

A004.6 Spindle automatic shift function is not turned on and cannot perform M41-M44

Alarm reason: When the automatic shift function of the spindle is invalid, execute the M41-M44 shift command;

Handling: Press [Reset button] to cancel the alarm.

A004.7 AK31 pre-indexing is not loosened at the beginning of the tool change

Alarm reason: Select AK31 tool holder, when performing tool change, the pre-indexing is still sensed in place at the beginning;

Handling: Press [Reset button] to cancel the alarm, check the pre-index sensor, and change the knife again.

A005.3 Spindle clamping is not allowed when spindle rotation or feeding

Alarm reason: spindle loosening state, spindle clamping when the first spindle is selected; When the first spindle rotates, or moves the 5th axis (C-axis) in the first spindle position mode, the spindle clamping alarm is performed; When spindle clamping when selecting the second spindle; The second spindle rotates, or the second spindle position mode moves the 4th axis (A axis) to perform the spindle clamping alarm;

Handling: Press [Reset button] to cancel the alarm.

A005.4 The spindle is clamped and is not allowed to rotate or feed

Alarm reason: spindle clamping state, spindle clamping when the first spindle is selected; The first spindle rotates, or the 5th axis (C-axis) is moved when the first spindle position mode is alarmed; When spindle clamping when selecting the second spindle; Second spindle rotation, or second spindle position mode when moving the 4th axis (A-axis) alarm;

Handling: Press [Reset button] to cancel the alarm.

A006.0 The three-digit switch is paused and the program cannot start

Alarm reason: When the three-position switch function is active, the three-position switch starts the program in the program pause state

Handling: Press [Reset button] to cancel the alarm.

A006.2 M50, M51 code specified error

Alarm reason: The opposite command was executed in the forward or reverse rotation of the Y-axis power head

Handling: Press [Reset button] to cancel the alarm.

A006.3 M53, M54 code specified error

Alarm reason: The opposite command was executed in the forward or reverse rotation of the 4-axis power head

Handling: Press [Reset button] to cancel the alarm.

A006.4 The three-position switch is in a paused state and must not start the spindle

Alarm reason: When the three-position switch function is active, the three-position switch starts the spindle rotation in the spindle stop state

Handling: Press [Reset button] to cancel the alarm.

A006.5 Three-position switch 1\2 is on at the same time, wiring error

Alarm reason: When the three-position switch function is active, the three-position switch 1\2 turns on the alarm at the same time

Handling: Confirm that the wiring is correct.

A008.3 The power head cannot rotate at the same time as the spindle

Alarm reason: When the spindle and the power head cannot rotate at the same time, the spindle and power head rotate together command is executed

Handling: Press [Reset button] to cancel the alarm.

A008.4 The Y 4-axis power head cannot be rotated at the same time

Alarm reason: Alarm when the Y, 4-axis power head rotates at the same time

Handling: Press [Reset button] to cancel the alarm.

A020.0 Guard door not closing warning

Alarm reason: The protective door is not closed when the protective door function is opened

Handling: Close the protective door

A020.1 Insufficient lubricant warning

Alarm reason: insufficient lubricating oil

Treatment: Add lubricating oil

A020.2 Insufficient air pressure warning

Alarm reason: insufficient air pressure (the program will pause when warning that the air pressure is insufficient)

Treatment: Wait for sufficient air pressure and the warning to be canceled

A020.3 Tool holder unlocked warning

Alarm reason: The system does not receive the tool holder locking signal when the tool is not changed. (This warning has no effect when using row knives).

Handling: Manual tool change or input mode to complete the tool change

Appendix 3, chip breaking function (software date 20200106 above version only).

Note: When using the chip breaking function, the cutting acceleration and deceleration must be a linear type of front acceleration and deceleration;

bit parameter 168.2=0/168.3=0; The acceleration and deceleration time is changed to the acceleration and deceleration number parameter 313;

The larger the number parameter 313, the faster the acceleration and deceleration; The smaller the hour, the smaller the acceleration and deceleration; Default 100

1. Function description

Reduce the need for chip removal in the roughing process, improve the quality of the machining surface, and add chip breaking function.

Second, the relevant parameters

The new parameters are as follows:

Default chip breaking length for 213 chip breaking mode (G04.9).

[Data Type] Floating-point

[Default] 1.0

[Data description] In chip breaking mode, the default chip breaking length. Units in millimeters

Default chip breaking pause time for 214 chip breaking mode (G04.9).

The [Data Type] font

[Default] 100

[Data description] In chip breaking mode, the default chip breaking pause time. Units in milliseconds

3. Detailed description of functions

When the chip breaking function is turned on, the interpolation axis pauses for a period of time after a certain distance (chip breaking length) has been machined (chip breaking pause time). Since the spindle does not stop rotating at this time, chip breaking can be carried out.

The format for turning on chip breaking is:

G4.9 P [chip breaking pause time] Q [chip breaking length] H [chip breaking speed];

H [chip breaking speed] is broken at the default speed F5 when not **entered.**

Use the following format to enable chip breaking, and you can use the parameter as the default value:

G4.9 P [chip breaking pause time] ; The chip breaking length uses parameter 213

G4.9 Q[chip breaking length]; The chip breaking pause time uses parameter 214

G4.9 P0 ; Use both parameters as default values

When the chip breaking pause time, or the chip breaking length is less than or equal to 0, the PS alarm will be triggered.

When the chip breaking function is active, when the chip breaking function is turned on again by command, the currently accumulated interpolated motion length is reset, and the new data is used for chip breaking in subsequent motion segments.

The format for turning off chip breaking is:

G4.9 ;

Example: O0001;

T0101;

M3S1200;

M08;

G0X45;

G0Z3;

G4.9 P100 Q1;//Roughing opens chip breaking function, chip breaking length 1 **mm, chip breaking time 100ms**

G71U1R0.5;

G71P10Q20U0.2;

N10G0X0;

G1Z0;

G03X4.09Z-6.55R3.59;

G02X17.45Z-22.72R19.93;

G03X19.07Z-34.46R7.03;

```
G03X22.78Z-50.31R8.41;
N20G01Z-56;
G4.9;//Finishing closes chip breaking
M3S1500;
G70P10Q20;
G0Z60;
M30;
%
```

Appendix IV, Polygon Cutting Function (only available with the version of the Vehicle Function)

Vehicle spindle control can choose analog inverter control and pulse position mode control.

For the selection of the spindle to be controlled by a frequency converter, analog control is used; For spindles using servo spindles, it is recommended to use pulse position mode control (if the spindle inverter control, select analog, spindle does not need to switch position mode), and switch the position mode of the spindle at the beginning of the vehicle.

Add parameters:

Bit 178 2 When the feed shaft is made to simulate the spindle stop (0:no 1:Yes), stop the position before starting When changing to 1, the cutterhead stops at the starting position after the car stops;

Bit 178 3 Vehicle side spindle control (0: analog 1: pulse quantity).

PARAMETER 178.7 VEHICLE SQUARE AXLE SELECTION (0: 3rd AXIS 1: 4TH AXLE) DEFAULT 0 3TH AXIS FOLLOWS THE CAR SIDE

Parameter 1 79.1 Vehicle spindle selection (0: 5th axle 1: 4th axle) [If the vehicle chooses the 4th axle following the axle, the spindle cannot select the 4th axle].

Parameter 1 79.2 Vehicle type selection (0: encoder car side 1: pulse ratio example car side) [Select pulse ratio example car square, does not read encoder speed].

When selecting 0 encoder car, there must be an encoder feedback speed, otherwise the alarm; When you select 1, you can drive without an encoder, but the change angle must be stopped and then rotated by the spindle position mode (the spindle needs to switch the position mode).

When controlling the spindle with a frequency converter, the encoder side must be selected for the vehicle type.

Parameter 198.0 When the X axis returns to zero, a one-turn signal is used to slow down (0:No1:Yes).

Parameter 198.1 When the Z-axis returns to zero, a rotation signal is used to decelerate (0:No1:Yes).

Parameter 198.2 When the third axis returns to zero, a revolution signal is used to decelerate (0:No1:Yes).

Parameter 198.3 When the fourth axis returns to zero, a revolution signal is used to slow down (0:No1:Yes).

Bit 198 4 Use a turn signal to slow down when the fifth axis returns to zero (0:No1:Yes)

Bit parameter 208.0 X-axis G28 back to the reference point (0:no 1:Yes) every time the stop is used

Parameter 208.1 Z-axis G28 back to the reference point (0:no 1:Yes) every time the stop is used

PARAMETER 208.2 3TH AXIS G28 BACK REFERENCE POINT (0:No 1:YES) EVERY TIME THE STOP IS USED

POSITION 208.3 4TH AXIS G28 BACK TO THE REFERENCE POINT (0:NO 1:YES) EVERY TIME THE STOP IS USED

PARAMETER 208.4 5TH AXIS G28 BACK TO THE REFERENCE POINT (0:No 1:YES) EVERY TIME THE STOP IS USED

When selecting Zero to slow down back to zero using a turn signal, select G 28 to use the stop every time the reference point is G28 Zero is returned to zero every time looking for a turn signal at high speed, and then decelerated and reversed to find a turn of the signal falling edge at low speed to zero to complete the zeroing.

When zero is selected to use a turn signal to slow down back to zero, and the G28 reference point is not selected to use the stop every time, the first time G28 turns back to zero at high speed, it looks for a turn signal at high speed, and then decelerates and reverses to return to zero Find a falling edge of the signal at low speed to complete the zero, and the rest are directly returned to the coordinate zero position.

The square axle of the car must be set to the axis of rotation when it is selected to follow the axis;

At the same time, the gear ratio of the main shaft pulse and the gear ratio of the power head are the gear ratio of their respective feed shafts.

The rest of the gear ratios are set on the drive;

Code Format:

G68 J_ L_ S_ R_ ; The vehicle code opens the car side function

J_ Number of (spindle) vehicles (how many sides of the car); When J is positive, the spindle rotates positively, and when it is negative, the spindle is reversed;

L_ Number of knives (square axle); When L is positive, the square axis of the car rotates positively, and when it is negative, the square axis of the car is reversed;

S_ spindle speed; After the G68 code ends, the spindle rotates as an S-spindle

R_ Vehicle angle (switchable angle G68 R_ in the middle of the vehicle; Note: The switching angle is invalid when the pulse ratio is 179.2=1).

G69 ; The end of the vehicle code and the stop of the S speed pulse (the code completion must wait for the

pulse to be issued to stop the completion).

The default G69 state when the system is turned on; Restore the G69 state when the system emergency stop alarm is reset;

The following axle of the vehicle can be set to 3 or 4 axles;

System number parameter 345 3TH axis front acceleration and deceleration constant (start Y-axis power head acceleration and deceleration. M50/M51/M52）

System number parameter 346 4TH shaft front acceleration and deceleration constant (start 4-axis power head acceleration and deceleration M53/M54/M55).

If the spindle does not need to position the vehicle, you can directly use the G68 to switch the position mode, and do not need the M14 positioning to switch the position mode.

Encoder car side 179.2=0:

Analog vehicle control programming format:

M3S400； //Turn on the spindle speed

G68J2L1R0;//Turn on the car side mode (the spindle does not switch position mode).

....

G68 R_ ;// Angle can be switched halfway

....

G69;//Turn off car mode

Pulse position mode vehicle control programming format:

M5； Close the spindle

(M14);// The spindle positioning switching position simulation can be added here to make the spindle enter the position mode in the same position in advance, or it can be omitted

G68J2L1S400 R0;//Turn on Vehicle Mode (Spindle Switching Position Mode).

... .

G68 R_ ;// Angle can be switched halfway

... .

G69;//Turn off car mode

The pulse ratio is 179.2=1:

Pulse position mode vehicle control programming format:

M5； Close the spindle

M14;//Spindle positioning switching position simulation can be added here, so that the spindle enters the position mode in the same position in advance, and can be omitted if there is no need for a fixed position vehicle

G68J2L1S400;//Turn on Vehicle Mode (Spindle Switching Position Mode).

... .

G69;//Turn off car mode

G0 C_;// offset angle, when an offset angle is required, you need to stop the car mode

G68J2L1S400;//Turn on Vehicle Mode (Spindle Switching Position Mode).

... .

G69;//Turn off car mode

Appendix V, Drilling/Boring Cycle Instruction Description (2021 or above).

1. G83/G87 positive/side drilling cycle

1.1 Frontal drilling cycle G83:

Instruction format 1: G83 X(U)_ Z(W)_R_ P_ F_ K_ M_;

X_ the absolute value position of the hole (the incremental value position of the U_ hole for the X-axis of the starting point);

Z_ the absolute value position of the hole bottom (the position of the increment value of the bottom of the W_hole for point R);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_feed rate;

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Description: This format will be done in one punch and will not be drilled in layers.

Number parameter 216 [G83/G87 drilling **blank] default 2**

Number parameter 217 [spindle clamping M code] default 20

Parameter 172.5 [Drill/Boring/Rigid Tapping/Cyclic Spindle Clamping Automatic (0:No **1:Yes) Valid] Default 0**

Note 1: Alarm when edit R is lower than the bottom of the hole: the position of point R is lower than the position of the bottom of the hole;

NOTE 2: Alarm when editing Z(W): The drilling/boring cycle does not specify the hole bottom plane;

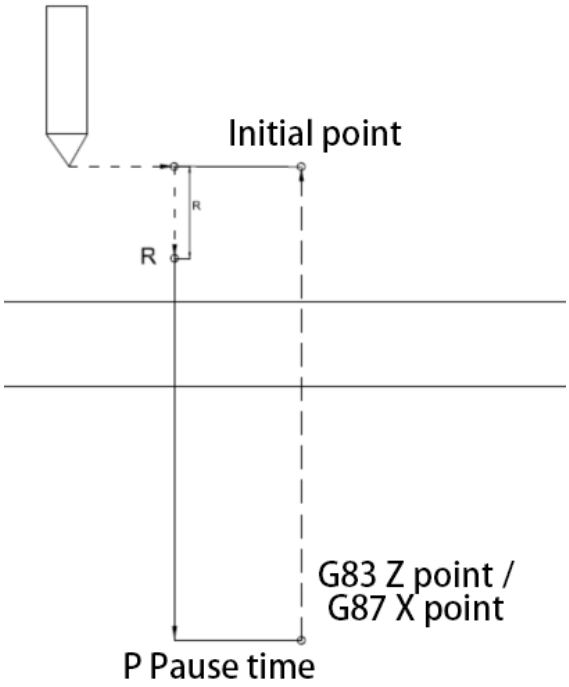
Note 3: When the automatic release of the C **S** axis of the G83/G87/G85/G89 **drilling cycle** is **effective (edited with M20** instruction**),** the CS axis command is not moved in the punching instruction G83/G87. The spindle clamping instruction needs to wait for the completion of the instruction before output; Instruction CS axis movement command needs to automatically loosen the spindle clamping

G83 C100 Z-20 R5 F100 M20;//After the completion of M 21, after the completion of C100, execute M20;

C140 M20; // After the completion of the execution of M 21, after the completion of the execution of C100, execute M20;

G80;

Note 4: Open parameter 172.5=1 [drilling/boring/rigid tapping/cyclic spindle clamping automatic (0:no 1:Yes) effective], when the C axis needs to be clamped and loosened in the cycle code, you can control the spindle clamping and loosening without editing the M20 code, The system automatically joins the execution of C coordinates first The system first executes the release code M **21** after the completion of the **wait for the completion of the C coordinate, and executes the M20** clamping code after the coordinates are completed**; If M 20 is also edited when the parameter is turned on, M20 shall prevail.**



Instruction format 2: G83 X(U)_ Z(W)_ R_ P_ F_ K_ M_ Q_;

X_ the absolute value position of the hole (the incremental value position of the U_ hole for the X-axis of the starting point);

Z_ the absolute value position of the hole bottom (the position of the increment value of the bottom of the W_hole for point R);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

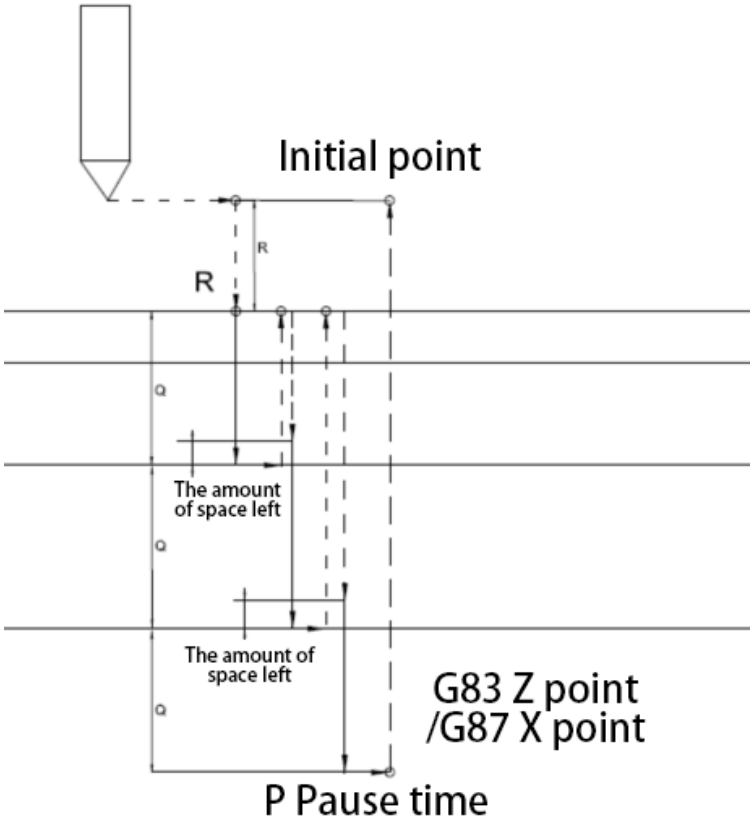
F_feed rate;

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Q_ depth of each cut (without plus or minus signs);

Note: This format will be divided into drilling, return to point R after each feed Q_, and then quickly feed to the empty amount position for drilling feed.



Instruction format 3: G83 X(U)_ Z(W)_R_ P_ F_ K_ M_ Q_ D_;

X_ the absolute value position of the hole (the incremental value position of the U_ hole for the X-axis of the starting point);

Z_ the absolute value position of the hole bottom (the position of the increment value of the bottom of the W_hole for point R);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_feed rate;

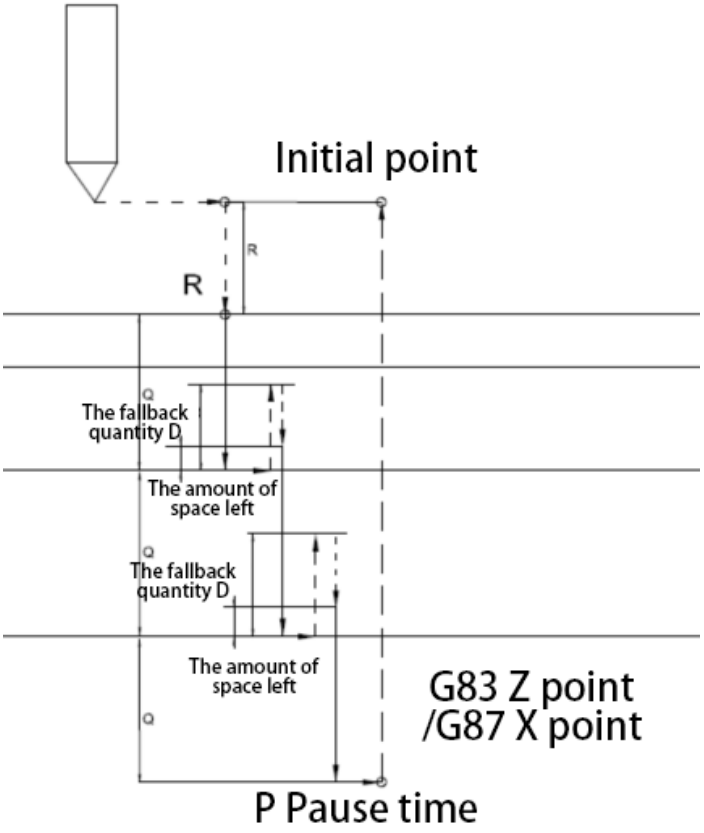
K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Q_ depth of each cut (without plus or minus signs);

D_ height of each retreat (regardless of plus or minus sign);

Note: This format will be divided into drill holes, each feed Q_ followed back to the setback height, and then quickly fed to the empty amount position for drilling feed.



1.2 Side drilling cycle G87:

Instruction format 1: G87 X(U)_ Z(W)_R_ P_ F_ K_ M_;

X_hole bottom absolute value position (U_hole bottom for R point delta value position);

Z_hole absolute value position (W_hole increment value position for the starting point Z axis);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_feed rate;

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Description: This format will be done in one punch and will not be drilled in layers.

Number parameter 216 [G83/G87 drilling **blank] default 2**

Number parameter 217 [spindle clamping M code] default 20

Parameter 172.5 [Drill/Boring/Rigid Tapping/Cyclic Spindle Clamping Automatic (0:No **1:Yes) Valid] Default 0**

Note 1: Alarm when edit R is lower than the bottom of the hole: the position of point R is lower than the

position of the bottom of the hole;

NOTE 2: Alarm when editing X(U): The drilling/boring cycle does not specify the hole bottom plane;

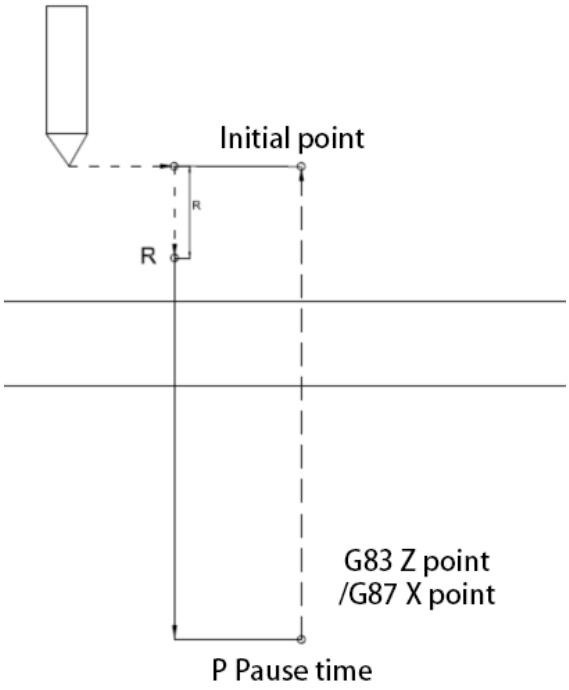
Note 3: When the automatic release of the C **S** axis of the G83/G87/G85/G89 **drilling cycle is effective (edit M20** instruction), the CS axis command has not been moved in the punching instruction G83/G87. The spindle clamping instruction needs to wait for the completion of the instruction before output; Instruction CS axis movement command needs to automatically loosen the spindle clamping;

G87 C100 X-20 R5 F100 M20;//After the completion of M 21, after the completion of C100, execute M20;

C140 M20; // After the completion of the execution of M 21, after the completion of the execution of C100, execute M20;

G80;

Note 4: Open parameter 172.5=1 [drilling/boring/rigid tapping/cyclic spindle clamping automatic (0:no 1:Yes) effective], when the C axis needs to be clamped and loosened in the cycle code, you can control the spindle clamping and loosening without editing the M20 code, The system automatically joins the execution of C coordinates first The system first executes the release code M **21** after the completion of the **wait for the completion of the C coordinate, and executes the M20** clamping code after the coordinates are completed**; If M 20 is also edited when the parameter is turned on, M20 shall prevail.**



Instruction format 2: G87 X(U)_ Z(W)_R_ P_ F_ K_ M_ Q_;

X_hole bottom absolute value position (U_hole bottom for R point delta value position);

Z_hole absolute value position (W_hole increment value position for the starting point Z axis);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

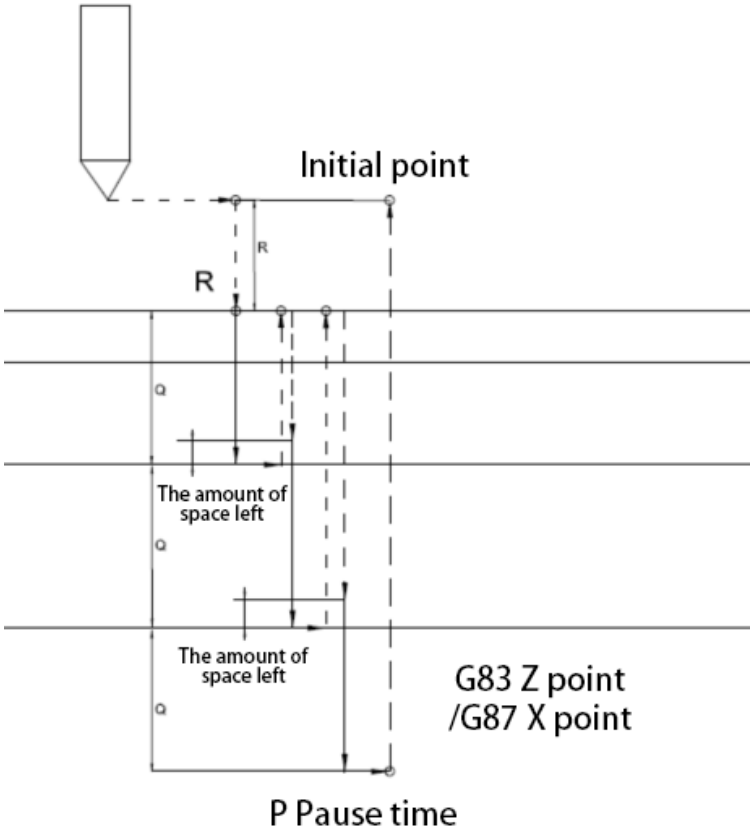
F_feed rate;

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Q_ depth of each cut (without plus or minus signs);

Note: This format will be divided into drilling, return to point R after each feed Q_, and then quickly feed to the empty amount position for drilling feed.



Instruction format 3: G87 X(U)_ Z(W)_R_ P_ F_ K_ M_ Q_ D_;

X_hole bottom absolute value position (U_hole bottom for R point delta value position);

Z_hole absolute value position (W_hole increment value position for the starting point Z axis);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_feed rate;

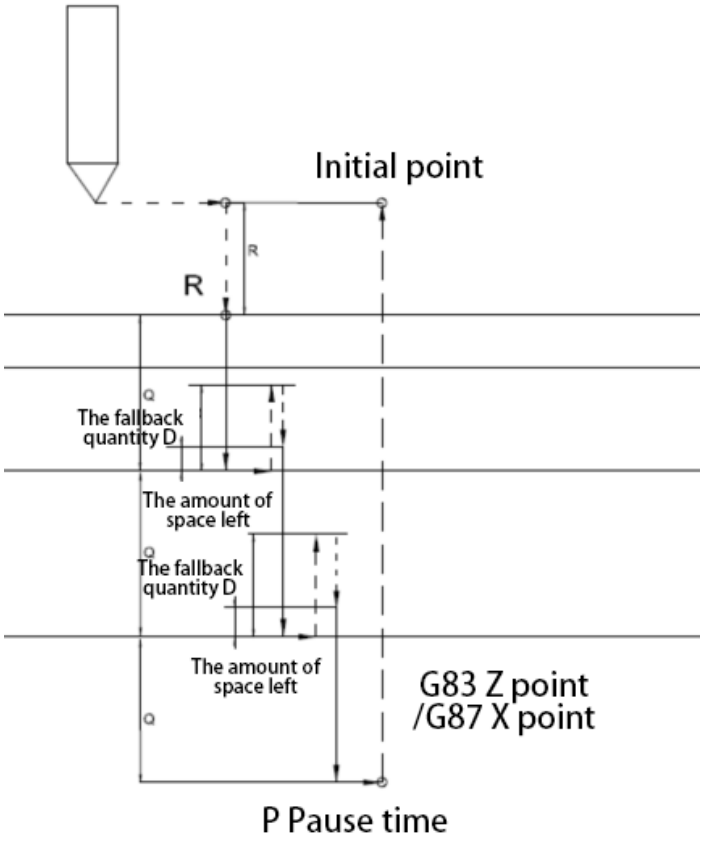
K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Q_ depth of each cut (without plus or minus signs);

D_ height of each retreat (regardless of plus or minus sign);

Note: This format will be divided into drill holes, each feed Q_ followed back to the setback height, and then quickly fed to the empty amount position for drilling feed.



2. G85/G89 positive/side boring cycle

2.1 Front boring cycle G85:

Instruction format 1: G85 X(U)_ Z(W)_R_ P_ F_ K_ M_;

X_ the absolute value position of the hole (the incremental value position of the U_ hole for the X-axis of the starting point);

Z_ the absolute value position of the hole bottom (the position of the increment value of the bottom of the W_hole for point R);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_feed rate;

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Note: Boring cycle feed and retract are performed at feed F speed.

Number parameter 216 [G83/G87 drilling **blank] default 2**

Number parameter 217 [spindle clamping M code] default 20

Parameter 172.5 [Drill/Boring/Rigid Tapping/Cyclic Spindle Clamping Automatic (0:No **1:Yes) Valid] Default 0**

Note 1: Alarm when edit R is lower than the bottom of the hole: the position of point R is lower than the position of the bottom of the hole;

NOTE 2: Alarm when editing Z(W): The drilling/boring cycle does not specify the hole bottom plane;

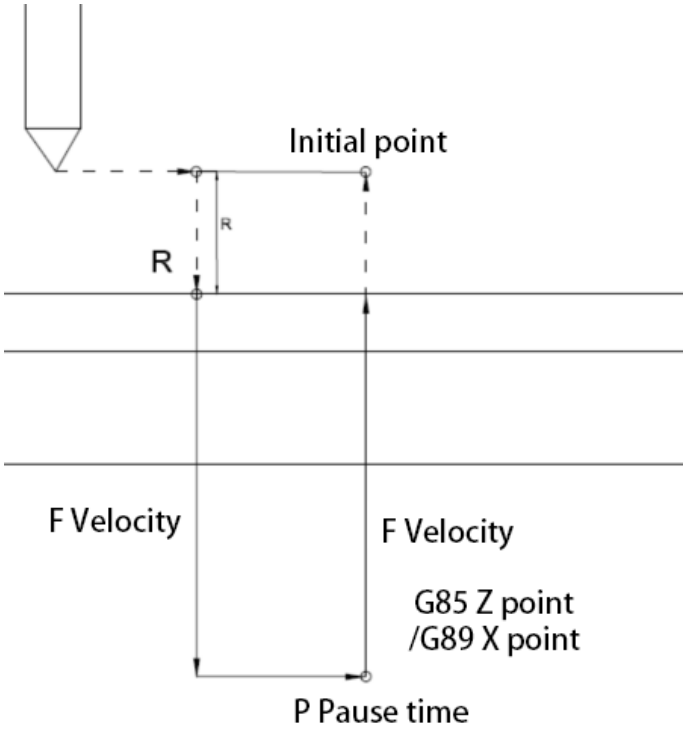
Note 3: When the automatic release of the C **S** axis of the G83/G87/G85/G89 **drilling cycle** is **effective (edit M20** instruction**),** the CS axis command is not moved in the punching instruction G85/G89. The spindle clamping instruction needs to wait for the completion of the instruction before output; Instruction CS axis movement command needs to automatically loosen the spindle clamping

G85 C100 Z-20 R5 F100 M20;//After the completion of M 21, after the completion of C100, execute M20;

C140 M20; // After the completion of the execution of M 21, after the completion of the execution of C100, execute M20;

G80;

Note 4: Open parameter 172.5=1 [drilling/boring/rigid tapping/cyclic spindle clamping automatic (0:no 1:Yes) effective], when the C axis needs to be clamped and loosened in the cycle code, you can control the spindle clamping and loosening without editing the M20 code, The system automatically joins the execution of C coordinates first The system first executes the release code M **21** after the completion of the **wait for the completion of the C coordinate, and executes the M20** clamping code after the coordinates are completed**; If M 20 is also edited when the parameter is turned on, M20 shall prevail.**



2.2 Side boring cycle G89:

Instruction format 1: G89 X(U)_ Z(W)_R_ P_ F_ K_ M_;

X_hole bottom absolute value position (U_hole bottom for R point delta value position);

Z_hole absolute value position (W_hole increment value position for the starting point Z axis);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_feed rate;

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Note: Boring cycle feed and retract are performed at feed F speed.

Number parameter 216 [G83/G87 drilling **blank] default 2**

Number parameter 217 [spindle clamping M code] default 20

Parameter 172.5 [Drill/Boring/Rigid Tapping/Cyclic Spindle Clamping Automatic (0:No **1:Yes) Valid] Default 0**

Note 1: Alarm when edit R is lower than the bottom of the hole: the position of point R is lower than the position of the bottom of the hole;

NOTE 2: Alarm when editing X(U): The drilling/boring cycle does not specify the hole bottom plane;

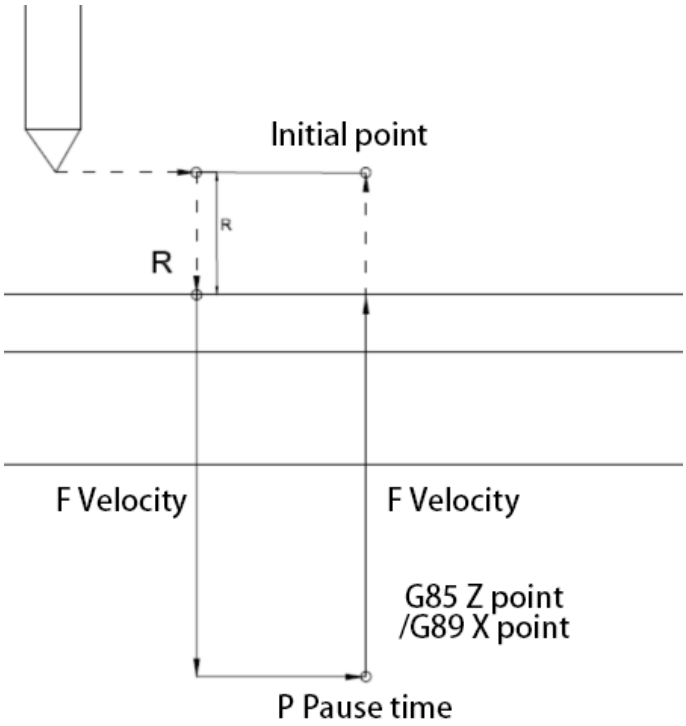
Note 3: When the automatic release of the C S axis in the G83/G87/G85/G89 **drilling cycle** is **effective (edit M20 instruction),** the CS axis command is not moved in the boring command G85/G89. The spindle clamping instruction needs to wait for the completion of the instruction before output; Instruction CS axis movement command needs to automatically loosen the spindle clamping;

G89 C100 X-20 R5 F100 M20;//After the completion of M 21, after the completion of C100, execute M20;

C140 M20; // After the completion of the execution of M 21, after the completion of the execution of C100, execute M20;

G80;

Note 4: Open parameter 172.5=1 [drilling/boring/rigid tapping/cyclic spindle clamping automatic (0:no 1:Yes) effective], when the C axis needs to be clamped and loosened in the cycle code, you can control the spindle clamping and loosening without editing the M20 code, The system automatically joins the execution of C coordinates first The system first executes the release code M **21** after the completion of the **wait for the completion of the C coordinate, and executes the M20** clamping code after the coordinates are completed**; If M 20 is also edited when the parameter is turned on, M20 shall prevail.**



Appendix VI, Front/Side G84/G88 Tapping Cycle (available in versions above 2021).

1. Front tapping loop G84:

Front tapping cycle instruction format 1:

M29 S____ ; M29 opens the rigid tapping, S___tapping speed // do not write the M29 command for flexible tapping

G84 X(U)_ Z(W)_ R_ P_ F/I_ K_ M_;

X_ the absolute value position of the hole (the incremental value position of the U_ hole for the X-axis of the starting point);

Z_ the absolute value position of the hole bottom (the position of the increment value of the bottom of the W_hole for point R);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_metric tap pitch, I_ inch tooth number, **right-handed is positive, left-handed is negative;**

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Note: This format will be processed in one go.

Parameter 213.0 The spindle control mode is (0:Follow 1:Servo) when tapping

When 213.0 chooses to follow, the presence or absence of M29 commands are all flexible tapping, which is controlled by the forward and reverse rotation of the spindle; When selecting the servo, there is an M29 instruction for rigid tapping, and the tapping pulse port is selected through the parameters

Position parameter 209.0 G84 rigid tapping whether to choose the Y axis as the spindle (0:no 1 Yes).

Parameter 209.1 G84 rigid tapping whether to choose the fourth axis as the spindle (0:no 1 yes).

Position parameter 209.2 G84 rigid tapping whether to choose the fifth axis as the spindle (0:no 1 yes).

Parameter 209.3 G84 whether the spindle direction is reversed (0:no 1:Yes)

Parameter 209.4 G88 rigid tapping whether to choose the Y axis as the spindle (0:no 1Yes).

Parameter 209.5 G88 rigid tapping whether to choose the fourth axis as the spindle (0:no 1 yes).

Position parameter 209.6 G88 rigid tapping whether to choose the fifth axis as the spindle (0:no 1 yes).

Parameter 209.7 G88 whether the spindle direction is reversed (0:no 1:yes)

PLC parameters K014.7 M29 rigid tapping output spindle position mode Y4.2 (0: valid 1: invalid).

Number parameter 216 [G83/G87 drilling **blank] default 2**

Number parameter 217 [spindle clamping M code] default 20

Parameter 172.5 [Drill/Boring/Rigid Tapping/Cyclic Spindle Clamping Automatic (0:No **1:Yes) Valid] Default 0**

Note 1: Alarm when edit R is lower than the bottom of the hole: the position of point R is lower than the position of the bottom of the hole;

Note 2: Alarm when editing Z(W): The tapping cycle does not specify the hole bottom plane;

Note 3: When the automatic release of the C **S** axis of the G84/G88 **tapping cycle** is **effective (edited with the M20 instruction),** the CS axis command is not moved in the punching command G84/G88. The spindle clamping instruction needs to wait for the completion of the instruction before output; Instruction CS axis movement command needs to automatically loosen the spindle clamping

M 29S100;// has M29 command for rigid tapping

G84 C100 Z-20 R5 F100 M20;//After the completion of M 21, after the completion of C100, execute M20;

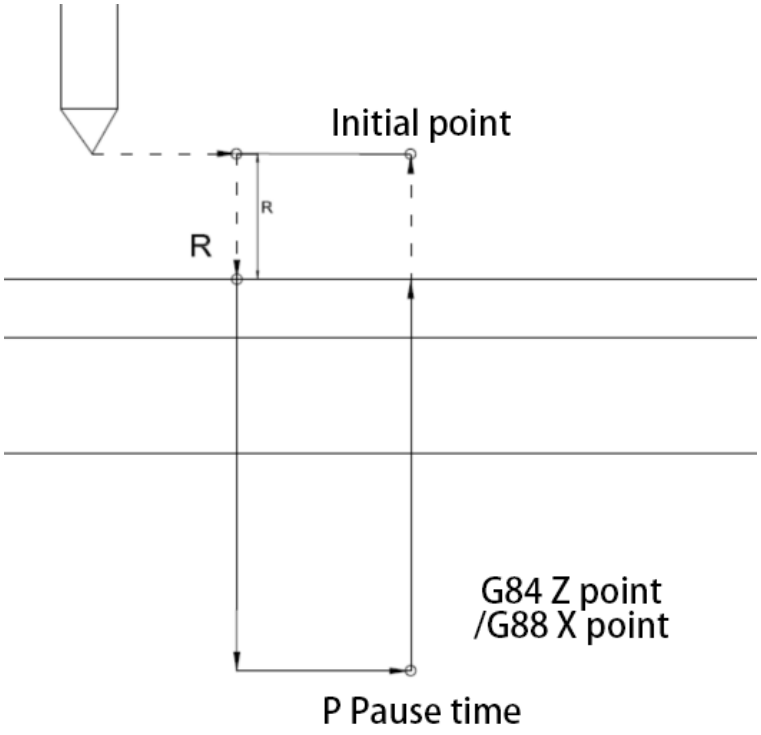
C140 M20; // After the completion of the execution of M 21, after the completion of the execution of C100, execute M20;

G80;

Note 4: Open parameter 172.5=1 [drilling/boring/rigid tapping/cyclic spindle clamping automatic (0:no 1:Yes) effective], when the C axis needs to be clamped and loosened in the cycle code, you can control the spindle clamping and loosening without editing the M20 code, The system automatically joins the execution of C coordinates first The system first executes the release code M **21** after the completion of the **wait for the completion of the C coordinate, and executes the M20** clamping code after the coordinates are completed**; If M 20 is also edited when the parameter is turned on, M20 shall prevail.**

Note 5: When the flexible tapping position parameter 213.0=0 is selected, editing M29 is also a flexible tapping will not change the tapping state, G 84 issues spindle forward and reverse control, and the Z axis is linked with the spindle to tap; Read the spindle feedback speed to control the Z-axis speed, execute the internal execution M 05

spindle stop before the G 84 command is executed, judge the output spindle direction according to the positive and negative of F / I, and output M 05 after the tapping is completed Stop the spindle, and the Z-axis feed is similar to the turning thread and wait for the encoder to turn a signal before feeding.



Front tapping loop instruction format 2:

M29 S____ ; M29 opens rigid tapping, S___tapping speed // Do not write M29 instructions for flexible tapping

G84 X(U)_ Z(W)_ R_ P_ F/I_ K_ M_ Q_;

X_ the absolute value position of the hole (the incremental value position of the U_ hole for the X-axis of the starting point);

Z_ the absolute value position of the hole bottom (the position of the increment value of the bottom of the W_hole for point R);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

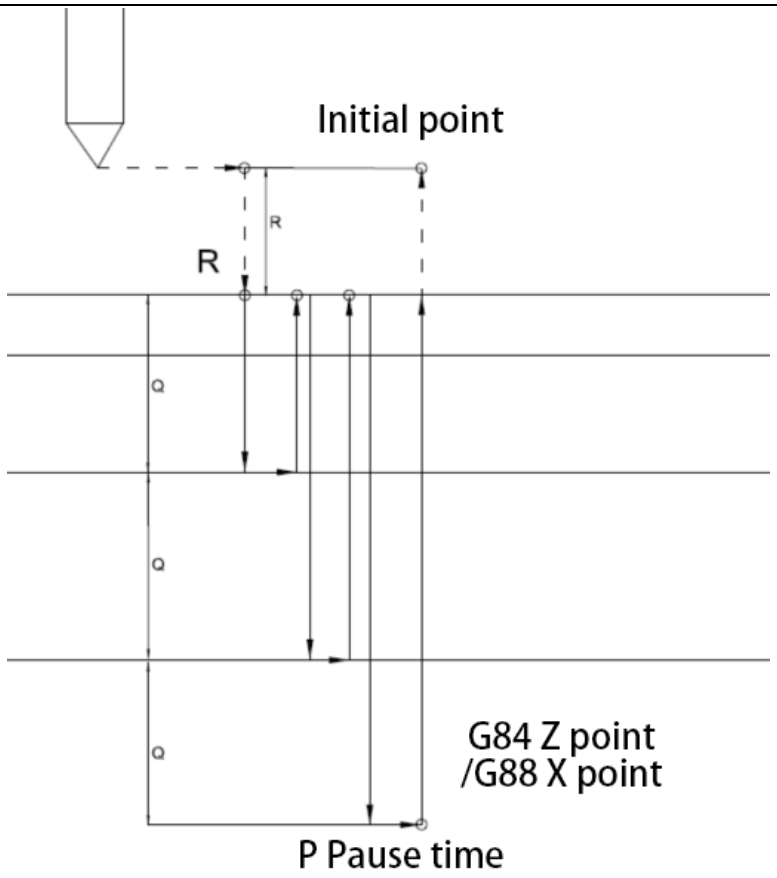
F_metric tap pitch, I_ inch tooth number, **right-handed is positive, left-handed is negative;**

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Q_ depth of each cut (without plus or minus signs);

Note: This format will be processed in layers, each feed Q_ and then back to the R point, and then tapped.



Front tapping loop instruction format 3:

M29 S____ ; M29 opens rigid tapping, S___tapping speed // Do not write M29 instructions for flexible tapping

G84 X(U)_ Z(W)_ R_ P_ F/I_ K_ M_ Q_ D_;

X_ the absolute value position of the hole (the incremental value position of the U_ hole for the X-axis of the starting point);

Z_ the absolute value position of the hole bottom (the position of the increment value of the bottom of the W_hole for point R);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_metric tap pitch, I_ inch tooth number, **right-handed is positive, left-handed is negative;**

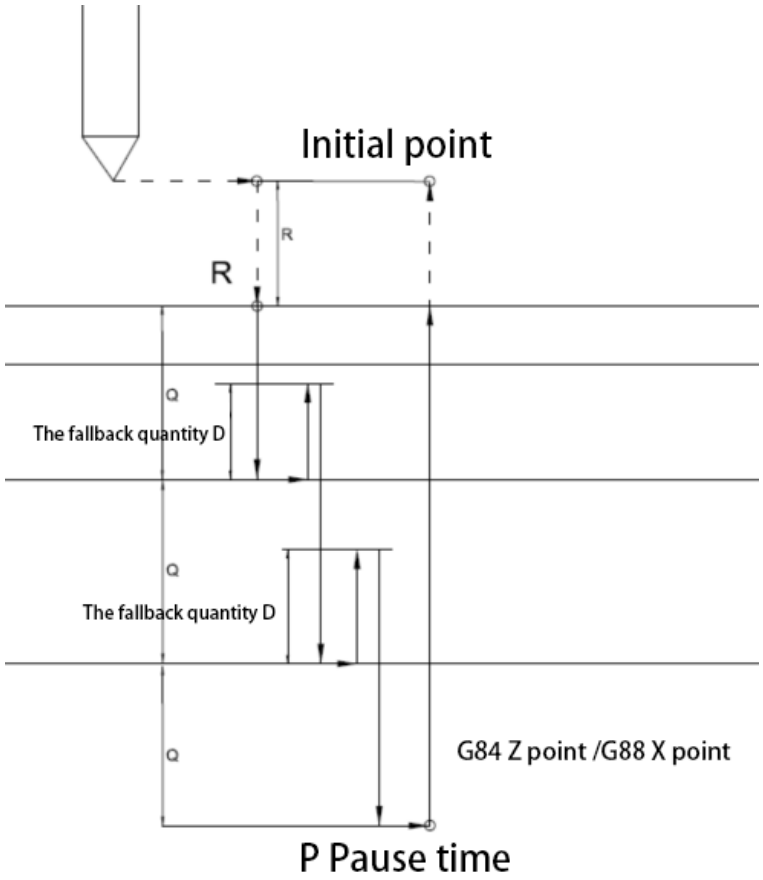
K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Q_ depth of each cut (without plus or minus signs);

D_ height of each retreat (regardless of plus or minus sign);

Note: This format will be processed in layers, each feed Q_ followed by a retract height and then a tapping feed.



2. Side tapping cycle G88:

Side tapping cycle instruction format 1:

M29 S____ ; M29 opens rigid tapping, S___tapping speed // do not write M29 command for flexible tapping

G88 X(U)_ Z(W)_ R_ P_ F/I_ K_ M_;

Z_hole absolute value position (W_hole increment value position for the starting point Z axis);

X_hole bottom absolute value position (U_hole bottom for R point delta value position);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_metric tap pitch, I_ inch tooth number, **right-handed is positive, left-handed is negative;**

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Note: This format will be processed in one go.

Parameter 213.0 The spindle control mode is (0:Follow 1:Servo) when tapping

When 213.0 chooses to follow, the presence or absence of M29 commands are all flexible tapping, which is controlled by the forward and reverse rotation of the spindle; When selecting the servo, there is an M29 instruction for rigid tapping, and the tapping pulse port is selected through the parameters; No M29 command for flexible tapping.

Position parameter 209.0 G84 rigid tapping whether to choose the Y axis as the spindle (0:no 1 Yes).

Parameter 209.1 G84 rigid tapping whether to choose the fourth axis as the spindle (0:no 1 yes).

Position parameter 209.2 G84 rigid tapping whether to choose the fifth axis as the spindle (0:no 1 yes).

Parameter 209.3 G84 whether the spindle direction is reversed (0:no 1:Yes)

Parameter 209.4 G88 rigid tapping whether to choose the Y axis as the spindle (0:no 1Yes).

Parameter 209.5 G88 rigid tapping whether to choose the fourth axis as the spindle (0:no 1 yes).

Position parameter 209.6 G88 rigid tapping whether to choose the fifth axis as the spindle (0:no 1 yes).

Parameter 209.7 G88 whether the spindle direction is reversed (0:no 1:yes)

PLC parameters K014.7 M29 rigid tapping output spindle position mode Y4.2 (0: valid 1: invalid).

Number parameter 216 [G83/G87 drilling **blank] default 2**

Number parameter 217 [spindle clamping M code] default 20

Parameter 172.5 [Drill/Boring/Rigid Tapping/Cyclic Spindle Clamping Automatic (0:No **1:Yes) Valid] Default 0**

Note 1: Alarm when edit R is lower than the bottom of the hole: the position of point R is lower than the position of the bottom of the hole;

Note 2: Alarm when editing X(U): The tapping cycle does not specify the hole bottom plane;

Note 3: When the automatic release of the C **S** axis of the G84/G88 **tapping cycle** is **effective (edited with the M20 instruction),** the CS axis command is not moved in the punching command G84/G88. The spindle clamping instruction needs to wait for the completion of the instruction before output; Instruction CS axis movement command needs to automatically loosen the spindle clamping

M 29S100;// has M29 command for rigid tapping

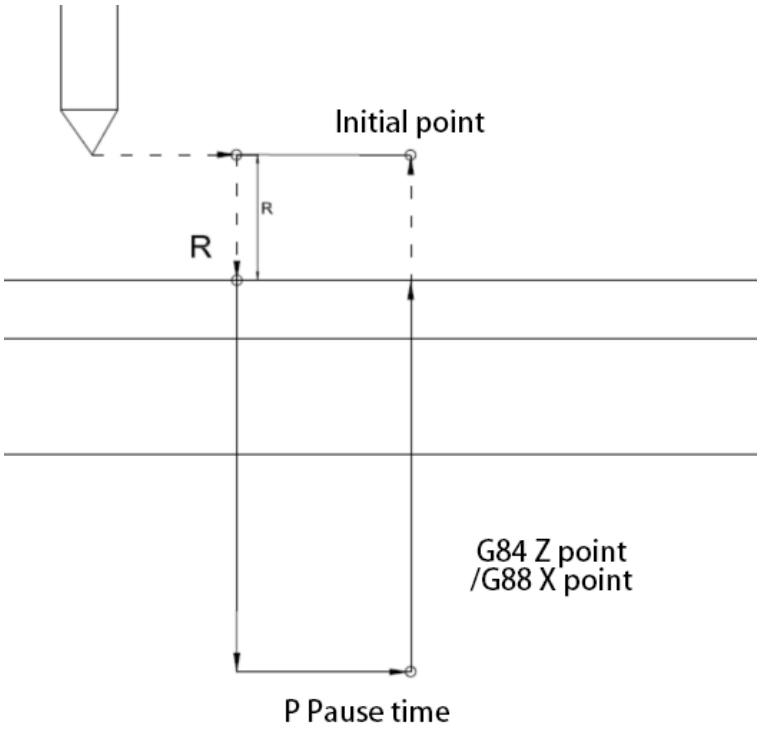
G88 C100 X-20 R5 F1 M20;//After the completion of M 21, after the completion of C100, the execution of M20;

C140 M20; After the completion of executing M 21, after the completion of C100, execute M20;

G80;

Note 4: Open parameter 172.5=1 [drilling/boring/rigid tapping/cyclic spindle clamping automatic (0:no 1:Yes) effective], when the C axis needs to be clamped and loosened in the cycle code, you can control the spindle clamping and loosening without editing the M20 code, The system automatically joins the execution of C coordinates first The system first executes the release code M **21** after the completion of the **wait for the completion of the C coordinate, and executes the M20** clamping code after the coordinates are completed**; If M 20 is also edited when the parameter is turned on, M20 shall prevail.**

Note 5: When the flexible tapping position parameter 213.0=0 is selected, edit M29 is also flexible tapping does not change the tapping state, G88 issues spindle forward and reverse control, X Shaft and spindle linkage tapping; Read the spindle feedback speed to control the Z-axis speed, execute the internal execution M 05 spindle stop before the G 88 command is executed, judge the direction of the output spindle according to the positive and negative of F / I, and output M 05 after the tapping is completed Stop the spindle, and the X-axis feed is similar to the turning thread and wait for the encoder to turn the signal before feeding.



Side tapping cycle instruction format 2:

M29 S____ ; M29 opens rigid tapping, S___tapping speed // do not write M29 command for flexible tapping

G88 X(U)_ Z(W)_ R_ P_ F_ K_ M_ Q_;

Z_ the absolute value position of the hole (the incremental value position of the W_hole for the Z-axis of the starting point);

X_ the absolute value position of the bottom of the hole (the position of the incremental value of the bottom of the U_hole for point R);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

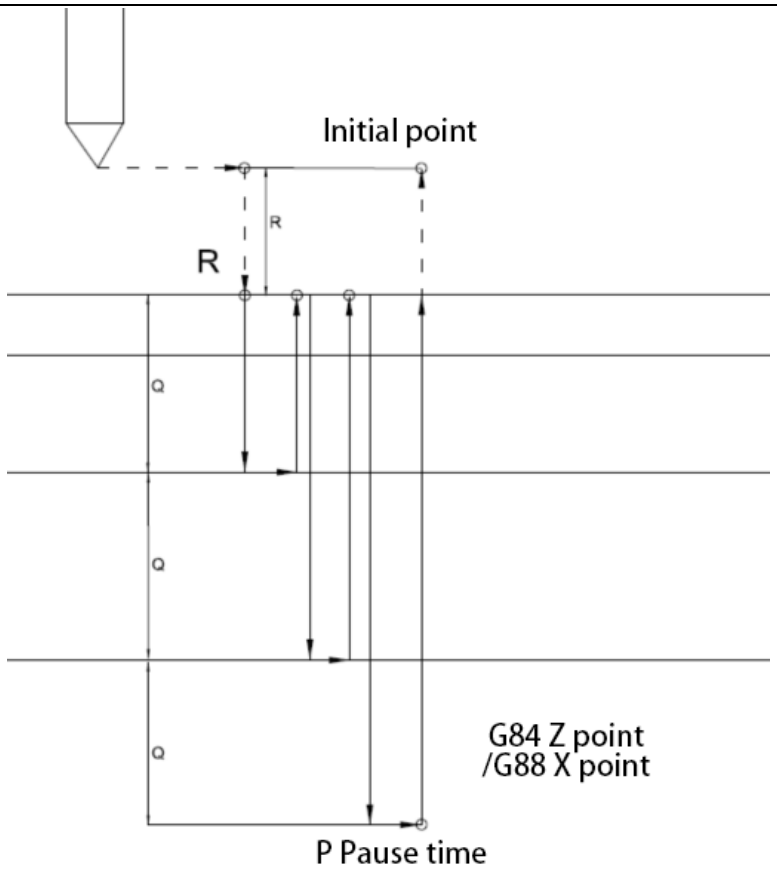
F_metric tap pitch, I_ inch tooth number, **right-handed is positive, left-handed is negative;**

K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Q_ depth of each cut (without plus or minus signs);

Note: This format will be processed in layers, each feed Q_ and then back to the R point, and then tapped.



Side tapping loop instruction format 3:

M29 S____ ; M29 opens rigid tapping, S___tapping speed // do not write M29 command for flexible tapping

G88 X(U)_ Z(W)_ R_ P_ F_ K_ M_ Q_ D_;

Z_ the absolute value position of the hole (the incremental value position of the W_hole for the Z-axis of the starting point);

X_ the absolute value position of the bottom of the hole (the position of the incremental value of the bottom of the U_hole for point R);

R_ the increment value from the starting point to the R point (regardless of the plus or minus sign), and the processing starts from the starting point by default without editing;

P_hole bottom pause time, unit ms, default pause without editing;

F_metric tap pitch, I_ inch tooth number, **right-handed is positive, left-handed is negative;**

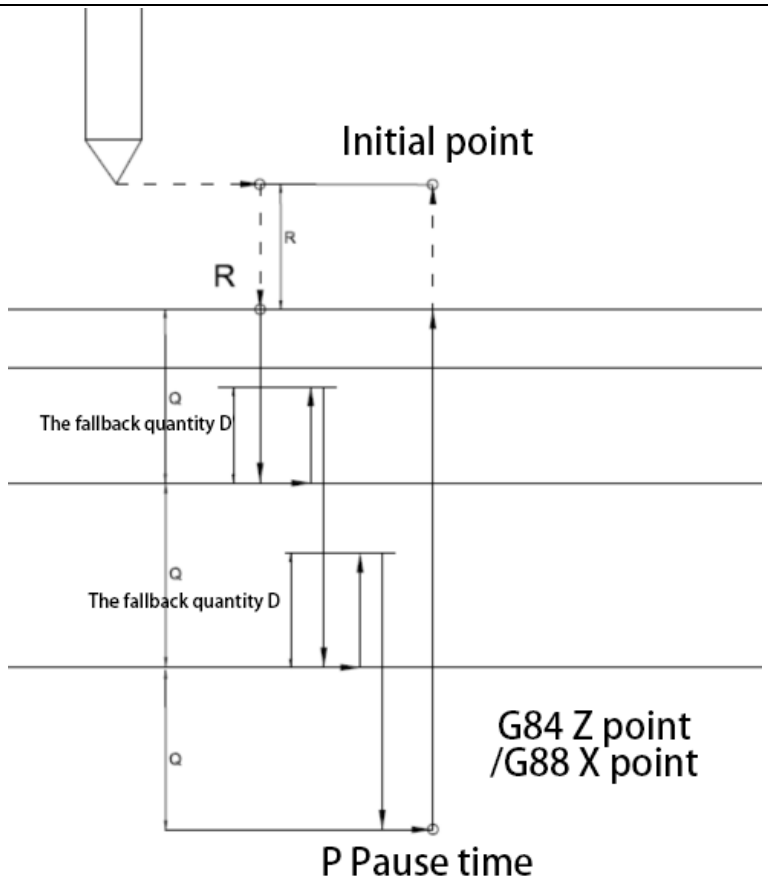
K_ number of repetitions, default 1 time without editing, (only the front hole is valid, and K needs to be added after each coordinate when multiple holes need to be processed repeatedly);

M_spindle clamping code, the spindle is not clamped by default without editing;

Q_ depth of each cut (without plus or minus signs);

D_ height of each retreat (regardless of plus or minus sign);

Note: This format will be processed in layers, each feed Q_ followed by a retract height and then a tapping feed.



Appendix VII: Online revision of special instructions G08/G09 (only available for version 2 021 or above).

Programming Format:

G08/G09 X(U) Z(W) Y(V) A/B(E) C(H) R(D);

Illustrate:

X/Z/Y/A/B/C absolute value programming, edit data is the absolute coordinates of the current position input into the corresponding knife complement number;

U/W/V/E/H/D incremental programming, programming data incrementally entered into the corresponding tool complement number;

R(D) is the tool tip radius compensation: R absolute programming enters the editing data into the tool complement as the tip radius, and D is incremental programming to enter the edit data into the tool complement number;

G08 Compensate for the current knife supplement;

G09 Compensation 00 Knife Supplement;

Corresponding parameters:

Using the G08/G09 instruction requires opening bit parameter 1 79.3=1 [G10 function from new decoding (0:no 1:yes) support] ;

Need to modify 0 0 tool complement time need to open bit parameter 1 2.6=1 [NO.0 tool complement translation workpiece coordinate system (0: invalid 1 :valid)]

Note 1: To compensate for the special case of 0 0 number 0 tool supplement, when the previous tool complement number is 00, use the G08 or G 09 function, using the absolute programming G 80/G09 X_,[X_] The data is directly assigned to the 0 0 knife supplement (in the case of 0 0 knife to supplement the original data 1 0, G is executed 08/G09 X20 0 knife complement value becomes 2 0, instead of adding 2 0 to 1 0). ； Using the incremental programming G08/G09 U_, [U_] data increments are added to the 0 0 knife supplement (0 0 knife supplement the original data 1 0 , when G08/G09 U20 is executed, the complement value of 0 0 becomes 3 0, which is 2 added to 1 0 0）。

Note 2: After compensating 0 0 knife compensation, all knife compensation will increase 0 0 compensation, which is similar to the coordinate system base offset; For example, G 09 can be used if the workpiece is reworked with 0 1/02/03/04 and the diameter is 0.2 mm smaller X/U-0.2 compensation 0 No. 0 knife repair to compensate for other knife patches.

Note 3: 0 No. 0 knife compensation is in the opposite direction to other knife compensation directions, the negative direction is compensated in the case of small size, and the positive direction is compensated in the case of large size.

G08/G09 usage example:

1) Compensation 00 knife supplement:

   T0100;

   G08 X/U-0.2;

   or

   T0101;//Current arbitrary knife complement

   G09 X/U-0.2;

   The effect is the same as 0 0 knife compensation 0.2mm;

2) Incrementally compensate for the current cutter patch

   T0101;// When the knife complement is 0 1, compensation 01 knife supplement

   G08 U0.2;

   Compensation 0 No.1 tool supplement, add 0.2mm on the basis of the original knife supplement data, when the diameter of the No. 01 knife repair workpiece is 0.2mm smaller, this method can be used to compensate;

3) Absolutely compensate for the current knife patch

   T0101;// When the knife complement is 0 1, compensation 01 knife supplement

   G08 X20;

   Compensate 0 No. 1 tool supplement, take the current position as the position of tool X 20, and the value of 0 No. 1 tool supplement is the data [machine coordinates] of normal tool X20 -[X20]； When T 0101 is called again at this position, the current X-axis absolute coordinates are 20.

   Note: After modifying the knife supplement, you need to call the knife supplement again to be effective;

For example: T0101;// when the knife complement number is 0 1, compensation 01 knife supplement
G08 U0.2;

At this time, the compensated knife patch does not take effect, and only the compensated knife patch takes effect when executing the next T0101 instruction.

Appendix VIII. Description of new control parameters (version 2021 or later).

1) Added 98D absolute communication protocol

Number parameter 198 absolute value (0:KY1000 1:SANKYO 2:98D).

Number parameter 199 Absolute value stop bit (0: odd check 1 : no check) KY300Ci is changed to 0, and Sanxie/98D is changed to 1，

When using absolute value communication, select different drives according to the matching.

2) Number parameters

213 chip breaking function triggers movement in millimeters (default 1).

214 Time per chip break in milliseconds (default 100).

313 L-type time constant for acceleration and deceleration before cutting feed

Change to L-type acceleration before cutting feed (effective when using pre-cutting acceleration and deceleration).

3) Position Parameter 182.0 Grain processing high speed (0: normal 1: high speed)

Change to 1 to turn on the AB pulse feed pass thread function

Parameter 182.2 Thread stub shaft retract length optimization (0: not optimized 1: Optimized) (Optimized retract distance is the distance to the next G0 stub axis position)

4) Bit parameter 6.6 Program autosave (0:off 1:open) (autosave after 10 seconds without editing).

Program switch modification power off save: bit parameter 208.5 program switch control (0: on 1: off)

If you want to lock the program, you can turn off the program switch at the 3rd level of operation, and then the system is downgraded to level 4 or 5.

Auto Sequence Number Switch Modify Power Off Save : bit parameter 205.0 Auto insert sequence number (0: No 1: Yes)

5) Add M9000~M9998 call subprogram function to call O9000--O9998 program

6) When changing the tool, it can be executed together with other instructions

Bit parameter 178.6 Whether the tool change command can be executed with other instructions (0:no 1:Yes)

7) Modify the absolute value communication to keep alarming

215.4 Whether absolute communication keeps alarming (0:Yes 1:No).

8) Processing time power-off memory
Parameter 173.5 Whether the processing time is cleared at power-on (0:no 1:yes)

9) Added G71G72II. function
bit parameter 177.5 G71G72 whether to use the binary algorithm (0:Yes 1:No).
bit parameter 177.6 G71G72 whether the two shapes last walked along the trajectory once (0:no 1:Yes)

10) Added the function of updating the zero point of the absolute value rotation axis to avoid the problem of overflow of the rotation axis coordinates
The absolute value of the parameter 193.7 is whether the zero point of the axis of rotation is updated (0:no 1:Yes).
When the absolute motor shaft is set to the rotary axis, the bit parameter 1 93.7 is set to 1 to avoid the problem of overflow of the motor memory of multiple turns.

11) 216 Empty space in the borehole
217 Spindle clamping M-code
Bit parameters:
172.5 Cs axis perforated tapping whether the clamp is automatically loosened (0:no 1:Yes)
209.0 G84 rigid tapping spindle selection (0:no selection 1:3 axis).
209.1 G84 rigid tapping spindle selection (0:no selection 1:4 axis).
209.2 G84 rigid tapping spindle selection (0:no selection 1:5 axis).
209.3 G84 rigid tapping spindle direction (0: default 1: negation).
209.4 G88 rigid tapping spindle selection (0:no selection 1:3 axis).
209.5 G88 rigid tapping spindle selection (0:no selection 1:4 axis).
209.6 G88 rigid tapping spindle selection (0:no selection 1:5 axis).
209.7 G88 rigid tapping spindle direction (0: default 1: negation).

12) 178.2 Simulates whether the spindle stops at the start angle (0:no 1:Yes).
Number parameters:
The 375 simulates the lowest rotational speed at which the spindle and vehicle square axles stop to the starting angle
Modify CS axis background switching function Add number parameter 218 CS axis switching position mode M code
Add bit parameter function 186.1 Run the tool change instruction T to call the O9101 (0:invalid 1:valid)).
179.6 Spindle shifting (0:67 for fixed voltage 1:67 for fixed speed).
187.4 Running CS axis command did not switch position mode (0: alarm 1: wait).

13) Digital parameter 222 manual X-axis fast positioning speed
Digital parameter 223 manual Z-axis fast positioning speed
Digital parameter 229 manual 3rd axis fast positioning speed
Digital parameter 230 manual fourth axis fast positioning speed
Digital parameter 231 manual fifth axis fast positioning speed

14) Increase the number parameter 36 second analog spindle maximum speed

Add number of parameters 50 spindle output port selection (3: third axis 4: fourth axis) The other is the fifth axis

Increase the number of parameters 77 hand wheel test cutting top speed

Appendix IX, M-Code Table

M code	definition	remark
M00	Unconditional suspension	The program pauses when running to M00
M01	Select Pause Stop	The program pauses when running to M01 and the system has the Select Stop function turned on, otherwise it will run down
M02	End of procedure	
M03	The spindle is spinning	Interlock, boot default M05
M04	The spindle is reversed	
M05	The spindle stops	
M06	retain	
M08	Coolant	Interlock, boot default M09
M09	Turn off cooling	
M10	Tailstock forward	Interlock
M11	Tailstock backslid	
M12	Chuck clamping	Interlock
M13	The chuck is released	
M14	Spindle positioning switches position mode	Interlock
M15	The spindle switches the speed mode	
M20	Spindle clamping	Interlock
M21	The spindle is released	
M22	retain	All reserved M codes are invalid function codes
M23		
M24		
M25		
M26		
M27		
M28		
M29	Rigid tapping opens	The speed mode can be switched off using the M15
M30	End of procedure	
M31	The number of processed pieces is added to 1	
M32	Lubricating output	Interlock
M33	Lubrication is turned off	
M34	Guard door output	Interlock
M35	The protective door is closed	
M36	Chip conveyor output	Interlock
M37	The chip conveyor is turned off	
M38	Work light output	Interlock
M39	The work light is off	
M40	retain	All reserved M codes are invalid function codes

M41	The spindle shifts 1 gear	Interlock
M42	The spindle shifts 2 gears	
M43	The spindle shifts 3 gears	
M44	The spindle shifts 4 gears	
M45	retain	All reserved M codes are invalid function codes
M46		
M47		
M48		
M49		
M50	The 3rd axis power head rotates forward	Interlock
M51	The 3rd axis power head reverses	
M52	The 3rd axis power head stops	
M53	The 4th axis power head rotates forward	Interlock
M54	The 4th axis power head reverses	
M55	The 4th axis power head stops	
M56	retain	All reserved M codes are invalid function codes
M57		
M58		
M59		
M60		
M61		
M62		
M63	The second spindle rotates forward	Interlock, boot default M65
M64	The second spindle is reversed	
M65	The second spindle stops	
M66	retain	All reserved M codes are invalid function codes
M67		
M68		
M69		
M70	Customize theK1 output	Interlock
M71	CustomK1 off	
M72	CustomizeK2 output	Interlock
M73	CustomK2 off	
M74	CustomizeK3 output	Interlock
M75	CustomK3 off	
M76	CustomizeK4 output	Interlock
M77	CustomK4 off	
M78	**Restore feed rate 100%.**	Interlock
M79	**Restore the original feed rate**	
M80	retain	All reserved M codes are invalid function codes
M81		
M82		
M83		

M84		
M85		
M86		
M87		
M88		
M89	Customize the output	Multi-format programming
M90	The program segment repeats to end	Interlock, M91 C_ needs to end with M90
M91 C	The program segment starts repeatedly	
M92	Conditional jumps	
M93	Unconditional jumps	
M94	retain	All reserved M codes are invalid function codes
M95		
M96		
M97		
M98	Call the subroutine	If you do not write L times, it is called once by default
M99	End of subroutine	When written in the main program, the program is an infinite loop
M9000—M9999		A single call to the O 9000-O9999 program

Appendix 10: Supplementary Description of Macro Programs (available in versions above2021).

1. Statement-based macro code (macro B).

1.1 Arithmetic and logical operations

Arithmetic and logical operations

function	Expression structure	remark
Define or assign a value	#i=#j	
addition subtraction multiplication division	#i=#j+#k #i=#j-#k #i=#j*#k #i=#j/#k	
or and XOR	#i=#j OR #K #i=#j AND #K #i=#j XOR #K	Logical operations are performed bit by bit by binary number
square root absolute value rounding Round up	#i=SQRT[#j] #i=ABS[#j] #i=ROUND[#j] #i=FUP[#j]	

Round down Napierian logarithm Exponential function	#i=FIX[#j] #i=LN[#j] #i=EXP[#j]	
sine arcsine cosine inverse cosine tangent Anyway tangent	#i=SIN[#j] #i=ASIN[#j] #i=COS[#j] #i=ACOS[#j] #i=TAN[#j] #i=ATAN[#j]/[#k]	The unit of angle is specified in degrees, e.g. 90°30' is expressed in 90.5 degrees
Switching from BCD to BIN Switching from BIN to BCD	#i=BIN[#j] #i=BCD[#j]	Used for conversion with PMC signals

Related instructions

1、Angular units

The angular units of the functions SIN, COS, ASIN, ACOS, TAN, and ATAN are degrees (°). For example, 90°30’ should be expressed as 90.5° (degrees).

2、Arcsine #i=ASIN[#j]

i、The range of the result output is as follows,

When the parameter No180#7 NAT bit is set to 1, 90°~ 270°;

When the parameter No180#7 NAT bit is set to 0, -90°~ 90°;

ii、When #j goes outside the range of -1 to 1, a P/S alarm is raised.

iii、Constants can replace the variable #j.

3、Anticosine #i=ACOS[#j]

i、The result output range is from 180°~0°;

ii、When #j exceeds the range of -1 to 1 P/S alarm;

iii、Constants can replace the variable #j.

4、Anywaytangent #i=ATAN[#j]/[#k]

Specify the length of both sides, separated by a slash '/'.

i、The value range is as follows:

When the parameter No180#7 NAT bit is set to 1: 90°~270°;

[Example] when specifying #1=ATAN[-1]/[-1] #1=225°;

When the parameter No180#7 NAT bit is set to 0 -90°~90°;

[Example] when specifying #1=ATAN[-1]/[-1] #1=45.0°;

ii、Constants can replace the variable #j.

5、Natural logarithm #i=LN[#j]

i. Constants can replace the variable #j.

6、Exponential function #i=EXP[#j]

i、Constants can replace the variable #j.

7、ROUND rounding function

When the ROUND function is included in the arithmetic or logical operation code IF or WHILE, the ROUND function is rounded at the first decimal place.

For example:

When #1=ROUND[#2] is executed, at this point #2=1.2345, the value of variable 1 is 1.0.

8、Round up and round down

When CNC processes numerical operations, if the absolute value of the integer generated after the operation is greater than the absolute value of the original number, it is called rounding; If it is less than the absolute value of the original number, it is called rounding. Care should be taken with the handling of negative numbers.

For example:

Suppose #1=1.2 and #2=-1.2

When #3=FUP[#1] is executed, 2.0 is assigned to #3.

When #3=FIX[#1] is executed, 1.0 is assigned to #3.

When #3=FUP[#2] is executed, -2.0 is assigned to #3.

When #3=FIX[#2] is executed, -1.0 is assigned to #3.

1.2 Transfer and Circulation

In the program, the use of GOTO statements and IF statements can change the flow direction of control. Three transfer and loop operations are available.

1、GOTO statements (unconditional transfer).

2、The condition controls the IF statement.

3、WHILE loop statement.

1）Unconditional transfer (GOTO statement)

The program segment transferred to the sequential number n. When an alarm is assigned a sequence number other than 1 to 99999, you can specify the sequence number using an expression.

Format: GOTOn; n: Sequential number (1~99999).

Example: GOTO1;

GOTO#101;

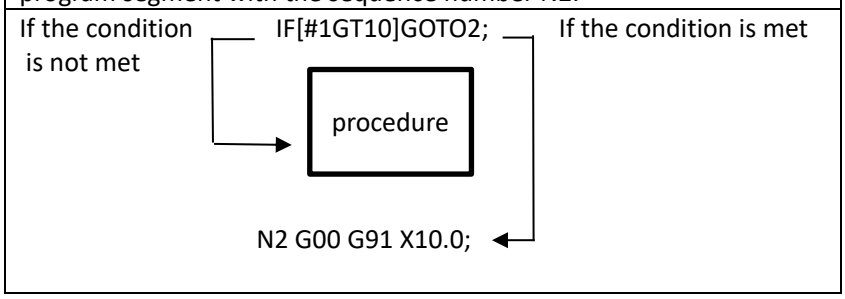
2） Conditional Control (IF Statement)

GOTO format: IF [conditional expression] GOTOn;

If the specified conditional expression is true, transfer to the program segment with the sequential number n; If the specified conditional expression does not hold, the next program segment is executed sequentially.

Example:

If the value of variable #1 is greater than 10, transfer to the program segment with the sequence number N2.



THEN format: IF [conditional expression]THEN< macro program statement >;

If the conditional expression is true, only one statement can be executed after THEN.

Example: IF[#1EQ#2]THEN#3=0;

If the value of #1 is equal to the value of #2, assign 0 to variable #3; if not, the assignment statement after THEN is executed in order.

Conditional expressions: Conditional expressions must include conditional operators, which can be variables, constants, or expressions on both sides, enclosed in parentheses '['']'.

Conditional operators: The conditional operators listed in the following table are available for the system.

Conditional operators	meaning
EQ or ==	Equals (=)
NE or <>	Not equal to (≠).
GT or >	Greater than (>).
GE or >=	Greater than or equal to (≥).
LT or <	Less than (<).
LE or <=	Less than or equal to (≤).

For example: IF[3<>2]GOTO2; Its meaning is: if 3 is not equal to 2, jump to the N2 program segment;

IF[#101>=7.22]THEN#101=SIN30； Its meaning is: if #101 is greater than or equal to 7.22, then the assignment operation after THEN is performed. That is, a sine of 30 degrees is assigned to variable #101.

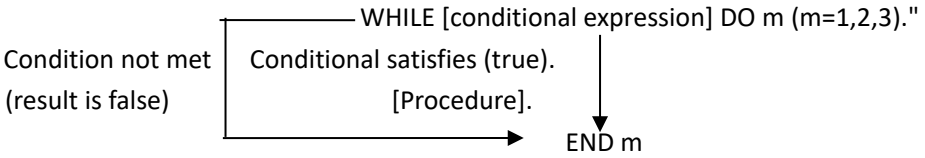
Typical program: The following program calculates the sum of integers 1~10.

```
O9500
#1=0； ..... and initialized to 0
#2=1； ..... The initial value of the added number is 1
N1 IF[#2 GT 10]GOTO2； ..... When the added number is greater than 10, it is transferred to N2
#1=#1+#2； ..... Calculate the sum of two numbers
#2=#2+1； ..... Be added to add 1
GOTO1； ..... Unconditionally jump to program segment N1
N2 M30； ..... End of procedure
```

3）LOOP (WHILE STATEMENT)

Specify a conditional expression after WHILE, and when the specified condition is true, execute the program segment from DO to END; Otherwise, jump to the program segment after END.

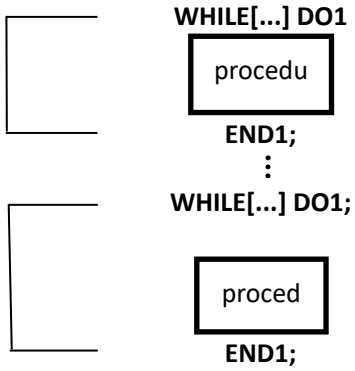
Example:



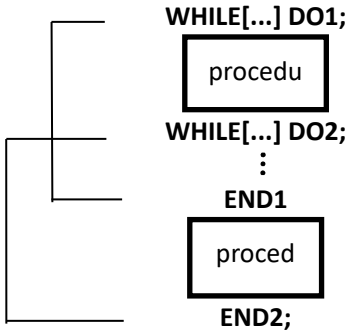
Note: When the specified conditions are true, execute the program segment from DO to END; Otherwise, execute the program segment after END instead. The label after DO and the label after END should be consistent, and the label value can be 1, 2 or 3.

Nesting: DO, the label (1~3) in the END loop can be used as many times as needed. However, an alarm is issued when there is a cross-repeating loop in the program.

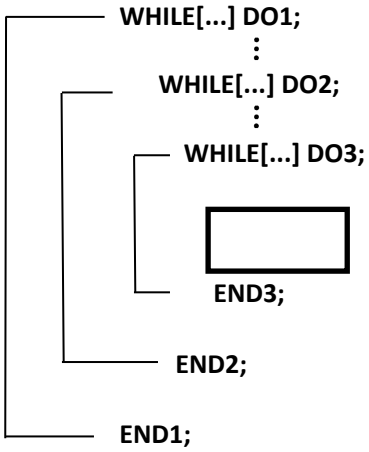
1. Labels (1 to 3) can be used multiple times upon request



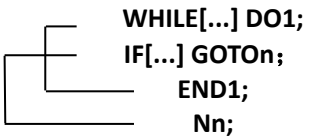
2. **The ranges of DO cannot be crossed**



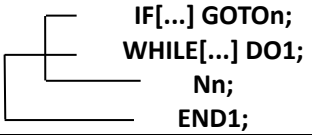
3. **DO loops can be nested 3 levels**



4. **The control can go to the outside of the loop**



5. **Transfers cannot enter the circulation zone**



1.3 Macro alarm

Format: ERR_;
Range 0~200;
Alarm number 3000+n;
For example: E RR01 or E RR1;
The system alarm number is 3001.

1.4 Special instructions (substitution of variable numbers with variables).

Format: "#" + "9" + permutation variable number
Example: #100=205, #205=500;
X#9100 and X500 codes function the same;
The X-#9100 and X-500 codes function the same;

It can be understood as #9_ _ _, followed by 3 digits as a common variable number, in the range 100~199，500～999；

#9100 represents the macro variable number represented by the value within #100;

For example, #100=510, #510=101;

At this time, write #9100, #9100=#510=101;

Appendix 11: Preparation of custom alarm content (available in 2021 or above versions).

Parameter: bit parameter 1 80.4 Read program macro variable/alarm comment (0: invalid 1: valid).

Macro A alarm

G65H99P_;//[ERR_, the system displays the alarm content] (within 25 words).

Range 0-200;

Macro B alarm

ERR_;//[ERR_, the system displays the alarm content] (within 25 words).

Range 0-200;

For example:

ERR1;//[ERR1, quantity arrived];

The system displays the macro program alarm 3001 quantity arrived;

Note: At the same time, the value of the system macro variable #3000 can be written for alarm, the range is also 0-200, and the alarm number is also consistent with 3000-3200; It can be written with G65 H01 P#3000 Q_, or #3000= _;

Example: G65 H01 P#3000 Q0;

#3000=0;

G65H99P0;

ERR0; These four weaves have the same effect.

Modify the system to read the program alarm comments, then display the alarm content and report it in the system file WARN2;

Program macrovariable comments can be read and saved in the system file MacroVar;

Specify the scope of the writeable alarm;

0650-0657； M89K0-K7 detection

3000-3200； Macro program alarm P0-P200

;

Write M89K0-K7 alarm specification format:

M89 K0-K7 J_ ;//[ERR650-657,M89K0-K7 detection alarm];

M89K0-K7 detection alarm; The alarm display content is recorded in the file WARN, and if the alarm content is not written when the same alarm number is present, the stored alarm display is directly read.

For example:

M89K3J5000;//[ERR653, M89K3 jacking not in place]

or

[ERR653, M89K3 jacking not in place]

M89K3J5000;

As long as the program reads [ERR653, M89K3 top material is not in place], the alarm content is saved in the system file 6No. 53 alarm;

When the next time the alarm display is not written, the same code is instructed, and the same alarm will be displayed before the content written;

For example:

M89K3J5000;//

At this time, the alarm will still show that the M89K3 top material is not in place;

Write macro program alarm specification format

Macro A:

G65H99P_;//[ERR_, alarm display content];

Macro B:

ERR_;//[ERR_, alarm display content];

The alarm display content is recorded in the file WARN2, and if the alarm content is not written when the same alarm number is present, the stored alarm display is directly read.

For example:

G65H99P0;//[ERR0, processing quantity arrived].

or

[ERR0, the number of processing arrived].

G65H99P0;

As soon as the program reads [ERR0, processing quantity arrives], the alarm content is saved in the system file alarm number 3000;

When the next time the alarm display is not written, the same code is instructed, and the same alarm will be displayed before the content written;

For example:

G65H99P0;

or

ERR0;

At this time, the alarm will still show the macro alarm 3000 processing quantity arrived;

The program reads macro variable comments saved in the system file MacroVar:

Comments can be changed:

#100-#199；

#500-#899； (#900-#999 reserved for internal use of the system);

Modify the annotation specification format;

//[#--, display content] (20 words or less).

//[#--, display content]

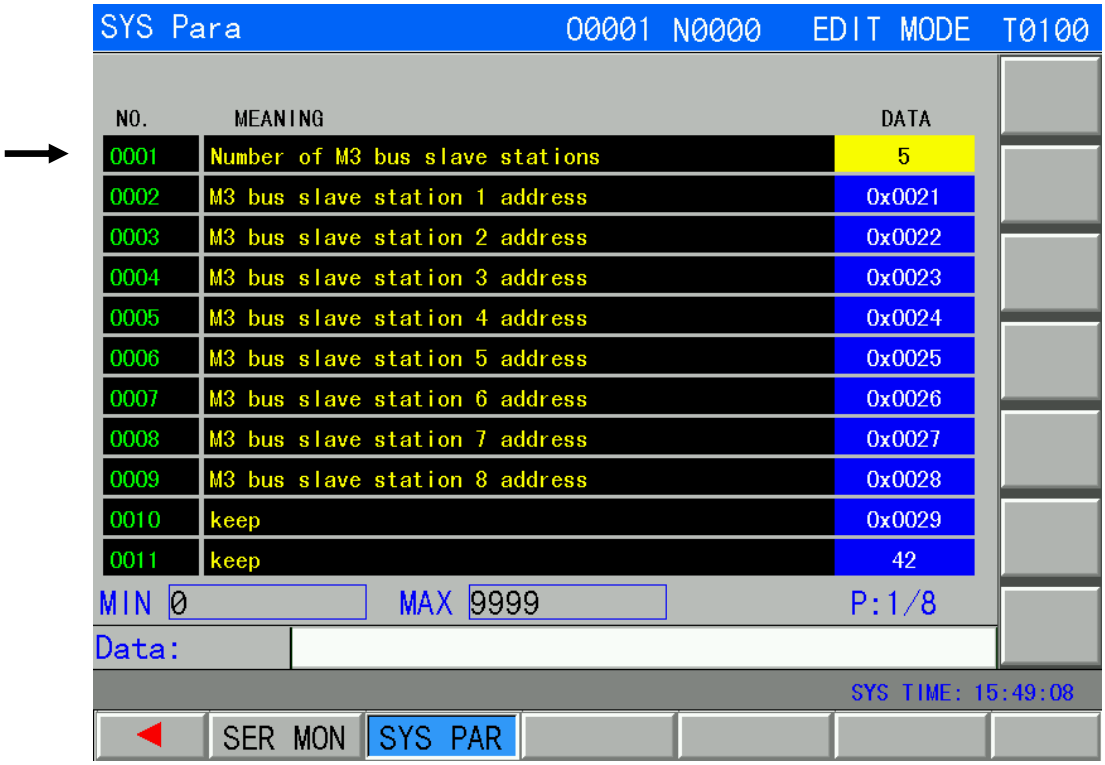
The display content will be saved in **MacroVar and can be viewed in a public variable;**

Macro variable comments are saved without changing the same macro variable comment.

Appendix XII, MIII. Bus System Connection Settings (available for the bus version).

Note: MIII. bus version system, there is [bus configuration] menu to set bus connection parameters, only need to set the number of communication axes and communication address and gear ratio;

1) First go to the [System Parameters] interface:

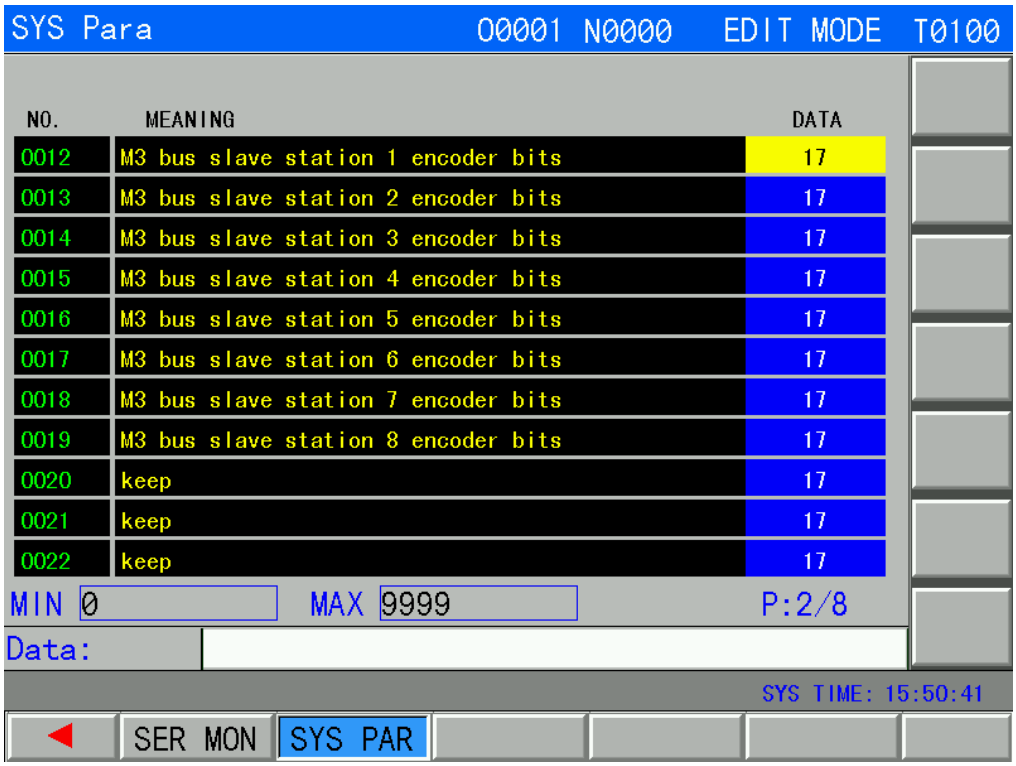


Note 1: 001 is the number of communication slaves, when there are two bus axes, it is set to 2; At this time, the system reads the addresses of slave address 1 and 003 02 and slave address; The slave address needs to correspond to the drive communication address;

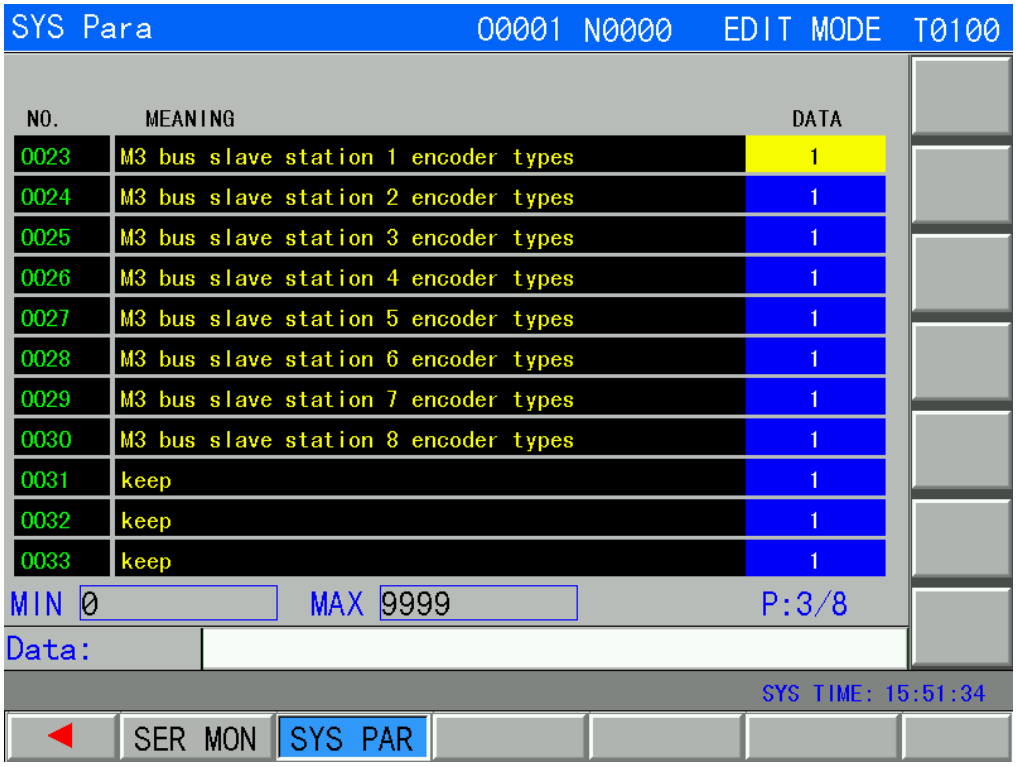
NOTE 2: The axes corresponding to the number of slaves are: slave 1 corresponds to the X axis, slave 2 corresponds to the Z axis, and slave 3 corresponds to 3 TH AXIS, SLAVE 4 CORRESPONDS TO 4 TH AXIS, SLAVE 5 TO 5TH AXIS;

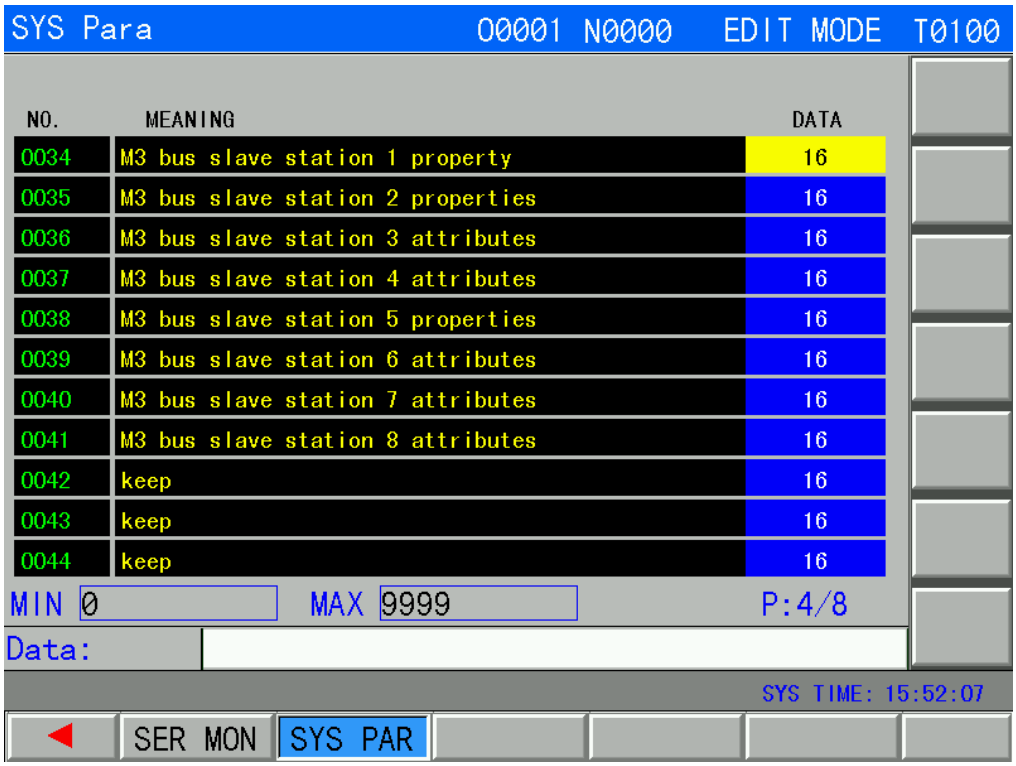
Note 3: The slave station address starts with 2 1, corresponding to Yaskawa drive communication address 21; When the KY300AWM3 driver is connected, the slave address 2 1 corresponds to the drive communication address 1, and the slave address 2 2 corresponds to the drive 2 , slave address 2 3 corresponds to drive 3, and so on;

Note 4: The remaining reserved parameters do not need to be set.

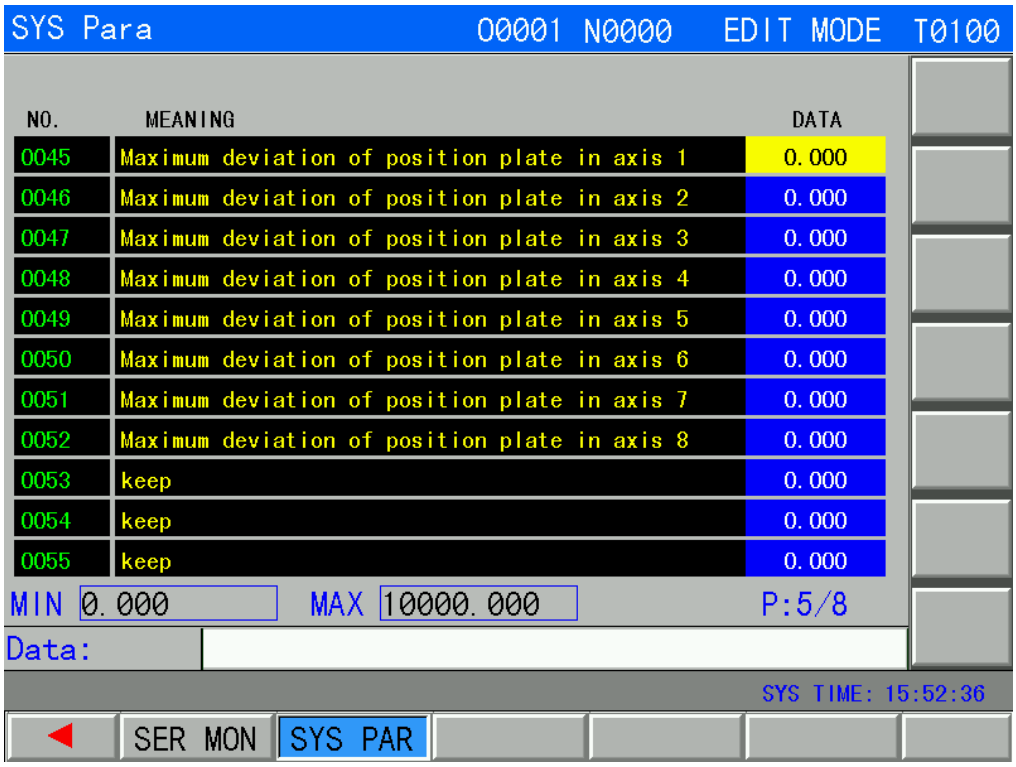


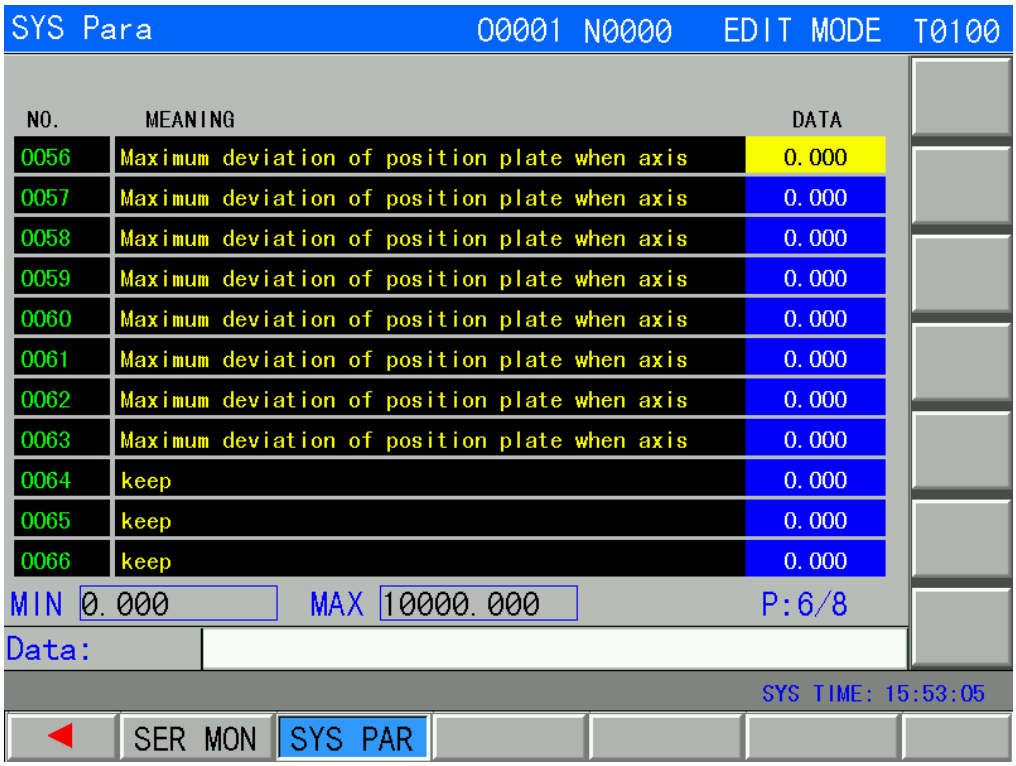
Note: The encoder number parameter is 17 by default and does not need to be set.



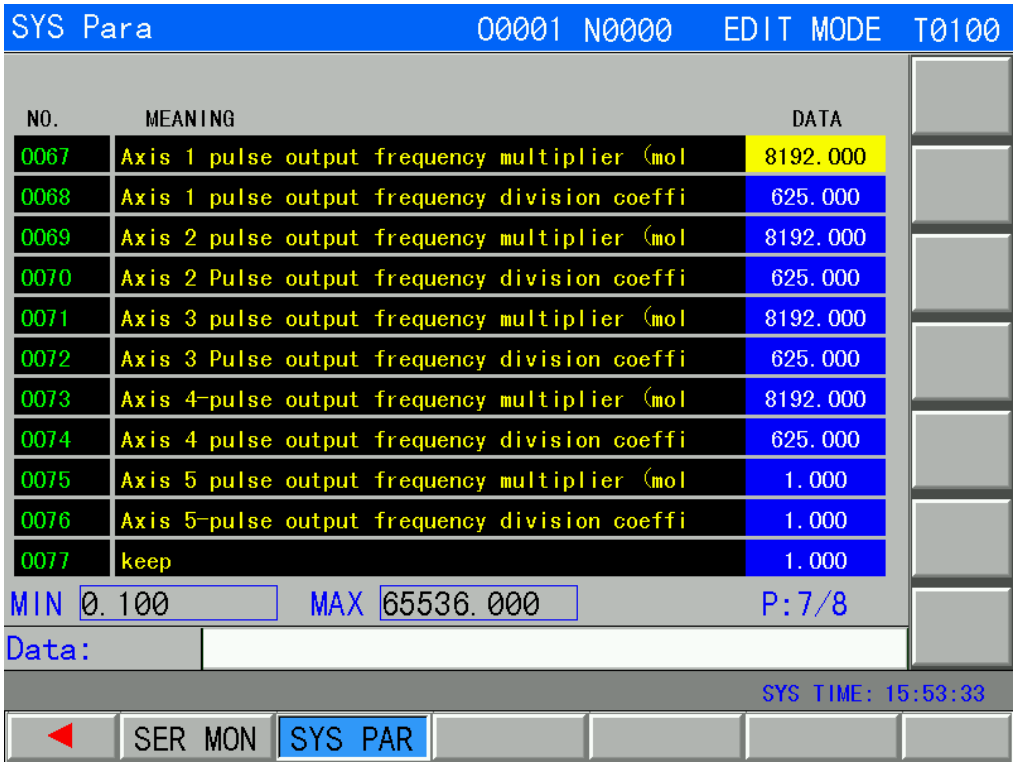


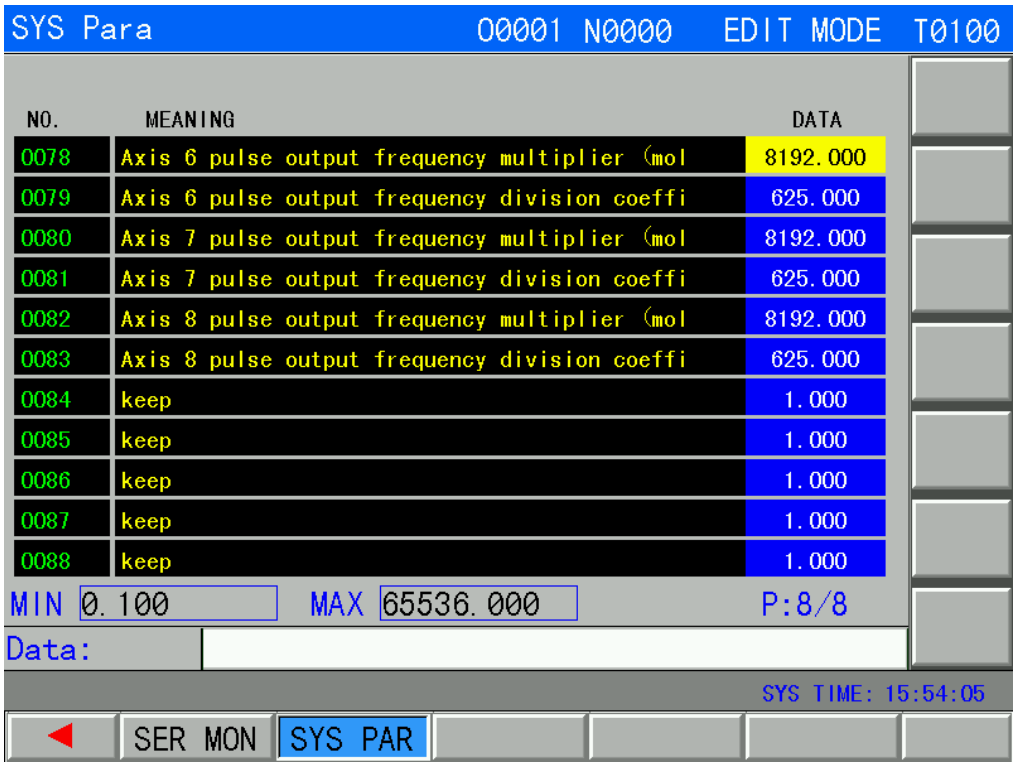
Note: Neither the encoder type nor the slave properties need to be set (if the motor encoder is incremental, the encoder type needs to be set to 0).





Note: Motion and stop deviations cannot be set at this time.

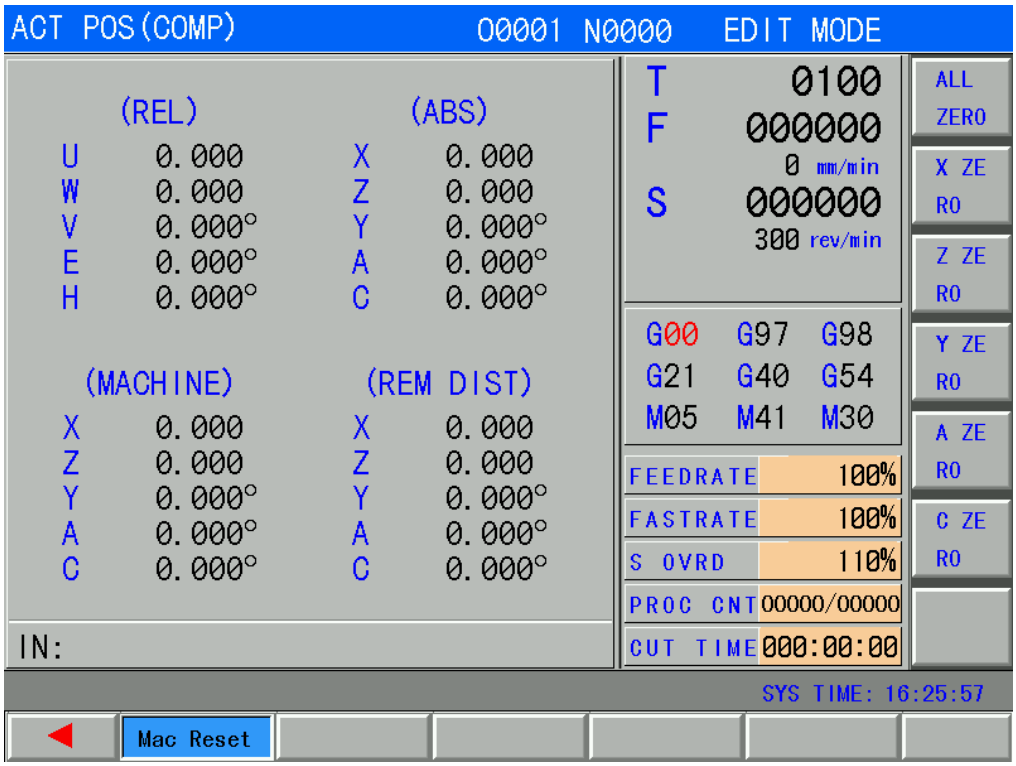




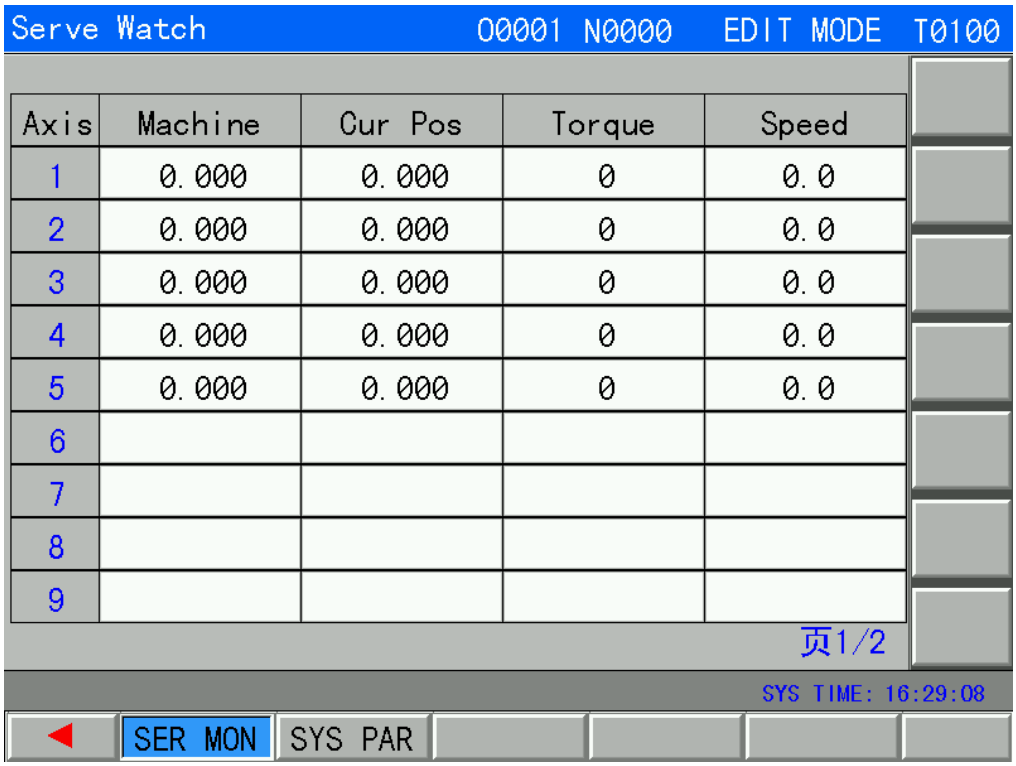
Note: The bus configuration default motor encoder number of 1 7 bits, the default gear ratio 8192/625, this gear ratio is the default counting gear ratio, the motor is 17 bits or 2 3 None of the bits need to modify this parameter value; For spindle pulse indexing, the gear ratio here for the number of spindle shafts corresponding to the number of spindles with only 2500 or 1 024 spindle encoder lines is changed to 1/1, Spindle pulse count base 10000.

Note: The gear ratio molecule corresponding to the motor drive of 2 3 positions needs to be changed to 64, and after the numerator is changed to 64, the gear ratio setting is consistent with 17 bits; For a direct-connection screw with a pitch of 1 0 mm, the gear ratio of the system parameters is 1/1 and the pitch is 8mm The direct connection screw, the system number parameter gear ratio 5/4; The counting method is the same as normal pulse counting.

2) The bus zero setting is the same as the absolute zero setting:
Enter the position interface, find the menu [Machine Clearing] to enter Clear Machine Zero:



3) After setting, you can see if the actual machine coordinates and the coordinates of the motor feedback are opposite



Note: When the coordinates of the machine tool are different from the current coordinates of the motor, it is generally caused by the wrong reading direction of the encoder, and the bit parameter 193 can be modified for

modification.

Appendix 13, Axis Not Returning to Zero Warning Setting (ladder diagram version V2.21 or later).

When the increment value is used, you can set the system to issue a warning when each axis has not returned to zero [each axis has not returned to zero] to prompt zeroing, and the system cannot start the program when this warning is issued, but it does not affect the manual/handwheel to move each axis or Manually control each output and clear the warning when the axis has returned to zero.

Parameters: PLC parameters

K33.0 The warning that each axis is not returning to zero (0:No 1:Yes) is valid

K33.1 3TH axis not returning to zero warning (0:yes 1:no) shielding

K33.2 4TH axis not returning to zero warning (0:yes 1:no) shielding

K33.3 5TH axis not returning to zero warning (0:yes 1:no) shielding

Appendix XIV, Rotary Axis Control Method (only available in version 2021 or above).

1、 Set the rotation axis parameters:

PARAMETER 187.0 SETS THE 3TH AXIS TYPE (0: LINEAR AXIS 1: AXIS OF ROTATION).

Parameter 187.2 Sets the Z-axis type (0: Line axis 1: Rotation axis).

PARAMETER 189.0 SETS THE 4TH AXIS TYPE (0: LINEAR AXIS 1: AXIS OF ROTATION).

Parameter 189.2 sets the X-axis type (0: linear axis 1: rotation axis).

PARAMETER 191.0 SETS THE 5TH AXIS TYPE (0: LINEAR AXIS 1: AXIS OF ROTATION).

Note: When setting the X axis as the rotation axis, you need to program the bit parameter 1.2=1 [(0:diameter 1:radius)], and the bit parameter 4.4=1 [Tool compensation values are expressed as (0:diameter 1:radius) values].

2、 Axis of rotation type:

The system divides the rotation axis settings into 2 categories, 1) rotation nearby, 2) rotation by symbol;

PARAMETER 188.1 3TH AXIS WHEN THE AXIS IS THE AXIS OF ROTATION (0: ROTATION NEAREST 1: ROTATION IN THE DIRECTION OF THE SYMBOL).

Parameter 188.4 When the Z axis is the axis of rotation (0: Nearby rotation 1: Rotation in the direction of the symbol).

PARAMETER 190.1 4TH AXIS WHEN THE AXIS OF ROTATION IS (0: NEAREST ROTATION 1: ROTATION IN THE DIRECTION OF THE SYMBOL).

Parameter 190.4 When the X axis is the axis of rotation (0: Nearby rotation 1: Rotation in the direction of the

symbol).

PARAMETER 192.1 WHEN THE 5TH AXIS IS THE AXIS OF ROTATION (0: NEAREST ROTATION 1: ROTATION IN THE DIRECTION OF THE SYMBOL).

1) Nearby rotation control:

The nearest rotation control mode machine coordinates and absolute coordinates are cyclic between 0-360 degrees, the relative coordinate coordinates can be set cyclically or not cyclically, the shortest path control is performed during absolute programming, and the incremental movement is performed during incremental programming (the shortest distance is not performed).

N1 G0 C0	The sequence number	The amount of actual location	The absolute coordinate value of the end point	Machine coordinates
N2 G0 C300	N2	-60, negative movement	300	300
N3 C100	N3	-160, negative movement	100	100
N4 C360	N4	-100, negative movement	0	0
N5 C-30	N5	-30, negative movement	330	330
N6 C0	N6	30, forward movement	0	0
N7 C360	N7	0, do not move	0	0
N8 C720	N8	0, do not move	0	0
N9 C0	N9	0, do not move	0	0
N10 C360	N10	0, do not move	0	0
N11 C360	N11	0, do not move	0	0
N12 H540	N12	540, forward movement	180	180
N13 H360	N13	360, forward movement	180	180
N14 H-200	N14	-200, negative movement	340	340

2) Select controls by symbol direction:

According to the symbol direction rotation control mode, machine coordinates and absolute coordinates are cyclic between 0-360 degrees, the relative coordinate coordinates can be set cyclic or not cyclic, according to the symbol rotation can be divided into two types of rotation axis A / B: (Note: A / B Both types are not valid under nearby rotation control).

PARAMETER 1 87.1 SETS THE 3TH AXIS TO THE TYPE WHEN ROTATING (0: AXIS OF ROTATION TYPE A 1: AXIS OF ROTATION Type B).

Parameter 1 87.3 Set the Z axis to the type of rotation (0: axis of rotation A type 1: axis of rotation B type).

PARAMETER 1 89.1 SETS THE 4TH AXIS TO THE TYPE OF ROTATION (0: AXIS OF ROTATION TYPE A 1: AXIS OF ROTATION B type).

Parameter 1 89.3 Set the X axis to the type of rotation (0: axis of rotation A type 1: axis of rotation B type).

PARAMETER 1 91.1 SETS THE 5TH AXIS AS THE TYPE OF ROTATION (0: AXIS OF ROTATION TYPE A 1: AXIS OF ROTATION B type).

Rotation axis type A: Absolute programming is performed in the symbolic direction, running in a similar way to a linear axis, moving in the positive direction from C 0 to C 300, C 300 to C200 for negative movement, incremental programming to perform incremental movement (do not perform the shortest distance).

N1 G0 C0	The sequence number	The amount of actual location	The absolute coordinate value of the end point	Machine coordinates
N2 G0 C300	N2	300, forward movement	300	300
N3 C100	N3	-200, forward movement	100	100
N4 C360	N4	260, forward movement	0	0
N5 C-30	N5	-30, negative movement	330	330
N6 C0	N6	-330, negative movement	0	0
N7 C360	N7	360, forward movement	0	0
N8 C720	N8	720, forward movement	0	0
N9 C0	N9	0, do not move	0	0
N10 C360	N10	360, forward movement	0	0
N11 C360	N11	360, forward movement	0	0
N12 H540	N12	540, forward movement	180	180
N13 H360	N13	360, forward movement	180	180
N14 H-200	N14	-200, negative movement	340	340

Note: In type A/B, when the coordinates go to multiples of 3 60 or 3 60, the next line is followed by 3 60 or 3 60 , the coordinates are calculated from 0; For example, the above program C 0-C360 (at this time went a circle of 360 degrees) - C720 (at this time from 0 The segment began to count and walked 2 laps).

Rotation axis **type B**: Absolute programming is performed in the direction of the symbol, and the operation mode moves in the positive direction (moving in the negative direction when there is a negative symbol), moving from C 0 to C 300 in the positive direction, C 300 Move in the positive direction [300-360(0)-200] to C200, and perform incremental movement (do not perform the shortest distance) during incremental programming.

N1 G0 C0	The sequence number	The amount of actual location	The absolute coordinate value of the end point	Machine coordinates
N2 G0 C300	N2	300, forward movement	300	300
N3 C100	N3	160, forward movement	100	100
N4 C360	N4	260, forward movement	0	0
N5 C-30	N5	-30, negative	330	330

		movement		
N6 C0	N6	60, forward movement	0	0
N7 C360	N7	360, forward movement	0	0
N8 C720	N8	720, forward movement	0	0
N9 C0	N9	0, negative movement	0	0
N10 C360	N10	360, forward movement	0	0
N11 C360	N11	360, forward movement	0	0
N12 H540	N12	540, forward movement	180	180
N13 H360	N13	360, forward movement	180	180
N14 H-200	N14	-200, negative movement	340	340

Note: In type A/B, when the coordinates go to multiples of 3 60 or 3 60, the next line is followed by 3 60 or 3 60 , the coordinates are calculated from 0; For example, the above program C 0-C360 (at this time went a circle of 360 degrees) - C720 (at this time from 0 The segment began to count and walked 2 laps).

1. Rotate the negative angle of type A**/B** by symbol

Bit Parameter 192.6 Rotate Negative Angle by Sign Instruction Type 0 (0 0:Type A 01:Type B 10: Type C 11: Type D).

Bit Parameter 1 92.7 Rotate Negative Angle by Sign Instruction Type 1 (0 0: Type A 01: Type B Type 10: Type C 11: Type D).

1. Negative angle editing does not exceed -360 cases
2. Negative angle editing cases over -360

1) Negative angle A type 192.7=0**, 192.6=0**

When not exceeding -360, take the shortest distance in the negative direction;

Above -360, take the negative (linear axis) distance.

N1 G0 C0	The sequence number	The actual amount of movement	Absolute coordinates	Machine coordinates
N2 C-260	N2	-260	100	100
N3 C-260	N3	0	100	100
N4 C-360	N4	-460 (-100-360)	0	0
N5 C-540	N5	-540 (-360-180)	180	180
N6 C-540	N6	-720 (-180-360-180)	180	180
N7 C-260	N7	-80	100	100
N8 C-720	N8	-820 (-100-360-360)	0	0

2) Negative angle B type 192.7=**0, 192.6=1**

When exceeding or not exceeding -360, take the negative (linear axis) distance.

N1 G0 C0	The sequence number	The actual amount of movement	Absolute coordinates	Machine coordinates
N2 C-260	N2	-260	100	100
N3 C-260	N3	-360 (-100-260)	100	100
N4 C-360	N4	-460 (-100-360)	0	0
N5 C-540	N5	-540 (-360-180)	180	180
N6 C-540	N6	-720 (-180-360-180)	180	180
N7 C-260	N7	-440 (-180-260)	100	100
N8 C-720	N8	-820(-100-360-360)	0	0

3) Negative angle C type 192.7=1, 192.6=0

When not exceeding -360, take the shortest distance in the negative direction;

When exceeding -360, go in the negative direction for a relatively short distance, continuously the same instruction does not exceed -360 without moving, and continuously exceeds -360 degrees of movement -360 displacement.

N1 G0 C0	The sequence number	The actual amount of movement	Absolute coordinates	Machine coordinates
N2 C-260	N2	-260	100	100
N3 C-260	N3	0	100	100
N4 C-360	N4	-100	0	0
N5 C-540	N5	-180	180	180
N6 C-540	N6	-360 (-180-180)	180	180
N7 C-260	N7	-80	100	100
N8 C-720	N8	-100	0	0

4) Negative angle D type 192.7=1, 192.6=1

When exceeding or not exceeding -360, take the shortest distance in the negative direction;

N1 G0 C0	The sequence number	The actual amount of movement	Absolute coordinates	Machine coordinates
N2 C-260	N2	-260	100	100
N3 C-260	N3	0	100	100
N4 C-360	N4	-100	0	0
N5 C-540	N5	-180	180	180
N6 C-540	N6	0	180	180
N7 C-260	N7	-80	100	100
N8 C-720	N8	-100	0	0