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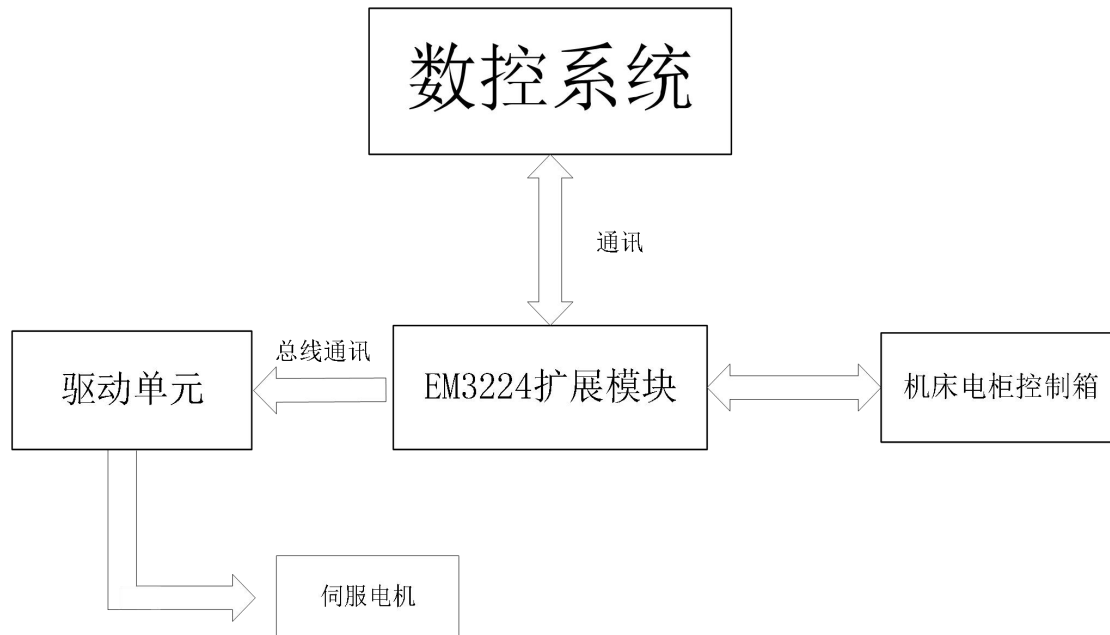
Chapter 4 Assembly and Connection

4.1 System Structure and Assembly

4.1.1 System Constituent

The DF-31TD series CNC system mainly consists of the following units (see the following figure), including:

1. CNC system
2. The expansion module EM3224
3. Bus AC servo drive unit
4. Absolute servo motor



4.1.2 System installation connection

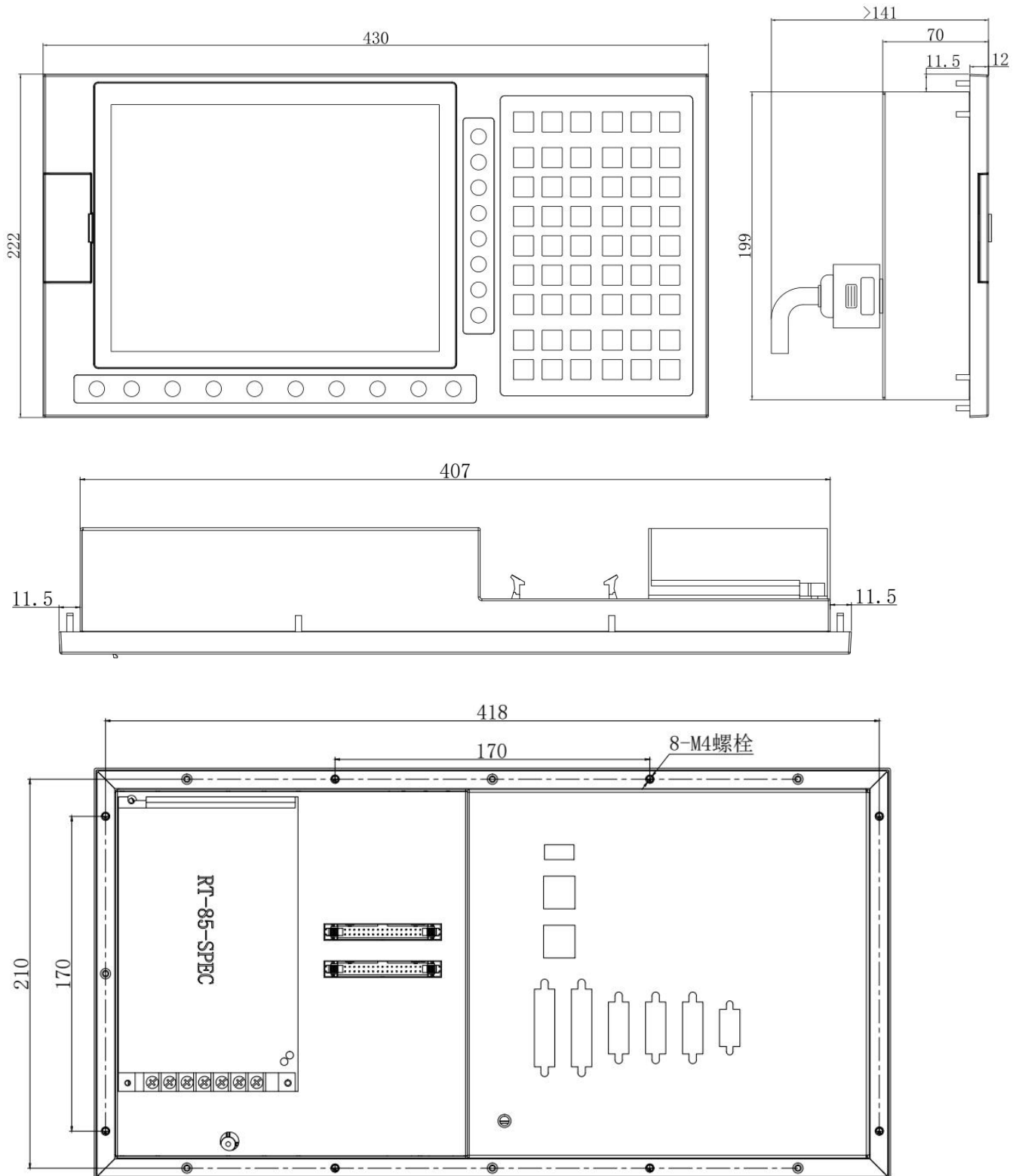
The CNC system and the driving units are constituent electric parts of the machine tool, and the working conditions (include the electric environment, temperature, humidity, vibration, etc.) will exert important influence toward them. Attention should be paid to the following matters, while carrying out CNC system assembling:

1. Enough gap (not less than 10cm) should be reserved between the back side of the numeric control device and the electric box wall for the convenience of cable connection and heat dissipation.
2. The numeric control device must be installed on the electric box reliably, and all fastening screws should be fitted, so as to avoid vibration.
3. The numeric control device should be installed at the position that can avoid contacting with scrap iron and coolant liquid.
4. The connection cable plug of the numeric control device should be fastened, so as to avoid unstable connection or the impact from machine tool vibration.
5. The devices that will result in strong electromagnetic interference should be less around the numeric control device

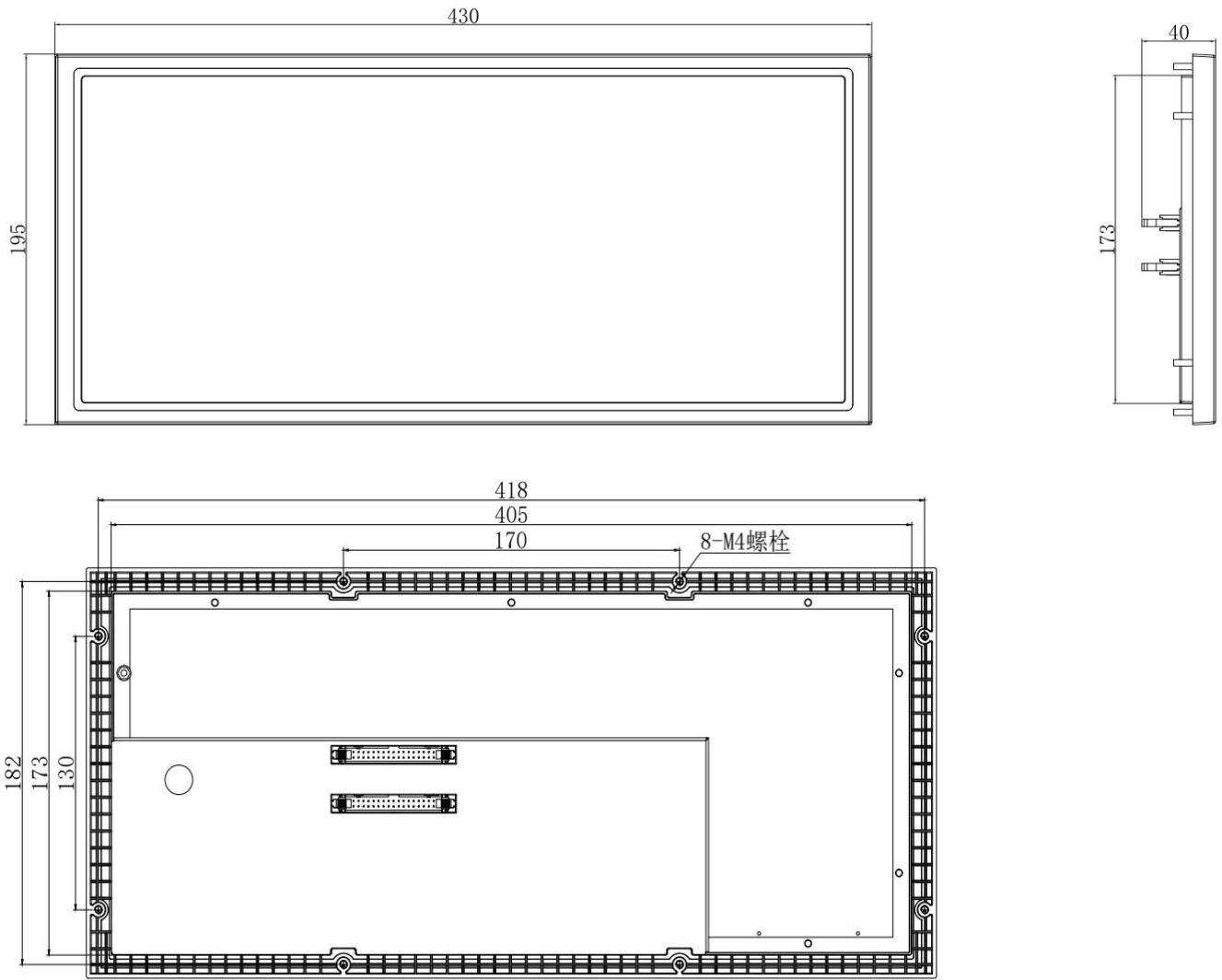
4.1.3 CNC system assembly dimension drawing

4.1.3.1 31TDa

Upper panel:

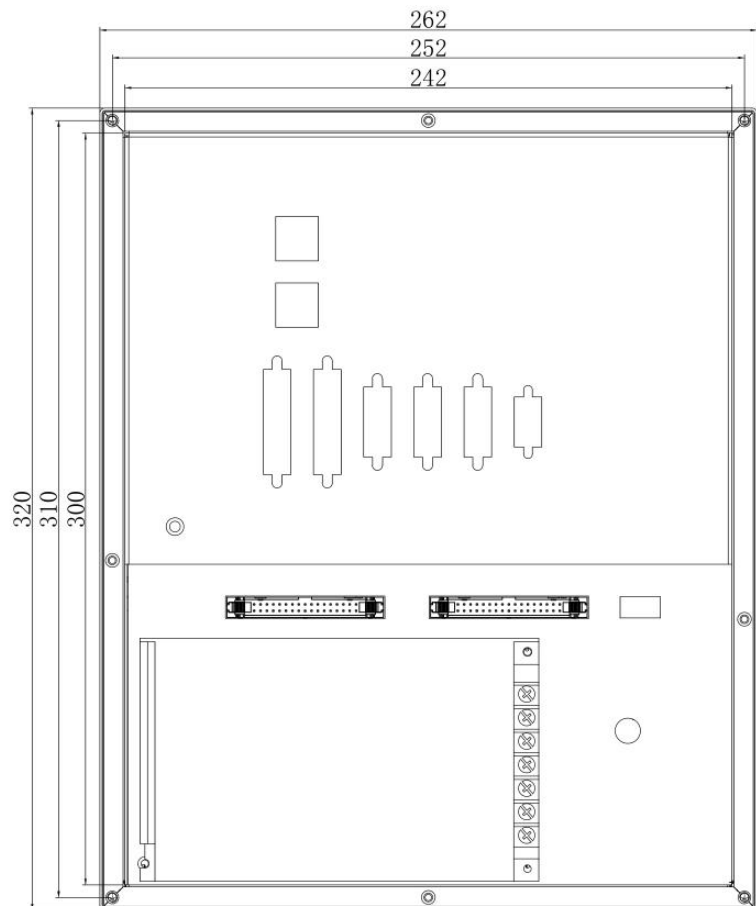
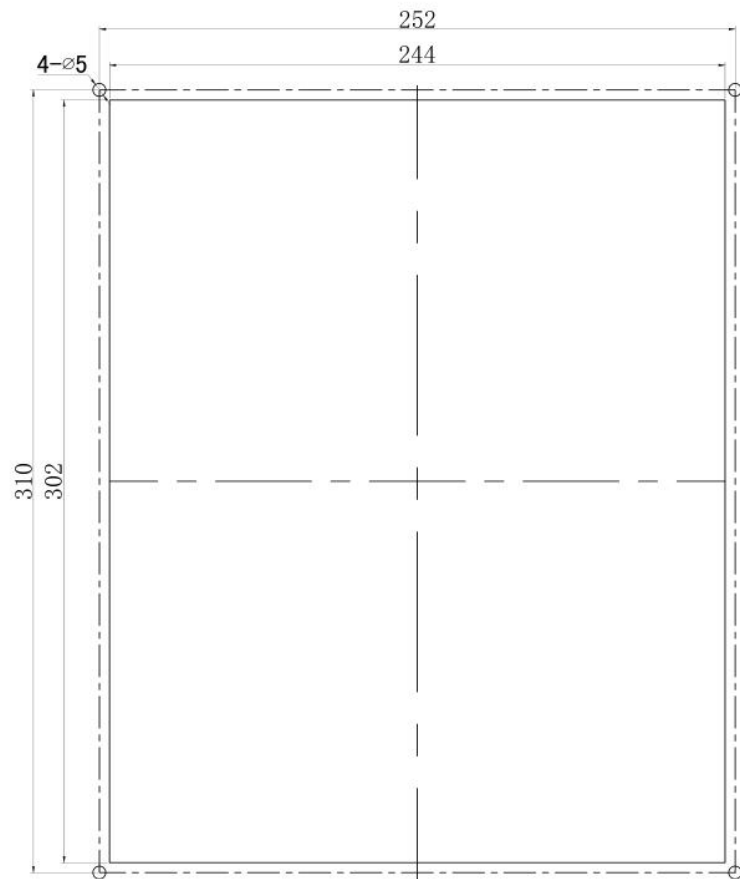
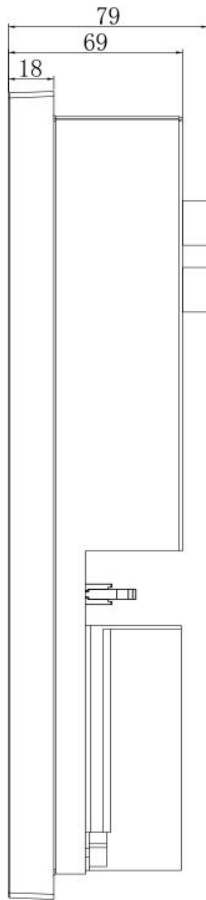


Lower panel:

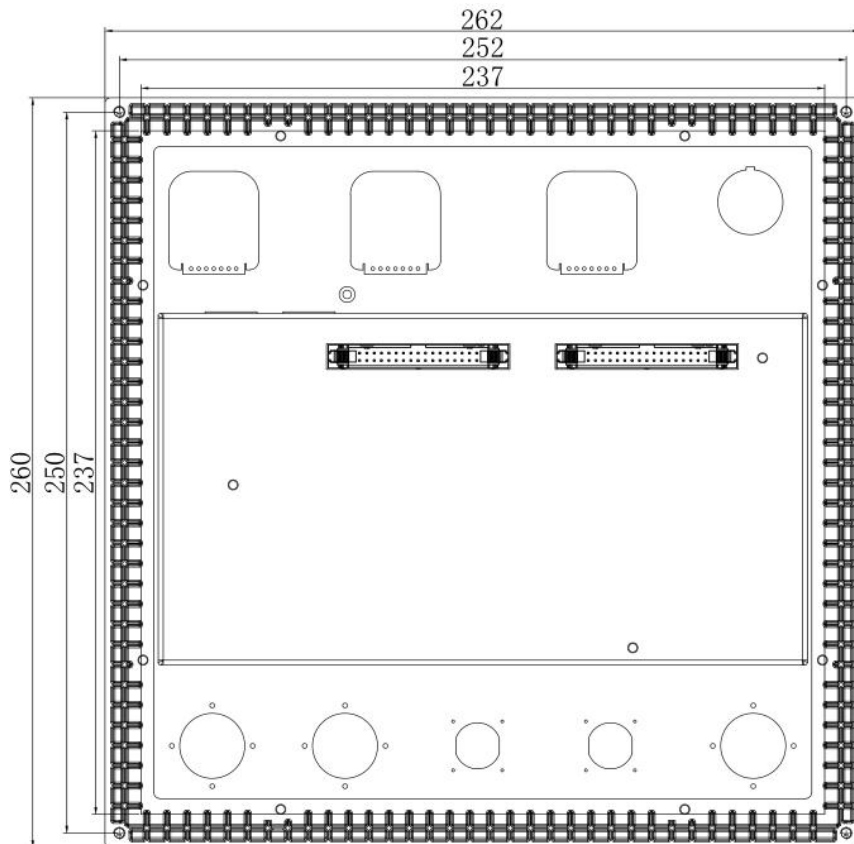
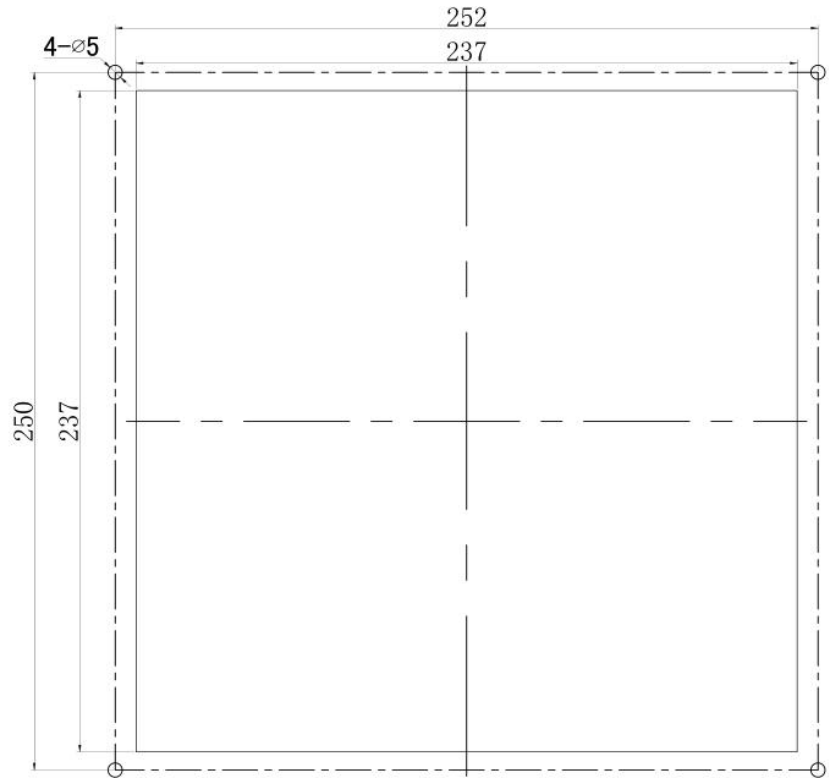
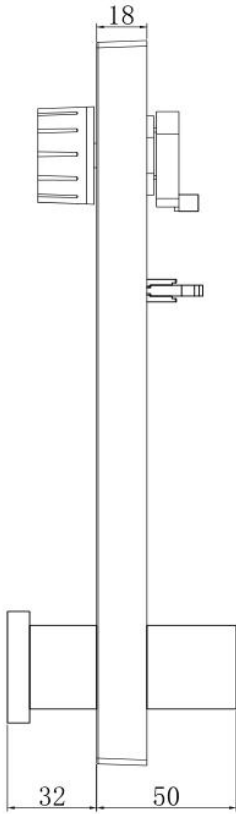


4.1.3.2 31TDva

Upper panel:

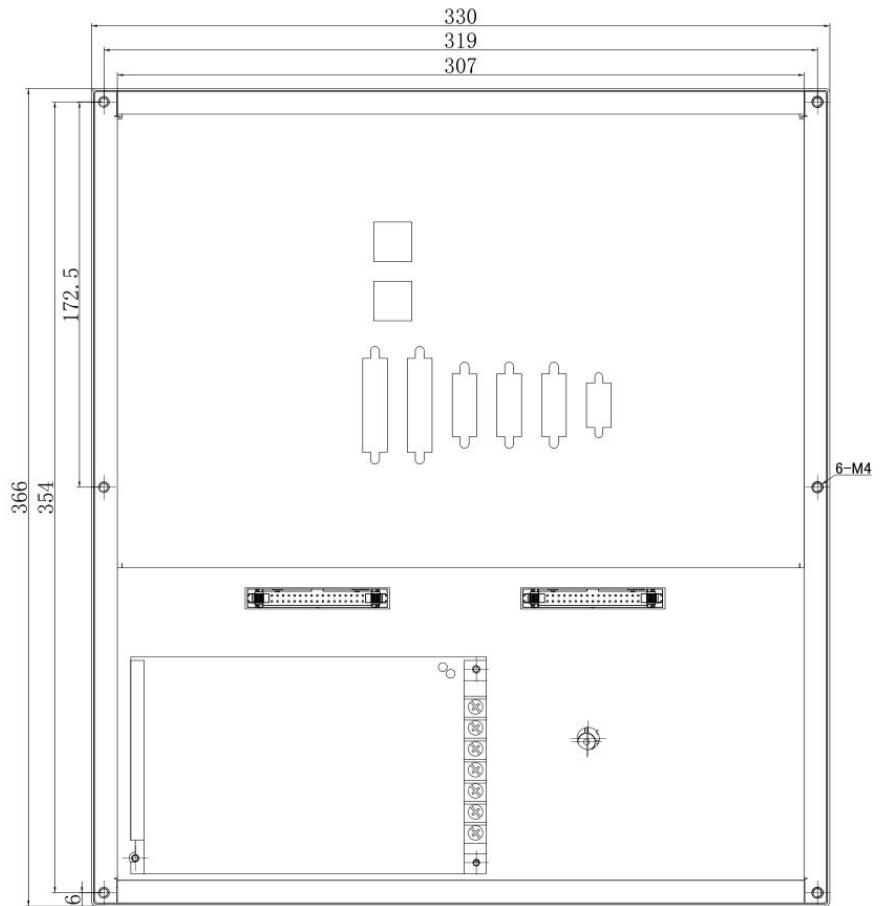
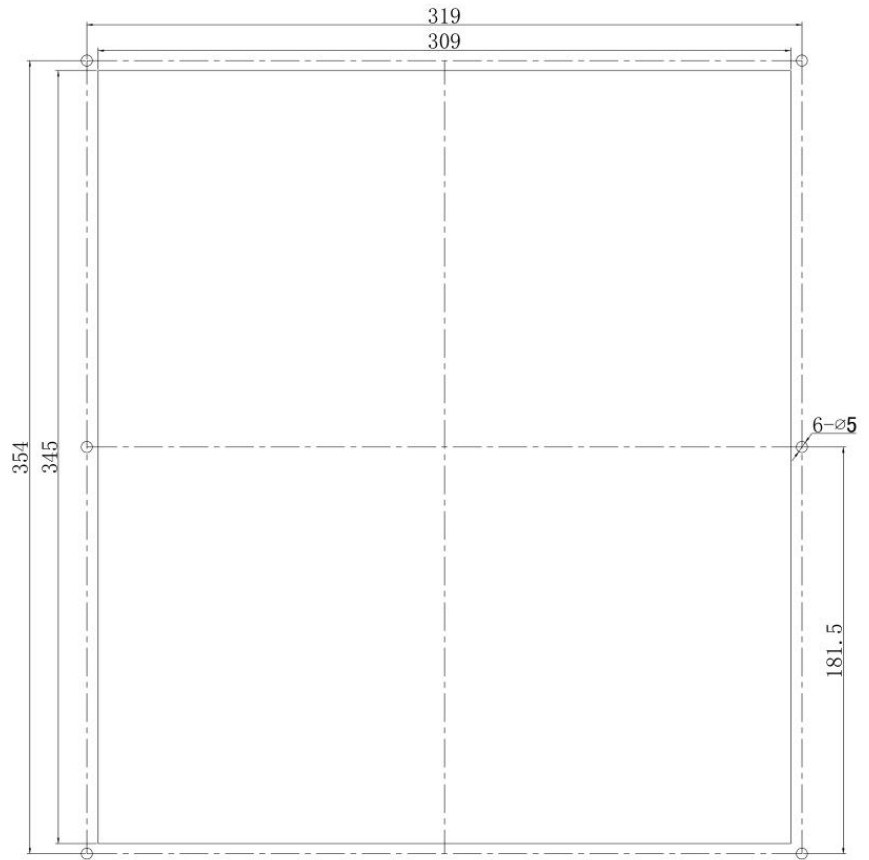
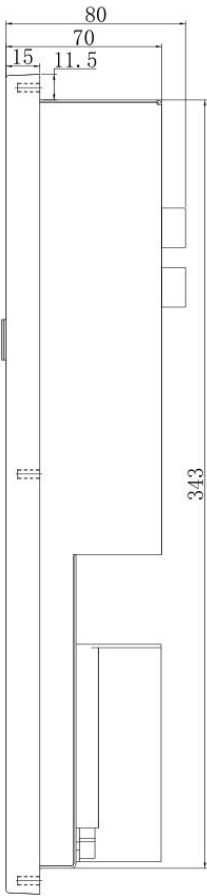


Lower panel:

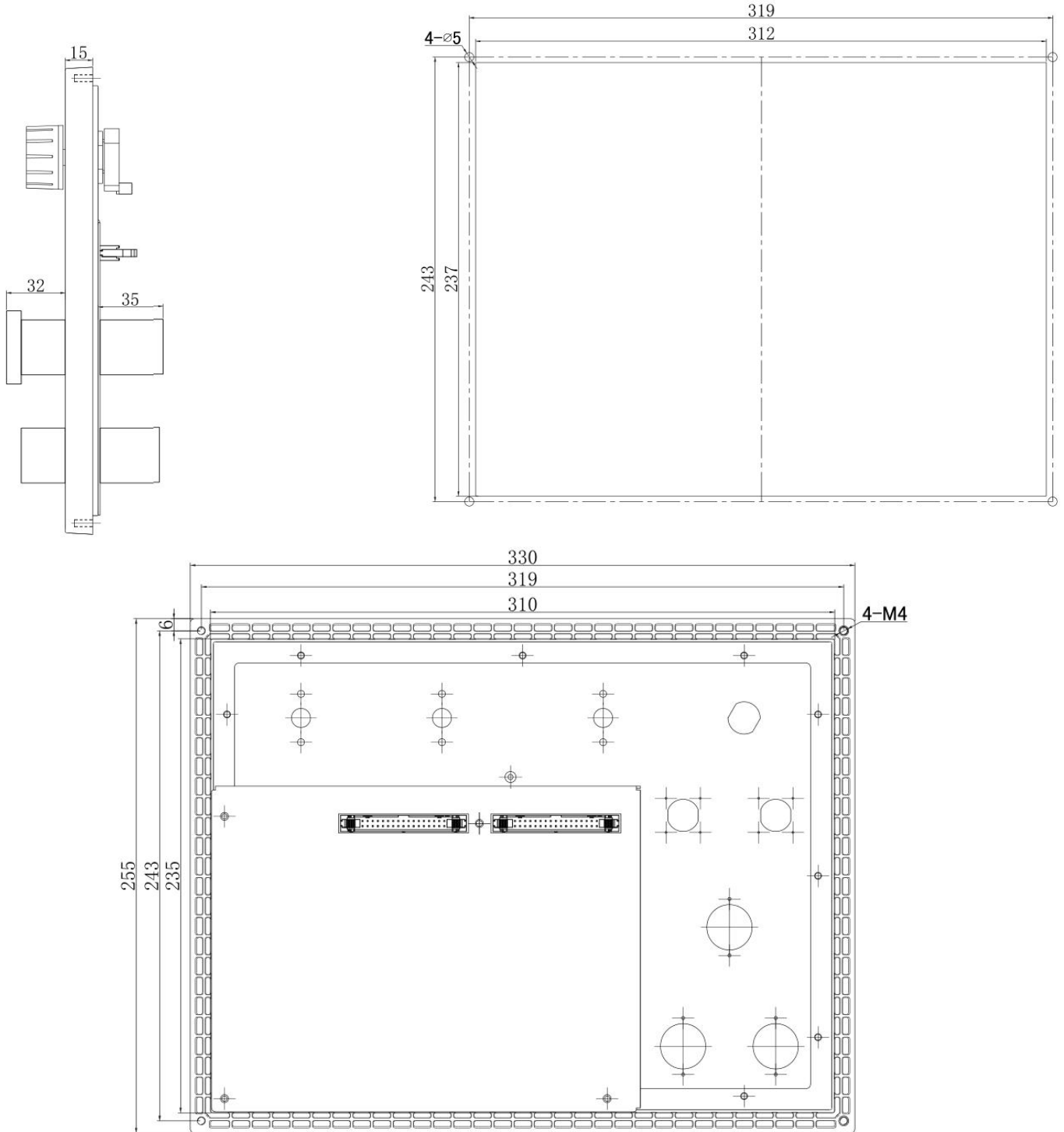


4.1.3.3 31TDb

Upper panel:



Lower panel:



4.2 Device Connection

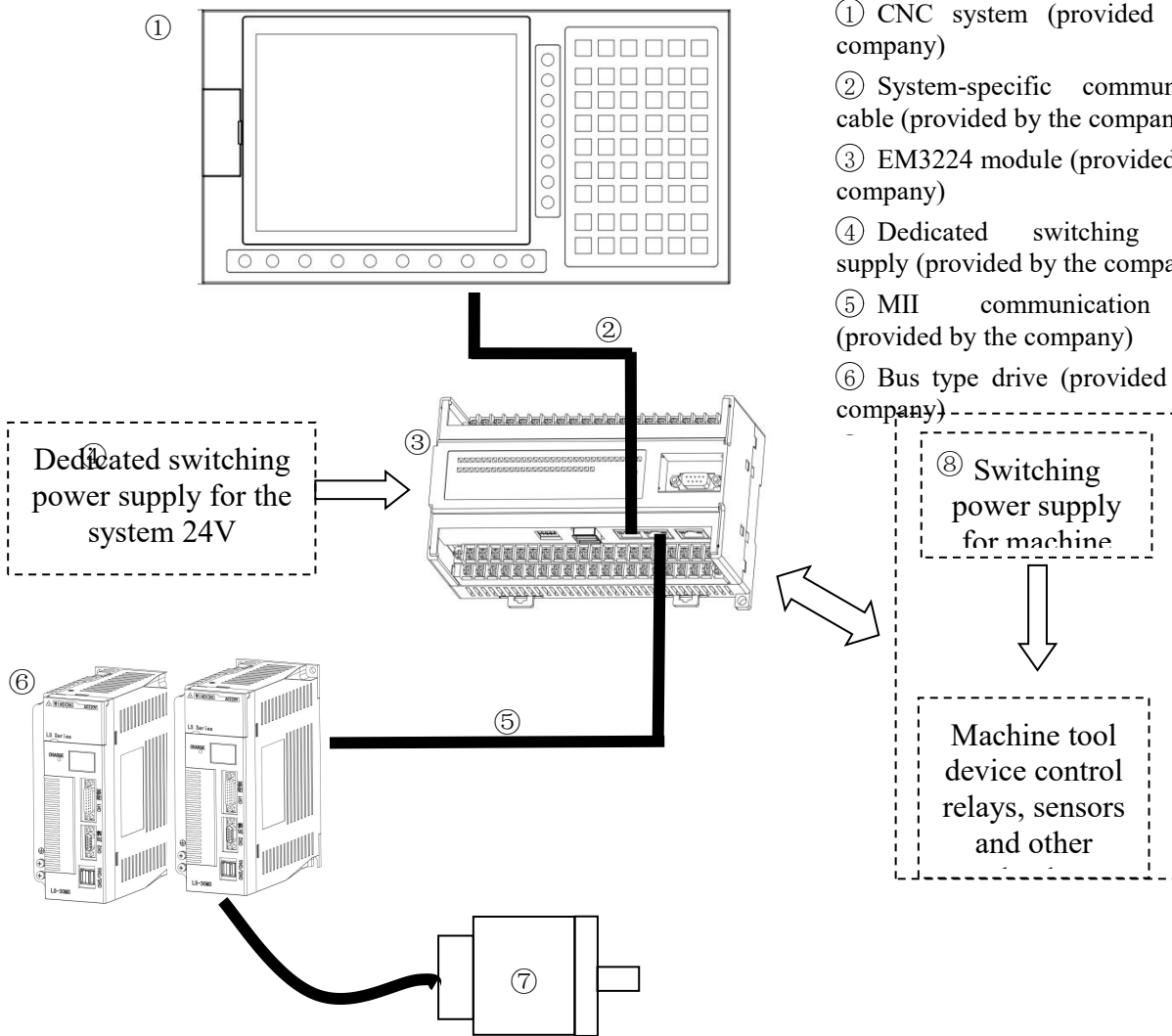
4.2.1 System interface frame drawing and the description

31 series interface
ENET-(RJ45) Ethernet interface
ECAT-(RJ45) EtherCAT bus interface
XS32 - (contact pin) Serial communication interface, 9-cored D type socket
XS35 - (contact pin) Second spindle encoder interface, 15-cored D type socket
XS36 - (contact pin) First spindle encoder interface, 15-cored D type socket
XS37 - (contact pin) External auxiliary panel interface
XS41 - (contact pin) Handheld unit interface, 25-cored D type socket
XS43-(contact pin) Pulse servo spindle interface, 25-cored D type socket
XS45 - (contact pin) Input/Output 1 interface, 25-cored D type socket

4.2.2 DEVICE CONNECTION SCHEMATIC

Device list:

- ① CNC system (provided by the company)
- ② System-specific communication cable (provided by the company)
- ③ EM3224 module (provided by the company)
- ④ Dedicated switching power supply (provided by the company)
- ⑤ MII communication line (provided by the company)
- ⑥ Bus type drive (provided by the company)

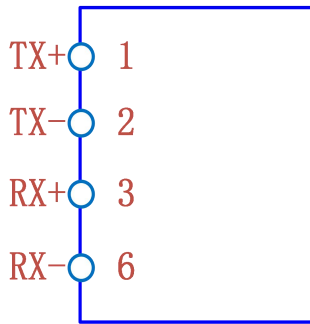


Notes!
 The system switching power supply ④ in the schematic is dedicated to the system and EM3224 module, and should not be used as a power supply for machine tool loads.

4.3 CNC system interface

4.3.1 ENET COMMUNICATION INTERFACE

1. Interface signal definition



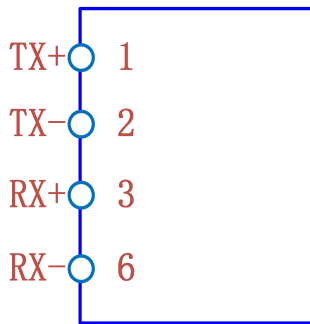
RJ45 interface

2. Signal definition table

Pin number	Signal name	Signal description
1	TX+	Send+
2	TX-	Send-
3	RX+	Receive+
6	RX-	Receive-

4.3.2 ECAT COMMUNICATION INTERFACE

1. Interface signal definition



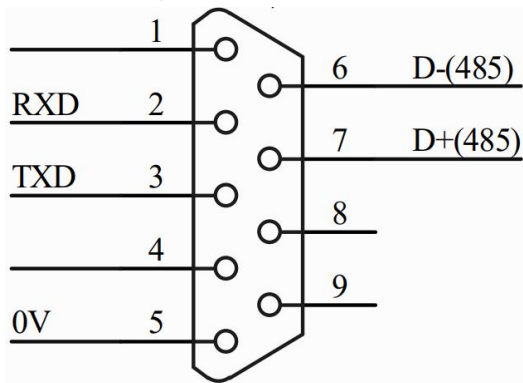
RJ45 interface

2. Signal definition table

Pin number	Signal name	Signal description
1	TX+	Send+
2	TX-	Send-
3	RX+	Receive+
6	RX-	Receive-

4.3.3 COMMUNICATION INTERFACE (XS32-PIN)

1. Interface signal definition



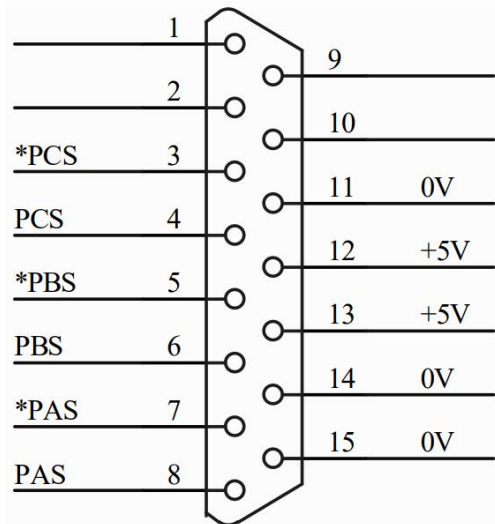
XS32 (contact pin)

2. Signal definition table

Pin number	Signal name	Signal description
2	RXD	RS232_Receive
3	TXD	RS232_Send
5	0V	Signal earth
6	D-	485 communication data-
7	D+	485 communication data+

4.3.4 ENCODER INTERFACE (XS36/XS35-PIN)

1. Interface signal definition

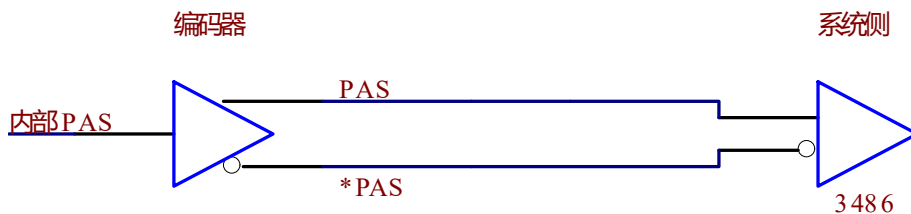


XS36/XS35 (pin)

2. Signal definition table

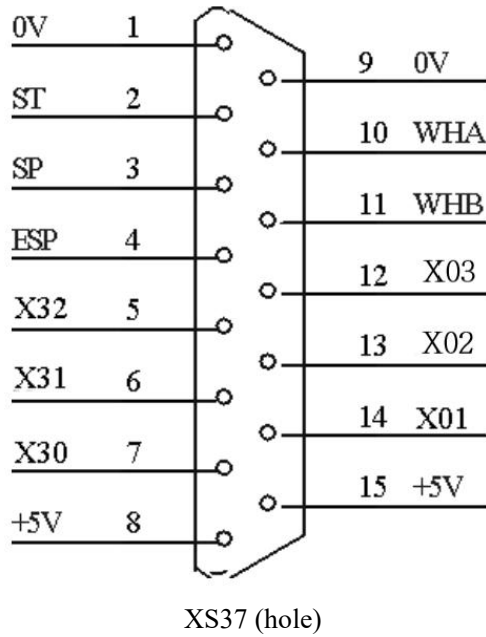
Pin number	Signal name	Signal description
1,2,9,10	Null	
3	*PCS	Encoder C-
4	PCS	Encoder C+
5	*PBS	Encoder B-
6	PBS	Encoder B+
7	*PAS	Encoder A-
8	PAS	Encoder A+
12,13	+5V	Power source signal
11,14,15	0V	Ground signal

3. Electrical principle drawing of the interface



4.3.5 AUXILIARY PANEL INTERFACE (XS37-HOLE)

1. Interface signal definition

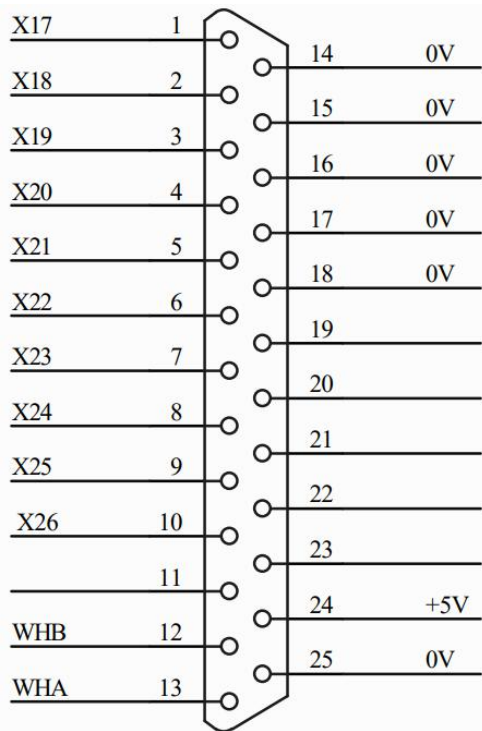


2. Signal definition table

Pin number	Signal name	Signal description
2	ST	External start input
3	SP	External pause input
4	ESP	Emergency stop input
5	X32	Extension input port (32)
6	X31	Extension input port (31)
7	X30	Extension input port (30)
10	WHA	Hand wheel A signal
11	WHB	Hand wheel B signal
12	X03	Extension output port (03)
13	X02	Extension output port (02)
14	X01	Extension output port (01)
8, 15	+5V	+5V power supply
1, 9	0V	Signal earth

4.3.6 HANDHELD UNIT INTERFACE (XS41-PIN)

1. Interface signal definition



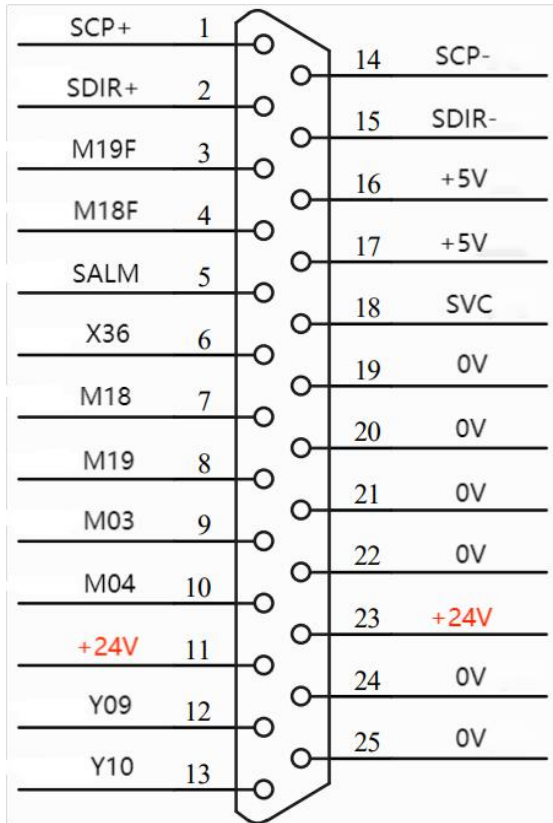
XS41 (contact pin)

2. Signal definition table

Pin number	Signal name	Signal description
1	X17	Extension input port 17
2	X18	Extension input port 18
3	X19	Extension input port 19
4	X20	Extension input port 20
5	X21	Extension input port 21
6	X22	Extension input port 22
7	X23	Extension input port 23
8	X24	Extension input port 24
9	X25	Extension input port 25
10	X26	Extension input port 26
12	WHB	Hand wheel B signal input port
13	WHA	Hand wheel A signal input port
14~18	0V	Signal earth
19~23	Null	
24	+5V	+5V power supply
25	0V	Signal earth
11	Null	

4.3.7 PULSE SERVO SPINDLE INTERFACE (XS43-PIN)

1. Interface signal definition



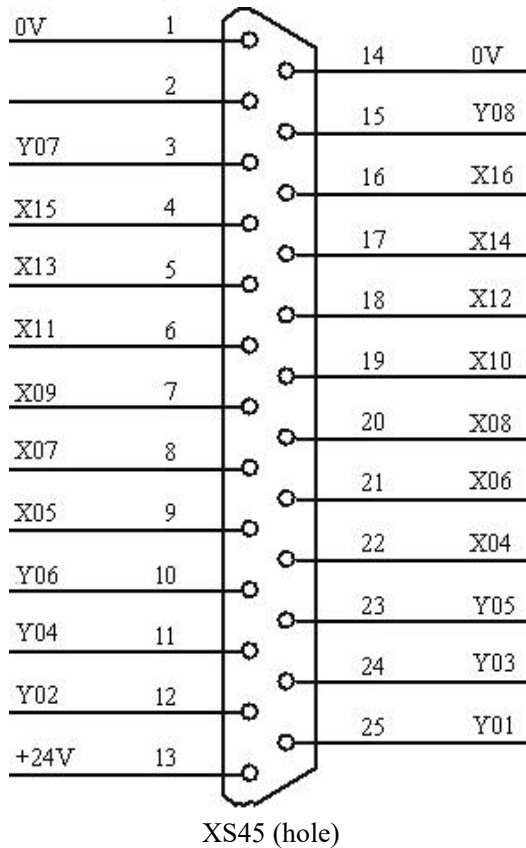
XS43 (pin)

2. Signal definition table

Pin number	Signal name	Signal description
1	SCP+	Spindle - pulse positive signal
14	SCP-	Spindle - pulse negative signal
2	SDIR+	Spindle - directional positive signal
15	SDIR-	Spindle - direction negative signal
3	M19F	Input of proper orientation
4	M18F	Input of position switch completion
5	SALM	Spindle - alarm input
6	X36	Extension input port 36
7	M18	Spindle - position mode switch output
8	M19	Spindle - orientation output
9	M03	Spindle - forward rotation output
10	M04	Spindle - backward rotation output
12	Y09	Extension output port 09
13	Y10	Extension output port 10
18	SVC	Analog output (0~10V DC)
16, 17	+5V	+5V power supply
19~22, 24, 25	0V	Signal earth
11, 23	+24V	+24V power supply

4.3.8 INPUT-OUTPUT 1 INTERFACE (XS45-HOLE)

1. Interface signal definition



2. Signal definition table

Pin number	Signal name	Signal description
3	Y07	Extension output port (07)
4	X15	Extension input port (15)
5	X13	Extension input port (13)
6	X11	Extension input port (11)
7	X09	Extension input port (09)
8	X07	Extension input port (07)
9	X05	Extension input port (05)
10	Y06	Extension output port (06)
11	Y04	Extension output port (04)
12	Y02	Extension output port (02)
15	Y08	Extension output port (08)
16	X16	Extension input port (16)
17	X14	Extension input port (14)
18	X12	Extension input port (12)
19	X10	Extension input port (10)
20	X08	Extension input port (08)
21	X06	Extension input port (06)
22	X04	Extension input port (04)
23	Y05	Extension output port (05)
24	Y03	Extension output port (03)
25	Y01	Extension output port (01)
13	24V	+24V power supply
1,14	0V	Signal earth
2		Null

4.4 Input and output interface description (motherboard)

When the system built-in PLC is enabled, all input/output signals can be customized. For example, the spindle forward output port is M03 by default, but Y03 can be specified as the spindle forward output port through parameter adjustment.

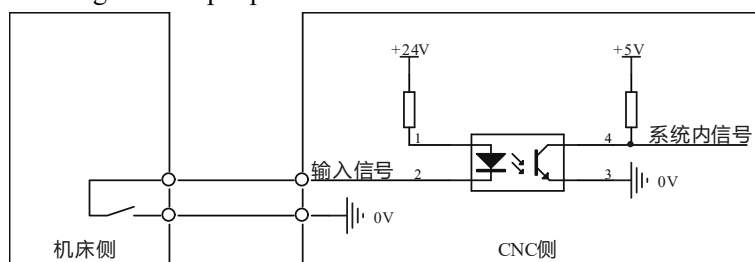
4.4.1 Schematic diagram of system input port (motherboard)

1. Input port signal overview

All input ports and system internal circuits are treated through optoelectronic isolation, and the electric specification of each input port is:

- (1) for optoelectronic isolation circuit, the maximum isolation voltage is 2500VRMS
- (2) the input voltage range is DC 0V~24V
- (3) the input port is NPN type

Electrical principle drawing of the input port is as below:



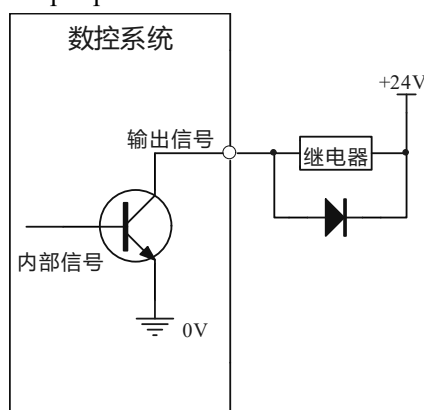
4.4.2 Schematic diagram of system output port (motherboard)

1. Output port signal overview

The drive circuit is Darlington OC (open collector) output, and the output electric specification by each circuit is:

- (1) When output is ON, the maximum load current is 500mA
- (2) the output port is NPN type
- (3) When output is OFF, the withstand voltage is below +24V.
- (4) When output is OFF, the leakage current is below 100uA.

Electrical principle drawing of the output port is as below:



4.4.3 Input/Output port definition (motherboard)

The **Diagnosis** button allows you to view the definition of the system input and output.

端口	管脚	名称	端口
01/X0.0	XS32-3	XPC	14/X1.1
02/X0.1	XS33-3	YPC	15/X1.1
03/X0.2	XS33-5	YALM	16/X1.1
04/X0.3	XS37-5	X04	17/X2.1
05/X0.4	XS37-4	ESP	18/X2.1
06/X0.5	XS37-3	SP	19/X2.1
07/X0.6	XS37-2	ST	20/X2.1
08/X0.7	XS40-1	DECX	21/X2.1
09/X1.0	XS40-2	DITW	22/X2.1
10/X1.1	XS39-11	DIQP	23/X2.1
11/X1.2	XS39-12	TCP	24/X2.1
12/X1.3	XS32-5	XALM	25/X3.1
13/X1.4	XS35-5	AALM	26/X3.1

Check the information of each input port by pressing **Diagnosis** → **Input Port Definition** on the system panel.

Name: indicates the name of the signal, which corresponds to the interface definition. Usually, the name of the signal indicates the purpose of the signal.

Pin: indicates the position of the actual interface of the signal;

For example, XS32-3 indicates that the signal is on pin 3 of XS32 plug.

Port: indicates the parameter programming port number and PLC address of the system input;

For example, 04/X0.3 means that the programming port number of the signal named X04 is 4, and the PLC address is X0.3.

All input ports in X** format (with one or two digits after X) are extension input ports, and any functions can be customized:

1. X18 wiring functions as chuck clamping in place signal;

① Press **Diagnostic** → **Input Port Definition** to view the port definition, and you can know that the port number of X18 is 18;

② Fill 18 into the system parameter P1321;

2. X27 wiring functions as advancement in proper signal of the automatic feeding cylinder, detecting cylinder action by programming;

① Press **Diagnostic** → **Input Port Definition** to view the port definition, and you can know that the port number of X27 is 27;

② M01 L27 is programmed to detect X27 signal;

All output ports in Y** format (with one or two digits after Y) are extension output ports, and any functions can be customized:

1. Y05 wiring functions as spindle locking output;

① Press **Diagnostic** → **Input Port Definition** to view the port definition, and you can know that the port number of Y05 is 05;

② Fill 05 into the system parameter P1050;

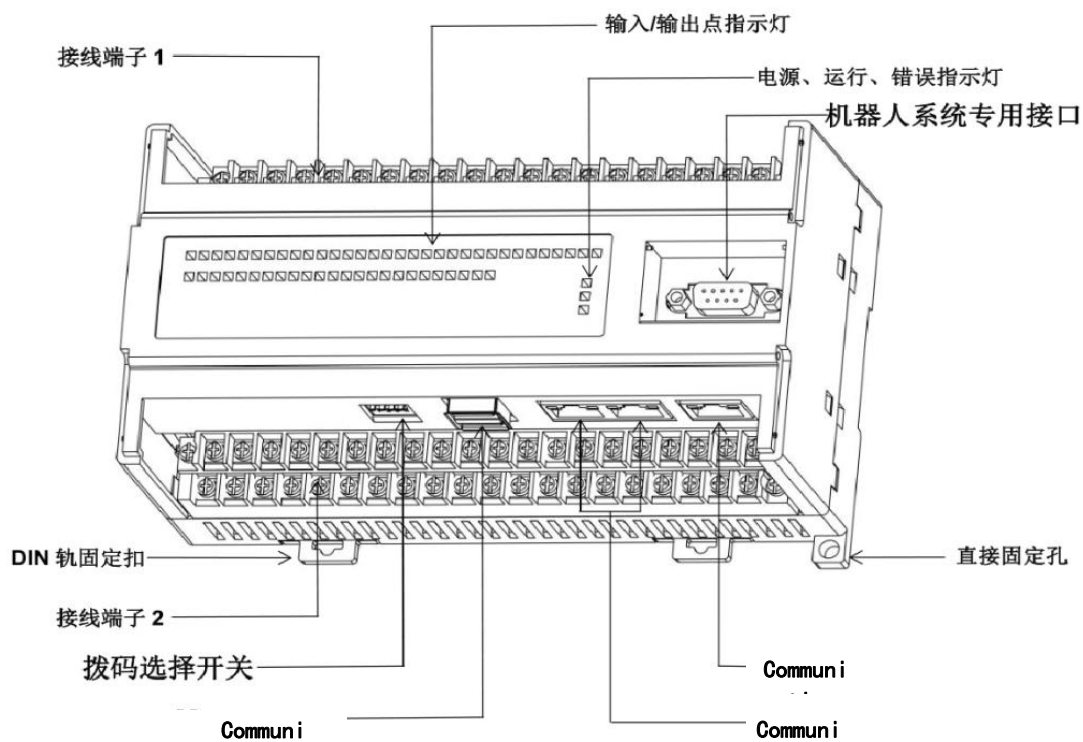
2. Y06 wiring functions as advancement output of the automatic feeding cylinder, starting cylinder action by programming;

① Press **Diagnostic** → **Input Port Definition** to view the port definition, and you can know that the port number of Y06 is 06;

② M20 K06 is programmed to output Y06 signal and M21 K06 is programmed to close the signal.

4.5 EM3224 Expansion Module

4.5.1 INTRODUCTION TO EM3224



Specifications:

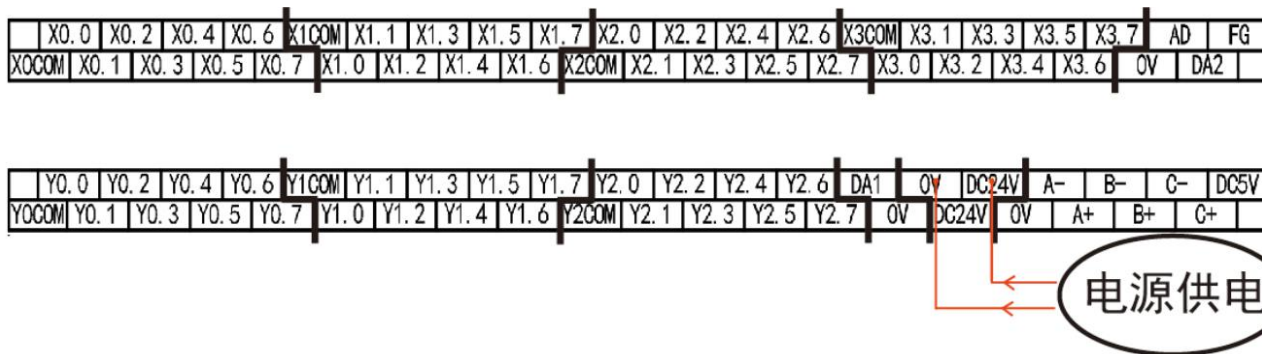
Item	Contents
Power supply voltage	DC21.6V~26.4V
Consumption power	5W
Insulation resistance	Above 5MΩ
Air	Noncorrosive and flammable gas
Ambient temperature	0°C~60°C
Ambient humidity	5%~95% (no condensation)
IO point	32-way input / 24-way output
Analog DA/AD	1-way analog input and 2-way analog output
Encoder feedback	1-way AB orthogonal pulse encoder feedback input
Communication	MECHATROLINK II, MODBUS, ETHERCAT
Grounding	Single-point grounding or common-point grounding is adopted, and public grounding is not allowed.

Interface description:

Communication port 1	USB interface	MII communications
Communication port 2	RJ45 interface	EtherCAT communication protocol
Communication port 3	RJ45 interface	EtherNET network port

4.5.2 SWITCHING VALUE INPUT/OUTPUT OF EM3224

1. Input /Output terminal schematic



2. Input port description

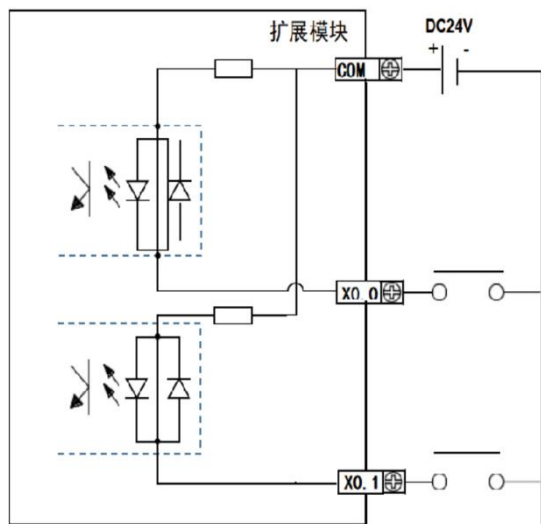
Four groups of switch inputs, each with 8 input points, are independent of each other. For example, the X0 group is connected with the NPN sensor and the X1 group is connected with the PNP sensor. To distinguish whether each group is NPN or PNP, it is only necessary to distinguish whether the COM terminal of each group is connected with 24V or 0V.

The input ports are opto-isolated from the internal circuitry of the system, and the electrical specifications of each input port are:

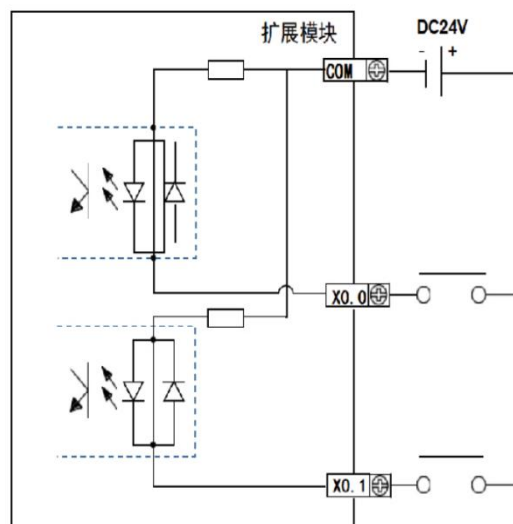
Item	Electrical specifications of each input port
Input point	A total of 32 points in 4 independent groups
Input form	High level (PNP), low level (NPN)
Input voltage	DC 12V~24V
Maximum isolation voltage	2500VRMS

Input port electrical schematic:

NPN: wiring



PNP wiring:



3. Output port description

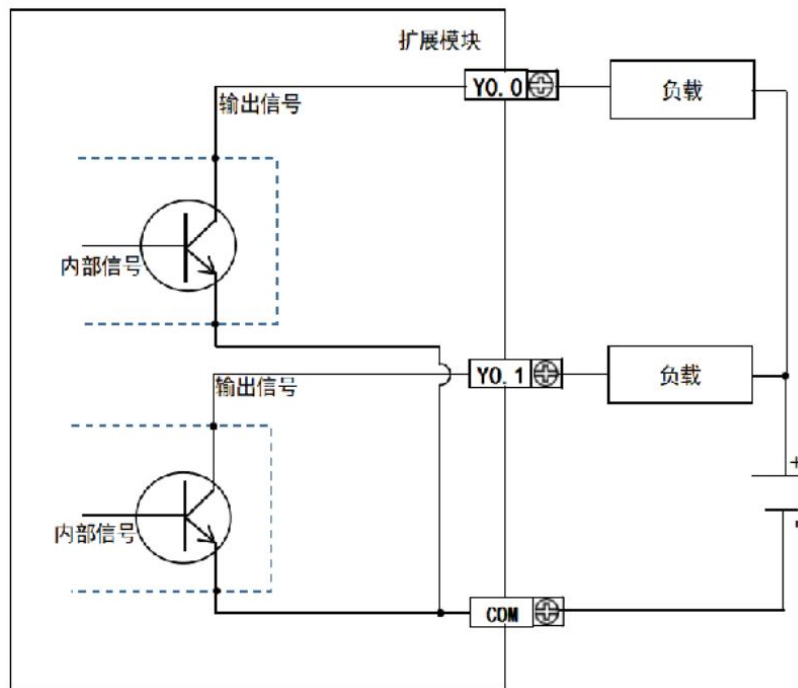
There are 3 groups of switching outputs, the output type is NPN low-level (0V) outputs, and each group of outputs is independent of each other.

The drive circuit is Darlington OC (open collector) output, and the output electric specification by each circuit is:

Item	Electrical specifications of each output port
Output point	A total of 24 points in 3 independent groups
Output form	High power NPN type transistor
Output current	Maximum load current 2A
Output voltage	DC 24V ± 10%

Output port electrical schematic:

NPN wiring:



4.5.3 ANALOG INPUT/OUTPUT OF EM3224

Item	Specification
Analog input (AD)	1-way analog input, acquisition range: DC 0~10V
Analog output (DA)	2-way analog output, output range: DC 0~10V

4.5.4 DEFINITION OF EM3224 ON CNC SYSTEM

After the system establishes a communication connection with EM3224, each input and output port corresponds to a certain address on the system. The definitions should be in accordance with the rules in the table below.

1. Switching value input/output

System parameter number	Name	Setting value
2721	X-axis start address of bus IO station input port	50 (default)
2722	Y-axis start address of bus IO station output port	50 (default)

Each input/output port in the CNC system has two addresses, which are the PLC address and the programming port number address, respectively.

- PLC addresses are in decimal to the left of the decimal point and in octal from 0 to 7 to the right of the decimal point;
- Programming port number addresses are decimal positive integers;

Example: X0.2 of EM3224; PLC address is $X0.2+50 = X50.2$, port number is $50*8+2+1=403$

	EM3224 definition	PLC address on NC	Signal function name on NC	Signal port number on NC
Input port	X0.0	X50.0	X401	401
	X0.1	X50.1	X402	402
	X0.2	X50.2	X403	403
	X0.3	X50.3	X404	404

	X3.7	X53.7	X432	432
Output port	Y0.0	Y50.0	Y401	401
	Y0.1	Y50.1	Y402	402
	Y0.2	Y50.2	Y403	403
	Y0.3	Y50.3	Y404	404

	Y2.7	Y52.7	Y432	432

2. Analog input/output

If there are more than 2 EM3224 expansion modules, as shown in the following table:

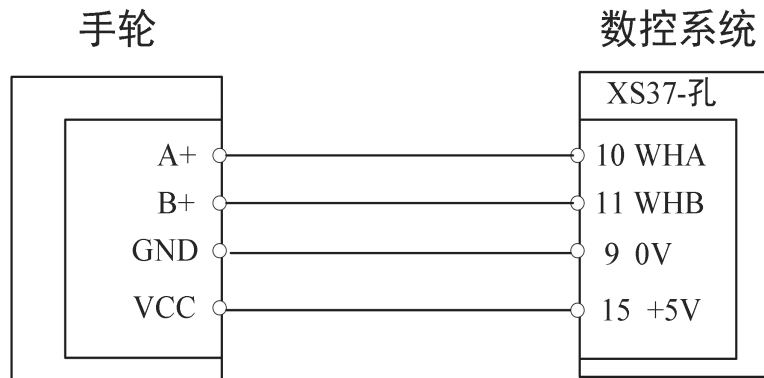
Definition of EM3224 analog input (AD)	Address number of the corresponding system
AD (EM3224 module 1)	Specified by line 1 of system parameter #2725
AD (EM3224 module 2)	Specified by line 2 of system parameter #2725

Definition of EM3224 analog output (DA)	Address number of the corresponding system (system parameter #1012)
System motherboard	1~3
DA1 (EM3224 module 1)	4
DA2 (EM3224 module 1)	5
DA1 (EM3224 module 2)	6
DA2 (EM3224 module 3)	7

4.6 Machine tool common function wiring definition

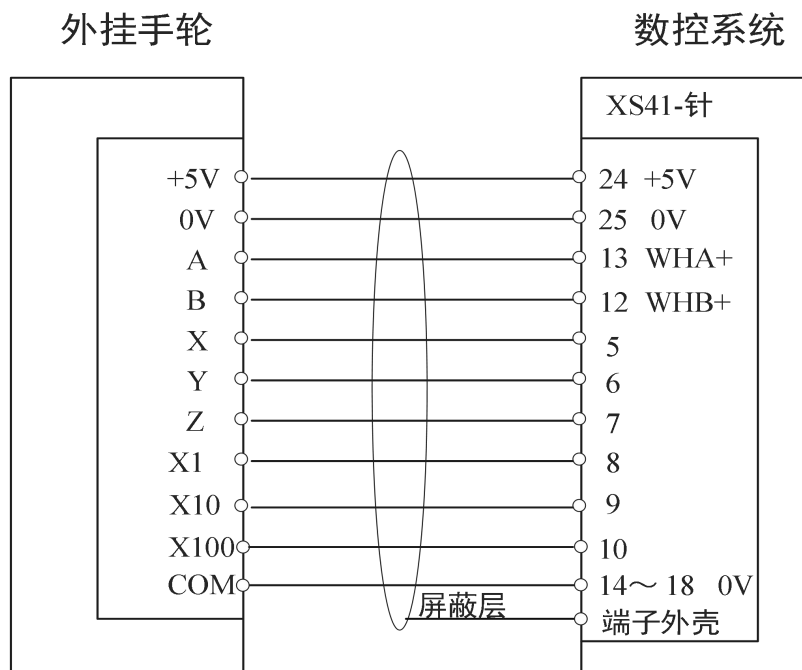
4.6.1 Handwheel wiring

Wiring diagram between the hand wheel and the CNC system:



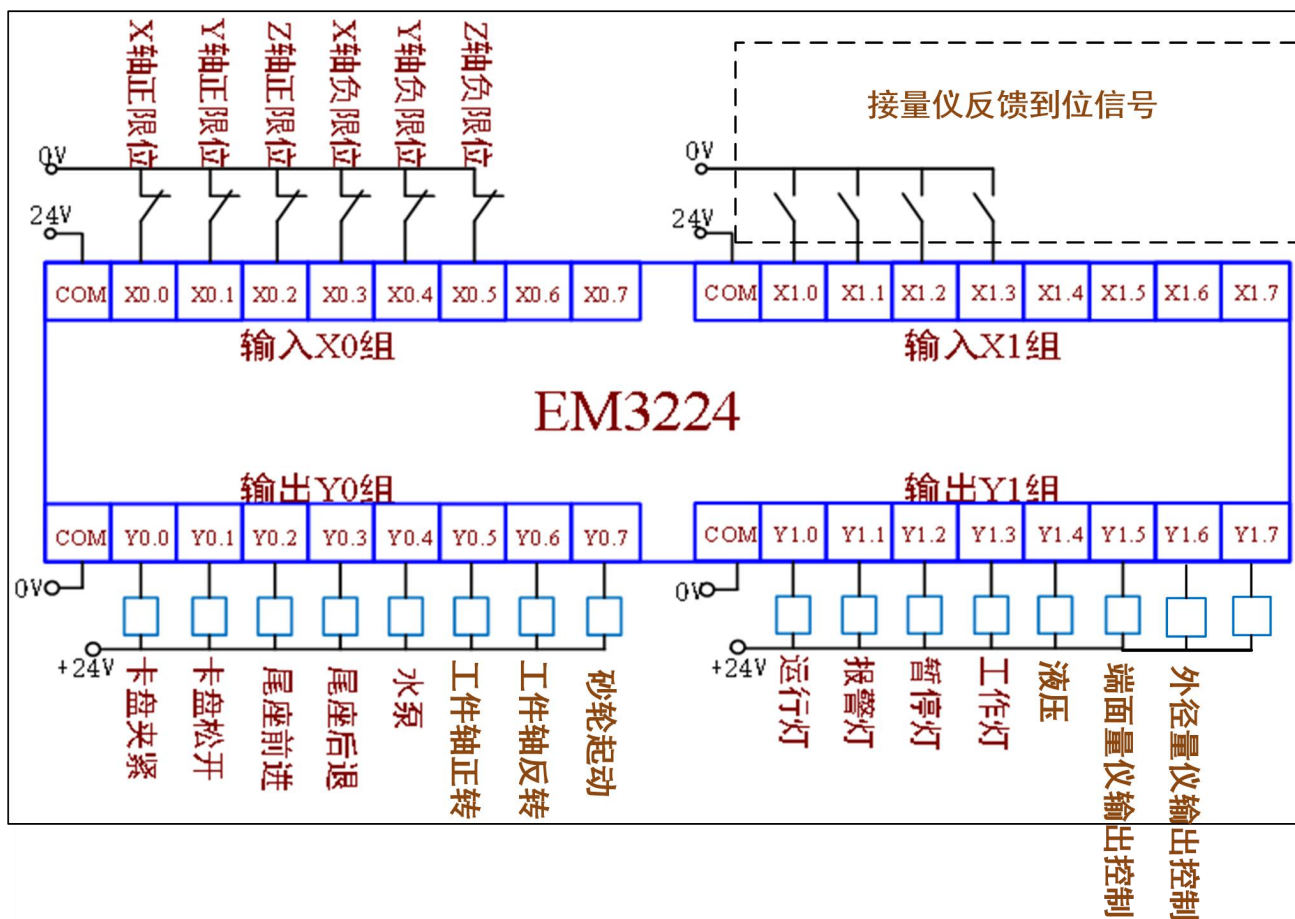
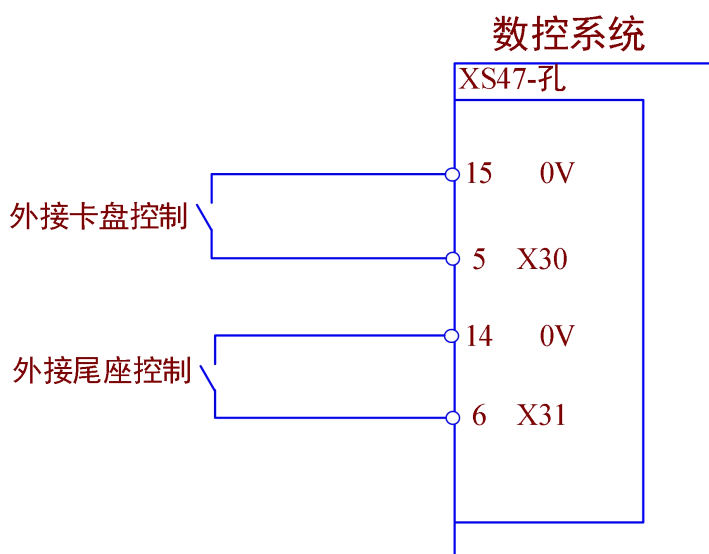
According to the difference of the output signal modes, there usually are two kinds of hand wheels: two-signal-line mode (A + and B + signals) and four-signal-line mode (A+, A -, B+, B -). For the four-signal-line hand wheel, A- and B- signals will not be connected.

External handwheel axis selection and override wiring diagram



Parameter number	Name	Default
600 Bit 1	Handwheel direction is forward/backward direction	0
600 Bit 2	The handwheel is an ordinary handwheel / handheld unit	0

4.6.2 Universal input and output wiring for machine tools



Chapter 5 Commissioning Instructions

5.1 Precautions before commissioning

5.1.1 System version

诊断						00767 N00000	
系统诊断							搜索号
序号	内容	序号	内容	序号	内容		
0001	软件版本号	0007	CPU利用率	1		0	
1	1.80.05	1		13	0102	手轮编码器累计脉冲	
0002	软件编译号	0020	IO站控制方式	1		0	
1	20041701	1	0x0000	0200		主轴编码器	
0003	逻辑版本号	2	0x0000	1		0	
1	0x800A	0021	IO站状态反馈	2		0	
2	0x0104	1	0x0000	0201		主轴编码器累计脉冲	
3	0x0401	2	0x0000	1		0	
0004	控制周期(ms)	0022	IO站版本	2		0	
1	1.000	1	0	0202		主轴编码器增量	
0005	系统名称	2		0	1		0
1	21TD_mh4	0100	手轮编码器	2		0	
0006	控制耗时	1		0	0203	主轴编码器分辨率	
1	209	0101	手轮编码器增量	1		0	
软件版本号							
						就绪 手动	09:58:18
系统诊断	输入输出 一览	输入口 定义	输出口 定义	伺服诊断	波形诊断		

Confirm the system software version number and system name before commissioning.

Note:

- The bus spindle is supported, and the bus IO expansion module needs the version beginning with software version 1.80.
- The system name can reflect the system type. For example, 31TD_ah4, indicating a lathe_bus type horizontal 4-axis system
31TD_ev2, indicating a lathe_bus type vertical 2-axis system

5.1.2 Input/Output port parameter definition

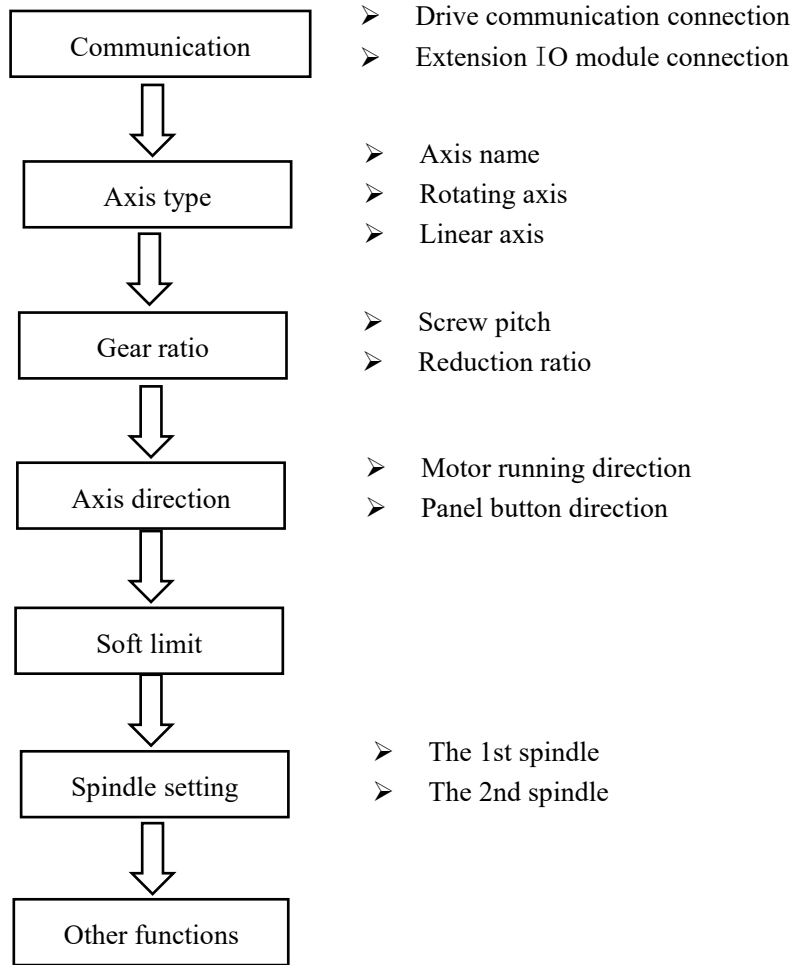
Most PLC function input/output ports of the 31 series systems can be set by parameters, such as the spindle forward and backward rotation output ports, the three-position switch input port, and external start/pause, etc.

According to the actual wiring, determine the port number and set the parameters through the input/output definition on the system diagnosis page. See paragraph 4.5.3 for details.

5.1.2 Precautions for parameter setting

When all parameters are modified, press the system reset button to save;

5.2 Basic commissioning process

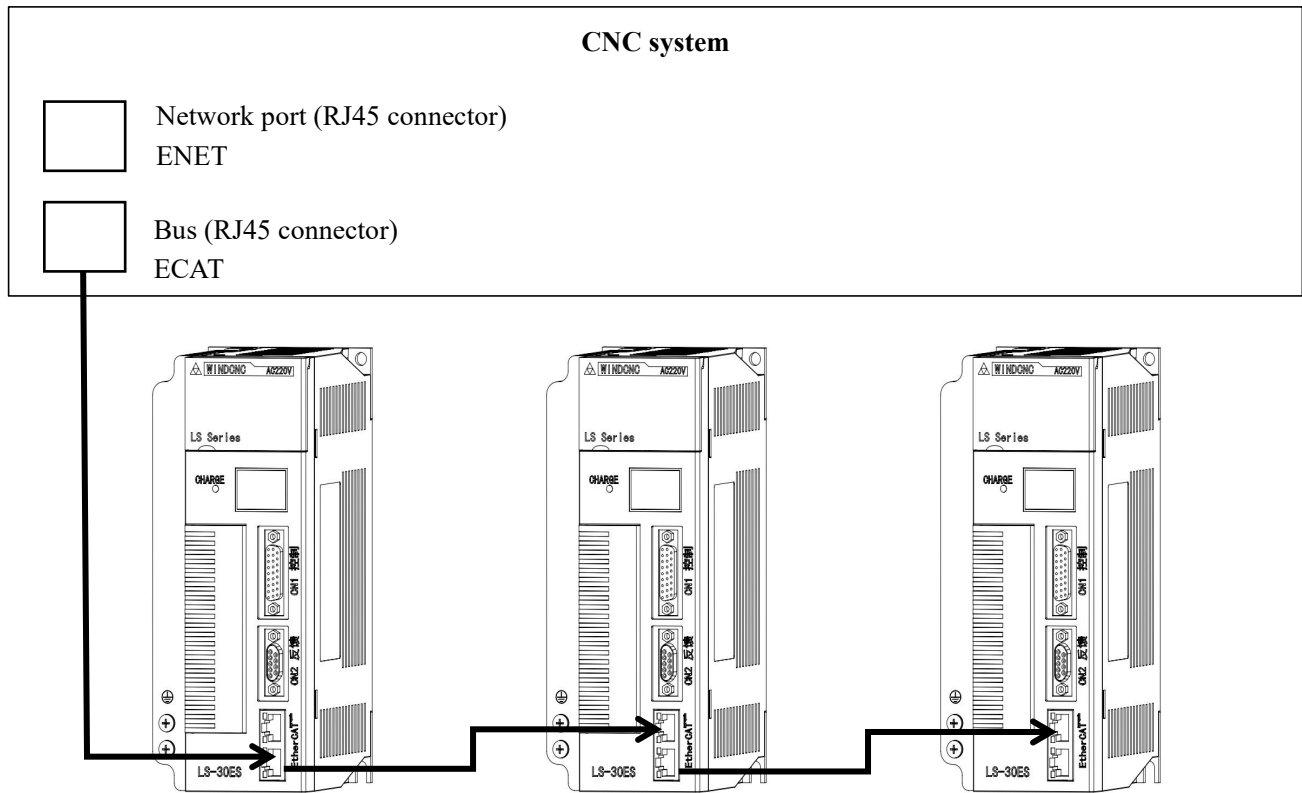


5.3 Communication Connection

Basic flow:

1. Set the communication address station number of the drive or bus expansion module.
2. Set the system communication address number to connect the bus servo drive and the extension IO module;
3. Power off and restart the system to check whether the communication is normal.

5.3.1 SCHEMATIC DIAGRAM OF THE ETHERCAT COMMUNICATION CABLE CONNECTION RULES



Note:

1. Unlike MII communication, EtherCAT communication lines cannot be plugged in at random and must be connected in the sequence according to the rules in the diagram above;
2. The last communication unit does not require a terminating resistor;

5.3.2 SETTING OF ETHERCAT DRIVE PARAMETERS

EtherCAT bus feed axis drives provided by Wind CNC: 30ES/30ED/30ET/50ES/75ES

Drive parameter number	Function description	Set value
PA/PB/PC606	Axis address	X:1 Y:2 Z:3 A:4 B:5 C:6

EtherCAT bus feed axis drives provided by Wind CNC: 30EDI/30ETI (servo drive with extension IO)

Drive parameter number	Function description	Set value
PA/PB/PC606	Axis address	X:1 Y:2 Z:3 A:4 B:5 C:6
PA605	Set the address of the extension IO station	Correspond to system parameter #2720

Note: Unplug the encoder wire or power on the drive for the first time for debugging, the drive will give an alarm A27/B27/C27.

Clear the alarm as follows:

1. Press F briefly to enter the drive menu and find FA000;
2. Press Δ briefly to find FA009;
3. Press S briefly to enter, and the digital tube displays PoSCL;
4. Press F to clear. When the digital tube displays CLFIN, it indicates that clearing is completed.
5. In case of biaxial drive, press and hold F to switch channels FA/FB/FC, and repeat the above operations;
6. Power off and restart the drive.

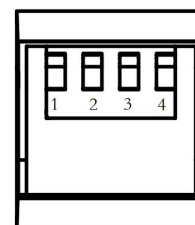
EtherCAT bus spindle servo drives provided by Wind CNC: SA037E/SA055E/SA075E

Drive parameter number	Function description	Set value
F7-5	Axis address	Correspond to the system and do not duplicate other drives

5.3.3 COMMUNICATION ADDRESS SETTING FOR EXPANSION MODULE EM3224

The EM3224 module's 4 dip switches are used to set the module's communication address number.

Dip switch 1~3		Dip switch 4
Dip switches toggled down	Function meaning	Not applicable
Switch 1 toggled down	Correspondence address number is 1	
Switch 2 toggled down	Correspondence address number is 2	
Switches 1 and 2 toggled down	Correspondence address number is 3	
Switch 3 toggled down	Correspondence address number is 4	
Switches 1 and 3 toggled down	Correspondence address number is 5	
Switches 2 and 3 toggled down	Correspondence address number is 6	
Switches 1, 2, and 3 toggled down	Correspondence address number is 7	



5.3.4 System communication parameter setting

System parameter number	Function description	Set value
0014	Axis address number of each axis	X:1 Y:2 Z:3 A:4 B:5 C:6 Ignore: 0
2720	Bus IO station address	Correspond to EM3224 dip switch or Correspond to the PA605 setting of the drive with extension IO

5.4 Axis type

System parameter number	Function description	Default setting value
0001	Related settings of each axis	0 0 0 0 0 0 0

Bit 1: radius/diameter programming;

For the X-axis of milling machine, set to diameter programming

Bit 2: **linear axis / rotating axis function**;

Setting is required for the rotating axis

Bit 3: relative coordinates do not circulate / circulate with one axis;

Is the relative coordinate for the rotating axis 360-degree cycle

Bit 4: The absolute command of the rotating shaft specifies rotation with/without following the principle of proximity;

Bit 5: The absolute command of the rotating shaft specifies movement in the direction of relative value / command;

Bit 6: The absolute command of the rotating shaft;

Bit 7: Disply / Not display the coordinate axis;

System parameter number	Function description	Set value
0012	Settings related to the name of each axis	X:1 Y:2 Z:3 A:4 B:5 C:6
		X _n :10 _n Y _n :20 _n Z _n :30 _n A _n :40 _n B _n :50 _n C _n :60 _n (n=1~9)
		X _A :165 Y _A :265 ... X _B :166 Y _B :266

5.5 Setting Electronic Gear Ratio

System parameter number	Function description	settings
0002 Bit 6	Command electronic gear ratio use / not use extension mode	1

Please make sure that the above bit parameters are open before proceeding to the next parameter setting.

Note: After the gear ratio is set, the workpiece coordinate system will be established after power-on again!

Understand the following points before setting the gear ratio:

- **Number of pulses required for one revolution of the motor**

Usually, the encoder line number of pulse-type ordinary servo motor is 2500, and the drive defaults to quadruplicated frequency, so the motor takes 10000 pulses as one turn;

The number of absolute servo motor encoder lines is the power of 2, which is mostly 17 bits and 23 bits in the market at present, and the corresponding pulse numbers required for one revolution of the motor are 2^{17} (131072) and 2^{23} (8388608), respectively.

- **Screw pitch of machine tool**

The distance moved for one revolution of the screw rod;

- **Reduction ratio of motor to screw rod**

In some occasions, for example, the load is particularly large, the motor can not drag the pallet through direct connection; or when the shaft is a rotating shaft, there is a reduction ratio;

5.5.1 Setting of gear ratio of linear axis

Example:

The z-axis is a screw rod with 6mm srew lead, with a reduction ratio of 1: 2, the drive is LS-30MS, and the motor has a 23-bit encoder:

System settings

System parameter number	Parameter description	Set value
0020	Number of gears on the driven wheel side	2
0021	Number of gears on the motor side	1
0022	Number of command pulses per revolution of each axis motor	10000
0023	The screw pitch of each axis as a straight axis	6

Wind CNC bus drive setting: (already set at the factory)

Drive parameter number	Parameter description	Setting value (default)
020E	Electronic gear ratio member	524288
0210	Electronic gear ratio denominator	625

5.5.2 Setting of gear ratio of rotating shaft

Because there is the possibility of data overflow when the absolute value motor is used as the rotating shaft, it is necessary to set the gear ratio parameters specially.

Example 1: Axis a is a index plate with a reduction ratio of 1: 30, the drive is LS-30MS, and the motor has a 23-bit encoder:

System settings

Drive parameter number	Parameter description	Setting value (default)
0020	Number of gears on the driven wheel side	30
0021	Number of gears on the motor side	1
0022	Number of command pulses per revolution of each axis motor	131072
0024	The angle of each axis as the rotating axis	360

Wind CNC bus drive setting:

Drive parameter number	Parameter description	Set value
020E	Electronic gear ratio member	64
0210	Electronic gear ratio denominator	1

Example 2: Axis a is a index plate with a reduction ratio of 1: 45, the drive is LS-30MS, and the motor has a 17-bit encoder:

System settings

System parameter number	Parameter description	Set value
0020	Number of gears on the driven wheel side	45
0021	Number of gears on the motor side	1
0022	Number of command pulses per revolution of each axis motor	131072
0024	The angle of each axis as the rotating axis	360

Wind CNC bus drive setting:

Drive parameter number	Parameter description	Set value
020E	Electronic gear ratio member	1
0210	Electronic gear ratio denominator	1

5.6 Axis direction

Set the moving direction of the pallet and the button direction of the panel.

Note: After setting, the system restarts!

5.6.1 Moving direction of coordinate axis

System parameter number	Function description
0002 Bit 3	Motor moving direction is positive/negative
0003 Bit 1	Motor feedback direction is positive/negative

Need to modify parameters 0002 and 0003 at the same time.

In general, the direction along which the tool gets close to is negative (the system coordinate value is getting smaller and smaller), and the direction along which the tool gets far away from the workpiece is positive (the system coordinate value is getting larger and larger).

5.6.2 Moving direction of panel buttons

System parameter number	Function description
0002 Bit 4	Manual movement direction is positive/negative

Effective immediately.

5.7 Limit

The operating range of the machine tool is limited by the machine tool coordinates of the system.

Note: Before setting the soft limit, the settings of paragraph 5.5 and paragraph 5.6 must be done properly.

5.7.1 SOFT LIMIT

The CNC system judges the limit according to the **machine coordinates**.

1. The first software limit

System parameter number	Function description
0501 Bit 1	The first soft limit is valid or invalid
0510	Soft limit coordinate 1 in positive direction
0511	Soft limit coordinate 1 in negative direction

Move the pallet to the limit position of the machine tool, and fill the mechanical coordinates of the machine tool into the target parameters on the system position page.

5.7.2 Hardware limit

A travel switch is installed on each axis of the machine tool. When the switch is pressed by the support plate of a certain axis of the machine tool, the system will stop the positive/negative movement of the axis and give an alarm at limit. The alarm can only be released by moving in the opposite direction.

System parameter number	Description
0501 Bit 2	Open the hard limit function of each axis
0501 Bit 7	Positive direction hard limit is normally open/closed
0501 Bit 8	Negative direction hard limit is normally open/closed
0520	Positive direction soft limit input port of each shaft
0521	Negative direction soft limit input port of each axis

5.8 Spindle setting

Conduct relevant settings of the lathe spindle.

5.8.1 Spindle type

System parameter number	Description
1011	0: Speed - Used for analog control of frequency converter spindle 2: Position - Servo indexing power head 3: servo spindle

参数 00001 N00000

系统参数				手轮
序号	内容	序号	内容	
3	0 0 0 0 0 0 0 0	1005	各主轴准停相关设置	
1002	主轴互锁相关设置	1	1 0 1 1 0 0 0 0	主轴
1	0 0 0 0 0 0 0 0	2	1 0 1 1 0 0 0 0	
2	0 0 0 0 0 0 0 0	3	1 0 1 1 0 0 0 0	卡盘
3	0 0 0 0 0 0 0 0	1006	各主轴锁住相关设置	
1003	各主轴/伺服反馈和输入相关设置	1	0 0 0 0 0 0 0 0	尾座
1	0 0 0 0 0 0 0 0	2	0 0 0 0 0 0 0 0	
2	0 0 0 0 0 0 0 0	3	0 0 0 0 0 0 0 0	
3	0 0 0 0 0 0 0 0	1011	各主轴类型(0:速度(DA或脉冲), 1	刀架
1004	各主轴速度/位置相关设置	1	2	The 1st spindle
1	0 0 0 0 0 0 0 0	2	0	
2	0 0 0 0 0 0 0 0	3	0	
3	0 0 0 0 0 0 0 0	1012	主轴速度控制时的输出地址编号(D	润滑
SSRV 0/1:速度脉冲方向(或总线),正向/反向				系统配置
				[更多]
				3
就绪 手动 09:00:10				
系统参数	螺距补偿	伺服参数		

The 1st spindle
The 2nd spindle

5.8.2 Setting of frequency variable spindle

Execution code:

- S speed value (speed value setting);
- M03/M04 (spindle forward/backward rotation);
- M05 (spindle stop);

Parameter number	Name	Set value
1011	Type of each spindle	0
1012	Address number during speed control of each spindle	Set in the table below
1030	Spindle forward rotation output port	Fill in the port number according to the connected line
1031	Spindle backward rotation output port	Fill in the port number according to the connected line
1095	Spindle alarm input port	Fill in the port number according to the connected line (Positive value means normally open, negative value means normally closed)

Example: The bus CNC system has 2 EM3224 expansion modules (one module contains 2 analog output ports)

First, determine which EM3224 is #1 and which is #2 by the order of system parameter #2720.

Then, set the parameters according to the following table:

Wiring	Set value of system parameter #1012
Wiring of analog output 1 of #1 EM3224	4
Wiring of analog output 2 of #1 EM3224	5
Wiring of analog output 1 of #2 EM3224	6
Wiring of analog output 2 of #2 EM3224	7

5.8.3 Servo spindle setting

The workpiece axis that needs indexing and positioning is usually used as the servo spindle.

Execution code:

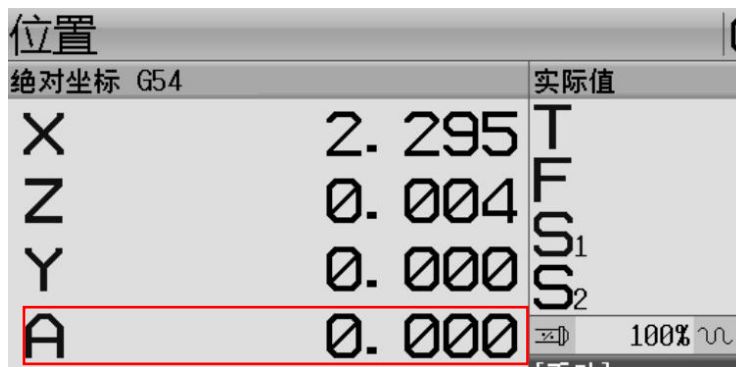
M17 (speed mode): M03/M04 Sxxxx

M19 (spindle orientation)

M18 (position mode): indexing G01, positioning G0 ...

Take the example of the bus servo spindle provided by Wind CNC for illustration:

Parameter number	Name	Set value
0014	Address number of axis A	Same as spindle servo F7-5
1011	Type of each spindle	3
1001, Bit 1	Speed direction (or bus), positive/negative	Modify according to the situation
1013	Axis number in spindle position mode	See the illustration below
1012	Address number during speed control of each spindle	0
1030	Spindle forward rotation output port	0
1031	Spindle backward rotation output port	0
1070	Output port in spindle position mode	0
1071	In-place input port in spindle position mode	0
1080	Spindle orientation output port	0
1081	Spindle in-place orientation input port	0



Setting of No.1013 parameter: assuming that axis A is the control axis of servo spindle, and axis A is ranked as 4 in the position interface, parameter 1013 is set as 4, and axis A must be the rotating axis.

5.8.4 Position spindle setting

The workpiece axis (1st spindle) to be indexed and positioned is usually used as the servo spindle.

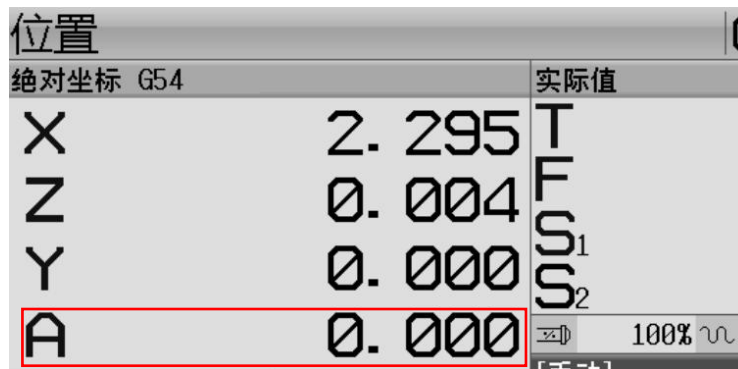
Execution code:

M03/M04 Sxxxx

Indexing G01..., Positioning G0...

Take the second spindle as an example with WindCNC bus servo motor equipped

Parameter number	Name	Set value	Remarks
1011	Type of each spindle	2	
1013	Axis number in spindle position mode		See the illustration below



Setting of No.1013 parameter: assuming that axis A is the power head, and axis Y is ranked as 3 in the position interface, parameter 1013 is set as 3, and axis Y must be the rotating axis.

5.8.5 Setting of speed and feedback

5.8.5.1 Setting of analog maximum speed

System parameter:

Parameter number	Name	Set value	Remarks
1025	Maximum speed of the 1st gear of the spindle	3000	

Wind CNC spindle servo drive parameters:

Parameter number	Name	Set value	Remarks
F0-7	Maximum spindle speed	3000	

5.8.5.2 System speed feedback display

Parameter number	Name	Set value	Remarks
1015	Input address number of spindle encoder	Connect XS36, fill in 1 Connect XS35, fill in 2	
1016	Number of encoder lines	2500	
1017	Encoder electronic gear ratio; number of gears on the encoder side	1	
1018	Encoder electronic gear ratio; number of gears on the spindle side	1	

Note: The 31 bus system supports two-channel encoder interfaces. When the spindle has no speed display, please check the system connection port.

5.9 Machine zero return setting

Parameter number	Name	Default
302 Bit 1	The zeroing function of each axis is valid/invalid	0
302 Bit 2	Zero return is not required / required for the first run	1
302 Bit 3	Return to zero from positive/negative direction	0
302 Bit 4	The zero return deceleration switch is normally open / normally close	0
051 Bit 2	Enable/Disable hard limit function for each axis	0
051 Bit 7	The forward hardware limit is normally open / normally close	0

Parameter number	Name	Default value
310	Zero returning mode of each axis	1
311	Fast speed of each axis during zero returning (mm/min)	4000
313	Low speed when each shaft accelerates and decelerates to return to zero	60
320	Minimum distance from deceleration switch of each axis to zero point	-10
321	Minimum distance from deceleration switch of each axis to zero point	10

- In the event of P310 = 0, zero returning is subject to way A. When the axis is the bus axis, it returns to the floating zero point;

Before carrying out zero returning of way A, it needs to confirm that the floating zero point has been established in advance. The establishing process of floating zero point is: move all axes to the position needed to be set; press **Position** to enter the comprehensive coordinate display interface; after pressing **Clear Machine Tool Coordinates**, next, press the button corresponding to the coordinate axis to be cleared, the corresponding machine tool coordinates are set to be 0, i.e., this point is the floating zero point; in this way, zero returning of way A is finished. After setting the floating zero point of machine tool correctly, the system will memory this zero point automatically. As long as the floating zero point is not reset, it will return to this point in future while carrying out zero returning of way A.

On condition that the floating zero point exists, X axis or Z axis direction key is pressed for one time, the system will move toward the floating zero point automatically. After reaching the zero point, the zero returning indicator light is on, indicating the complement of zero returning of this axis.

5.10 *Multi-channel setting

When the system includes multiple channels, the number of control axes and main axes of each channel can be assigned by parameters.



- System parameters: including all parameters of each channel
- Channel parameter: parameter of the current channel

Basic commissioning process of the multi-channel system:

1. In the system parameters, it assigns the spindle and feed control axis of each channel;

Parameter number	Name
0010	Number of channel to which the shaft belongs
1010	Number of channel to which each spindle belongs

2. In the channel parameters, debug the functions of each channel in normal process according to the description in paragraph 5.2.

5.11 Subprogram calling by customized keystroke

Call subprograms the keys USER1~USER5 of the system to realize output port control

Parameter setting:

Parameter number	Name	Set value
9080	Number of programs called by shortcut key command	5
9081	The number of starting program called by shortcut macro commands	9100
9082	External shortcut macro call input port 0	Pushbutton PLC address input port
9083	External shortcut macro call input port 1	Pushbutton PLC address input port
9084	External shortcut macro call input port 2	Pushbutton PLC address input port
9085	External shortcut macro call input port 3	Pushbutton PLC address input port
...

Example:

Press the custom button to enable/disable the output port M78

Set the port number of the external key input port to 401, and system parameter #9084 to 401 (indicating that O9102 is called when the input port is connected)

// Create a new program named O9102. The program content is as follows:

```
O9104
G04 I0
#1=RDDO[401]      // Read the status of output port (401)
IF[#1==1]
    M21 K401      // Disable the output port
ELSE
    M20 K401      // Enable the output port
ENDIF
M99
```


Appendix 1: Parameter List

The following parameters correspond to versions of the software after version number 2.80.23.

1. Axis/Servo Related Settings

0001	Related settings of each axis						
	DIA	ROT	RRL	RABS	RABG	RAGM	HID

DIA 0/1: radius/diameter programming

ROT 0/1: Linear axis / rotating axis function is effective

RRL 0/1: Relative coordinates do not circulate / circulate by one-cycle movement

RABS 0/1: The absolute command of the rotating shaft specifies rotation with/without following the principle of proximity

RABG 0/1: The absolute command of the rotating shaft specifies movement direction according to the relative value / the command sign

RAGM 0/1: The absolute command of the rotating shaft specifies to not carry out / carry out modulo operation of movement amount per cycle

HID 0/1: Display / Not display axis coordinates

[Default setting] 0000 0000

*0002	Servo/Motor control related settings					
	SVAC	SSS	MD	JD	SVPT	GREX

SVAC 0/1: Servo alarm is normally open / normally closed

SSS 0/1: The feedrate smoothing function without/with opening the S type

MD 0/1: Motor moving direction is positive/negative

JD 0/1: Manual moving direction is positive/negative

SVPT 0/1: Servo is single pulse / double pulse (bus system is AB pulse)

GREX 0/1: Command electronic gear ratio use / not use extension mode

[Default setting] 1000 0000

*0003	Servo/Motor feedback related settings						
	MFD	FGE	FIPC				

MFD 0/1: Motor feedback direction is positive/negative

FGE 0/1: Do not use / Use feedback gear ratio

FIPC 0/1: During position detection, detect the feedback position / command position

POCE 0/1: Use motor position / memory position to establish coordinates

[Default setting] 0000 0000

*0010	Number of channel to which the shaft belongs (exclusive to multi-channel)
-------	---

[Description] Set the number of channel to which each shaft belongs

0012	Name of each axis
------	-------------------

[Description] 1~6 correspond to X, Y, Z, A, B and C.

101~601 correspond to X1, Y1, Z1, A1, B1 and C1

0013	Decimal places of each axis
------	-----------------------------

[Default setting] 3

0014	Physical axis number of each axis
------	-----------------------------------

[Description] Set the pulse port number / bus axis address number of each axis, <0: Pulse axis axis 0: Ignore >0: Bus

0016	The coordinate axis of each axis in the basic coordinate system
------	---

Appendix 1: Parameter List [Axis/Servo Related Settings]

[Default setting] X:1 Y:2 Z:3 A (rotating axis): 4

[Description] Parallel axis of axis X: 5 Parallel axis of axis Y: 6 Parallel axis of axis Z: 7

0020	Electronic gear ratio override coefficient (number of gears at the driven side) specified for each axis
------	---

[Default setting] 1

0021	Electronic gear ratio frequency division coefficient (number of gears at the motor side) specified by each axis
------	---

[Default setting] 1

0022	Number of command pulses per revolution of each axis motor
------	--

[Default setting] 10000

0023	The screw lead of each axis as a straight axis (mm)
------	---

[Default setting] 10

0024	The per-cycle angle of each axis as the rotating axis
------	---

[Default setting] 360

0030	Motor encoder feedback port of each axis (0: bus feedback)
------	--

[Default setting] 0

0031	Feedback input multiplication coefficient (number of gears on the encoder side) of each axis
------	--

[Default setting] 1

0032	Feedback input frequency division coefficient (number of gears on the slave axis side) of each axis
------	---

[Default setting] 1

0033	Number of feedback pulses per revolution of each axis motor
------	---

[Default setting] 10000

0035	Maximum range of power-off movement for each axis (0: no check)
------	---

[Default setting] 10.00

0060	Servo alarm input port of each axis
0061	Servo enable output port of each axis
0062	P number of each axis enable opening or closing commands

[Default setting] 0

0063	Motor braking switch-on/switch-off output port of each shaft
0064	Coordinate establishment time delay (ms) when each axis servo is enabled

[Default setting] 50

0065	Time delay of each axis from servo enabling to braking switch-on/switch-off (ms)
------	--

[Default setting] 200

0070	G00 in-place detection distance of each axis (command equivalent)
------	---

[Default setting] 100

0071	In-position cutting detection distance for each axis (command equivalent)
0073	Maximum upper limit for load of each axis (percentage)
0074	Maximum time for load upper limit of each axis (ms)

2. Speed related settings

0110	G00 fast speed (mm/min)
------	-------------------------

[Default setting] 10000.000

0111	Gear F0 speed of G00 fast speed (mm/min)
------	--

[Default setting] 400.000

0112	G00 fast acceleration and deceleration time constant (ms)
------	---

[Default setting] 150

0113	G00 Low speed FL (mm/min) during quick acceleration and deceleration
------	--

[Default setting] 0

0114	G00 fast acceleration time (ms)
------	---------------------------------

[Default setting] 150

0120	Cutting speed upper limit (mm/min)
------	------------------------------------

[Default setting] 8000.000

0121	Cutting acceleration and deceleration time constant (ms)
------	--

[Default setting] 100

0122	Low speed FL during cutting acceleration and deceleration (mm/min)
------	--

[Default setting] 0

0123	Upper limit of automatic cutting override input (%)
------	---

[Default setting] 150

0125	Idle running speed(mm/min)
------	----------------------------

[Default setting] 2000.000

0130	Manual speed (mm/min)
------	-----------------------

[Default setting] 200.000

0131	Manual fast speed (mm/min)
------	----------------------------

[Default setting] 3000.000

0132	Manual feed acceleration and deceleration time constant (ms)
------	--

[Default setting] 200

0140	Speed acceleration and deceleration coefficient of rotating shaft
------	---

[Default setting] 1.000

[Description] >1: acceleration <1: deceleration

0141	Feedrate smoothing coefficient after S shape
------	--

[Default setting] 5

[Description] This parameter can make the speed of shaft movement stable, but if it is too large, it will lead to track error

3. Pitch/Clearance compensation related settings

0200	Pitch/Clearance compensation related settings (um/mm)						
	UPIM						

UPIM 0/1: screw thread compensation import unit: um/mm

[Default setting] 0000 0000

0201	Setting of reverse backlash compensation / pitch compensation of each axis						
	GAP	PEC	PCER				

GAP 0/1: reverse backlash compensation off/on

PEC 0/1: pitch error compensation off/on

PCER 0/1: The pitch compensation is effective after power-on / zero returning

[Default setting] 0000 0000

0210	Reverse backlash compensation amount (mm)
------	---

[Default setting] 0.000

0211	Reverse backlash compensation speed limit (mm/min)
------	--

[Default setting] 3000.000

0212	Reverse backlash acceleration and deceleration time constant (ms)
------	---

[Default setting] 150

0213	Reverse backlash compensation starting speed FL (mm/min)
------	--

[Default setting] 200.000

4. Setting related to zero returning

0300	Setting related to zero returning						
	MZ1	NWZ					

MZ1 0/1: manual zero returning by 1 key / continuous key pressing

NWZ 0/1: After returning to zero, use / not use G54~G59 workpiece coordinate systems

[Default setting] 0000 0000

0302	Settings related to zero returning for each axis						
	ZEN	ANZ	ZDR		ZSR	ZSA	

ZEN 0/1: The zero returning function is invalid/valid

ANZ 0/1: Zero returning is not required / required for the first automatic operation

ZDR 0/1: positive/negative zero returning

ZSR 0/1: The relative coordinates are cleared / not cleared after zero returning

ZSA 0/1: absolute clearing / establishment of absolute coordinate system after zero returning

[Default setting] 0100 1100

0310	Zero returning mode of each axis
------	----------------------------------

[Default setting] 1

[Description] 0: Zero returning Way A: Move directly to the position where the machine tool coordinates are 0 during zero returning.

1: Zero returning Way B: Check the deceleration switch, and then check the encoder zero pulse during zero returning.

2: Zero returning Way C: During zero returning, check the deceleration switch, and then check the deceleration switch for the second time at low speed.

3: Zero returning Way D: Only detect zero pulse of encoder, which is usually used for rotating shaft.

0311	Fast speed of each axis during zero returning (mm/min)
------	--

[Default setting] 4000.000

0312	Acceleration and deceleration time constant of each axis during zero returning (ms)
------	---

[Default setting] 200

0313	Low speed of each axis during zero returning (mm/min)
------	---

[Default setting] 60.000

0314	Deceleration switch input port of each axis
0320	Minimum distance from deceleration switch of each axis to zero point
0321	Maximum distance from deceleration switch of each axis to zero point

5. Coordinate system related settings

0400	Coordinate system related settings						
	PZSW		GOFS	RLC	FLC		

PZSW 0/1: During power-on, the workpiece coordinates are established with the coordinate system before power-off / the G54 coordinate system

GOFS 0/1: use / cannot use G92 or G50 offset

RLC 0/1: do not clear / clear G52 after reset

FLC 0/1: do not clear / clear G52") when executing M30 or M02

[Default setting] 0001 1000

0410	Absolute coordinate values automatically set after each axis returns to zero (mm)
------	---

[Default setting] 0.000

0411	Machine tool coordinates of the second reference point
------	--

[Default setting] 0.000

0412	Machine tool coordinates of the third reference point
------	---

[Default setting] 0.000

0413	Machine tool coordinates of the fourth reference point
------	--

[Default setting] 0.000

6. Limit related settings

0501	Limit related settings of each axis							
	SLM1	HLM	SLMZ	HLMZ	SLWC		PHLC	NHLC

SLM 0/1: The first software limit function is invalid/valid

HLM 0/1: Turn off/on the hardware limit function

SLMZ 0/1: During zero returning, the soft limit is invalid/valid

HLMZ 0/1: During zero returning, the hard limit is invalid/valid

SLWC 0/1: Carry out soft limit with machine tool / workpiece coordinates

PHLC 0/1: The forward hardware limit length is normally open / normally close

NHLC 0/1: The backward hardware limit length is normally open / normally close

[Default setting] 0000 0000

0502	Setting of soft limit switch for each axis							
	SLM2	SLM3						

SLM2 0/1: turn off/on the second software limit function

SLM3 0/1: turn off/on the third limit function

[Default setting] 0000 0000

0503	Soft limit control related settings							
	PSLM							

PSLM 0/1: Soft limit check is off/on before moving

[Default setting] 0000 0000

0510	The first forward soft limit coordinate
------	---

[Default setting] 0.000

0511	The first negative soft limit coordinate
------	--

[Default setting] 0.000

0512	Second forward soft limit coordinate
------	--------------------------------------

[Default setting] 0.000

0513	Second negative soft limit coordinate
------	---------------------------------------

[Default setting] 0.000

0514	Third forward soft limit coordinate
------	-------------------------------------

[Default setting] 0.000

0515	Third negative soft limit coordinate
------	--------------------------------------

[Default setting] 0.000

0520	Forward hard limit input port
------	-------------------------------

0521	Negative hard limit input port
------	--------------------------------

7. Handwheel related settings

0600	Handwheel settings						
	HDL D	HDL X	HDL R	HDL I	HDL DI		

HDL D 0/1: The handwheel direction is positive/negative

HDL X 0/1: The handwheel is an ordinary handwheel / handheld unit

HDL R 0/1: Turn off/on manual rollback

HDL I 0/1: During handwheel feed, the pulse exceeding the maximum speed pulse will not be / will be ignored

HDL DI 0/1: When the handwheel selection axis moves, the handwheel reverses setting pulse will not be / will be ignored

[Default setting] 0001 1000

0610	Handwheel speed upper limit of each axis
------	--

[Default setting] 0.000

0611	Low-speed FL for handwheel acceleration and deceleration of each axis (dedicated to exponential type)
------	---

[Default setting] 100

0612	Handwheel acceleration and deceleration time constant of each axis
------	--

[Default setting] 150

0615	Basic unit override of handwheel movement of each axis
------	--

[Default setting] 1

0616	Upper limit of handwheel override input
------	---

[Default setting] 100

0617	Upper limit of quick override movement in handwheel commissioning
------	---

[Default setting] 25

0620	Handwheel selection input port of each axis
------	---

[Default setting] 0

0621	Hand wheel override *1 input port
0622	Hand wheel override *10 input port
0623	Hand wheel override *100 input port
0624	Hand wheel override *1000 input port
0625	Hand wheel mode selection input port
0626	Handwheel interrupt mode selection input port
0626	Handwheel interrupt mode selection input port
0630	Handwheel interruption speed upper limit of each axis (mm/min)

[Default setting] 500.000

0631	Acceleration and deceleration time constant of handwheel interrupt mode (ms)
------	--

[Default setting] 400

8. Spindle related settings

1000	Spindle related channel setting						
	SCSU	SISO	SPNE	CTSA	SOVD		

SCSU 0/1: USER1 key is used to switch/customize spindle speed and position

SISO 0/1: The spindle inching key is used for inching / spindle positioning

SPNE 0/1: Multiple spindles in the channel are invalid/valid

CTSA 0/1: When cutting, do not detect / detect that the spindle speed has reached

SOVD 0/1: Spindle override shared/separated

[Default setting] 0000 0000

1001	Related settings of each spindle						
	SSRV		SSTR	SSTCE	SSPCE	SSPCE	SSAH

SSRV 0/1: speed pulse direction (or bus), positive/negative

SSTR 0/1: star triangle start function off/on

SSTCE 0/1: When the spindle is started, do not detect / detect that the actual speed has reached.

SSPCE 0/1: When the spindle is stopped, do not detect / detect that the rotating speed has stopped

SSPCE 0/1: When the spindle is stopped, the analog output is not saved / saved

[Default setting] 0000 0000

1002	Settings related to spindle interlock						
	SPQP	SPTS	SSPAL	SPRST	SPM30		

SPQP 0/1: Chuck clamping is not detected / detected when the spindle is started

SPTS 0/1: Tailstock advancing and retracting is not detected / detected when the spindle is started

SSPAL 0/1: Stop / Do not stop the spindle in case of system alarm

SPRST 0/1: Stop / Do not stop the spindle in case of reset

SPM30 0/1: Stop / Do not stop the spindle during execution of M30

[Default setting] 0000 0000

1003	Settings related to feedback and input of each spindle/servo						
	SERFD	SALC				SMEG	SCEZ

SERFD 0/1: The feedback direction of spindle encoder is positive/negative

SALC 0/1: The spindle alarm is normally open / normally close

SMEG 0/1: Spindle encoder multiple electronic gear ratios are invalid/valid

SCEZ 0/1: bus spindle, zero signal (servo support required) is not detected / detected

[Default setting] 0000 0000

1004	Spindle speed/position related settings						
	SCPO	SCCP	SPAZ	SCOP	SCOR	CSRS	CSPFR

SCPO 0/1: The spindle is in speed/position mode when it is powered on

SPTS 0/1: do not set / set coordinates after the spindle position mode is completed

SPAZ 0/1: When the spindle stops rotating in position mode, it does not stop / stops at the orientation position

SCOP 0/1: When the spindle is in the position mode for the first time, spindle orientation will not be executed / be executed

SCOR 0/1: When the spindle is in position mode, spindle orientation will not be executed / be executed every time

CSRS 0/1: When resetting in spindle position mode, do not switch / switch to speed mode

CSPFR 0/1: When it is in the spindle position mode, the spindle forward and backward rotation commands can not / can be used

[Default setting] 0000 0000

Appendix 1: Parameter List [Spindle related settings]

1005	Settings related to orientation of each spindle						
	SORC	SORRS	SORWS	SORWE	SORP	SORQS	

SORC 0/1: do not set / set the coordinates after spindle orientation

SORRS 0/1: When resetting, do not close / close the output port for spindle orientation

SORWS 0/1: During spindle orientation, don't wait / wait for the spindle to stop

SORWE 0/1: During spindle orientation, don't wait / wait for the encoder to stop

SORP 0/1: Output level/pulse signal during spindle orientation

SORQS 0/1: During spindle orientation, stop spindle/fast mode normally

[Default setting] 0000 0000

*1010	Number of channel to which each spindle belongs (exclusive to multi-channel)
-------	---

1011	Spindle type (0: speed) (1: gear shift) (2: position) (3: CS servo spindle)
1012	Output number during spindle analog control

[Default setting] 1

[Description] When the motherboard has dual or multiple analog outputs, you can choose the analog output port

1013	Channel axis number during spindle position control
------	---

[Default setting] 0

1015	Input address number of spindle encoder
------	---

[Default setting] 1

1016	Number of encoder lines
------	-------------------------

[Default setting] 1024

1020	(1017) Encoder electronic gear ratio; number of gears on the spindle side
------	---

[Default setting] 1

1021	(1018) Encoder electronic gear ratio; number of gears on the encoder side
------	---

[Default setting] 1

1025	Maximum speed of spindle first gear (r/min)
------	---

[Default setting] 3000

1026	Maximum speed of spindle second gear (r/min)
------	--

[Default setting] 2000

1027	Maximum speed of spindle third gear (r/min)
------	---

[Default setting] 1000

1028	Maximum speed of spindle fourth gear (r/min)
------	--

[Default setting] 500

1030	Spindle forward rotation output port
1031	Spindle backward rotation output port
1032	Spindle stop output port
1033	Spindle braking output port
1034	Time delay for spindle start (ms)

[Default setting] 200

1035	Time delay for spindle reversing (ms)
[Default setting] 300	
1036	Time delay for spindle stop (ms)
[Default setting] 100	
1037	Time delay for spindle stopping braking (ms)
[Default setting] 0	
1038	Time of spindle forward rotation output (ms)
[Default setting] 0	
1039	Time of spindle backward rotation output (ms)
[Default setting] 0	
1040	Time of spindle output stop (ms)
[Default setting] 100	
1041	Time of spindle output braking (ms)
[Default setting] 100	
1045	External spindle forward rotation input port
1046	External spindle backward rotation input port
1047	External spindle stop input port
1050	External spindle forward inching input port
1051	Spindle backward inching input port
1052	Spindle inching speed (r/min)
[Default setting] 50	
1055	Minimum spindle speed in G96 mode (r/min)
[Default setting] 50	
1056	The upper limit of actual rotating speed (r/min) when the spindle is regarded as stopping
[Default setting] 12	
1057	Deviation range between actual spindle speed and target speed (%)
[Default setting] 15	
1058	When cutting, wait for the spindle speed to reach the time limit (ms)
[Default setting] 8000	
1059	Waiting for the spindle speed to reach the time limit when the spindle starts (ms)
[Default setting] 8000	
1070	Output port in spindle position mode
1072	In-place input port in spindle position mode
1074	Upper limit of time to wait for the spindle position mode in-place signal (ms)
[Default setting] 1000	
1073	Delay time till the spindle position mode is in place (ms)
[Default setting] 1000	
1074	Acceleration and deceleration time constant in spindle position mode (ms)

Appendix 1: Parameter List [Spindle related settings]

[Default setting] 200

1075	Spindle speed mode output port
1076	In-place input port of spindle speed mode
1077	Upper limit of time to wait the spindle speed mode is in place (ms)
1078	Delay time till the spindle speed mode is in place (mm)

[Default setting] 200

1080	Spindle orientation output port
1081	Input port for spindle positioning completion
1082	Upper limit of waiting time for spindle orientation completion signal (ms)

[Default setting] 200

1083	Delay time for completion of spindle orientation (ms)
------	---

[Default setting] 0

1084	Machine coordinate value after spindle positioning is completed (mm)
------	--

[Default setting] 0

1090	Spindle enable output mode (0: power on, 1: speed mode, 2: speed and position)
1091	Spindle enable output port
1092	Spindle alarm input port

1100	Number of spindle gears
------	-------------------------

[Default setting] 4

1122	Gear 2 encoder electronic gear ratio; number of gears on the encoder side
1123	Gear 2 encoder electronic gear ratio; number of gears on the spindle side
1124	Gear 3 encoder electronic gear ratio; number of gears on the encoder side
1125	Gear 3 encoder electronic gear ratio; number of gears on the spindle side
1126	Gear 4 encoder electronic gear ratio; number of gears on the encoder side
1127	Gear 4 encoder electronic gear ratio; number of gears on the spindle side

1151	S01 output port
1152	S02 output port
1153	S03 output port
1154	S04 output port

1155	S01 in-position input port
1156	S02 in-position input port
1157	S03 in-position input port
1158	S04 in-position input port

1159	Upper limit of waiting time for successful switching between gears (ms)
------	---

[Default setting] 3000

1160	Delay time of switching between gears (ms)
------	--

[Default setting] 200

1161	Delay time for gear shift (ms)
------	--------------------------------

[Default setting] 200

1300	Settings related to locking of each spindle						
	SLKPO	RSTSL	M30SL	SURA	SLTL	SLKSA	

SLKPO 0/1: The spindle is in the unlocked/locked state when power is powered on

RSTSL 0/1: The spindle is not released / is released in case of reset

M30SL 0/1: The spindle is not released / is released during the execution of M30.

SURA 0/1: When the spindle is positioned, the lock is not released / is released automatically

SLTL 0/1: When the spindle is locked, the load output is not restricted / is restricted.

SLKSA 0/1: When the spindle starts, the lock is not released / is released automatically.

[Default setting] 0000 0000

1310	Spindle locking and clamping outlet (M12)
1311	Spindle locking and loosening outlet (M13)
1312	External spindle locking input port
1313	External spindle locking release input port
1314	Spindle locking and in-position clamping input port
1315	Spindle locking and in-position release input port
1320	Upper limit of waiting time for spindle stop before spindle locking (ms)

[Default setting] 5000

1321	Actual upper limit of speed allowed for spindle locking (mm/min)
------	--

[Default setting] 10

1322	Delay time before spindle locking (ms)
------	--

[Default setting] 1000

1323	Upper limit of waiting time for spindle locking and in-position clamping (ms)
------	---

[Default setting] 5000

1324	Delay time after spindle locking (ms)
------	---------------------------------------

[Default setting] 1000

1325	Upper limit of waiting time for spindle locking and in-position release (ms)
------	--

[Default setting] 5000

1326	Delay time of spindle lock release (ms)
------	---

[Default setting] 1000

1400	Settings related to spindle synchronization group 1						
	SSYNP	SSES	SSYNR	SSYSD	SSYPI		

SSYNP 0/1: The synchronization mode is the encoder mode / position mode

SSES 0/1: When the spindle is synchronized in encoder feedback mode, the slave axis carries out / does not carry out cutting speed smoothing

SSYNR 0/1: Synchronize from current position / position 0 when R is not specified

SSYSD 0/1: Forward/Backward motion of slave axis

Appendix 1: Parameter List [Spindle related settings]

SSYPI 0/1: The slave axis is subject to P adjustment / PI adjustment.

[Default setting] 1010 0000

1410	Maximum speed of slave axis in spindle synchronization mode (r/min)
------	---

[Default setting] 3000

1411	Time constant of the slave axis in spindle synchronization mode (ms)
------	--

[Default setting] 300

1412	Slave axis feedrate smoothing in spindle synchronization mode
------	---

[Default setting] 50

1414	Load limit (percentage) for each spindle in the spindle synchronization mode (0~300, 0 means no limit)
------	---

[Default setting] 30

1420	Driving spindle number of spindle synchronization group 1
1421	Driven spindle number of spindle synchronization group 1
1422	Driving spindle number of spindle synchronization group 2
1423	Driven spindle number of spindle synchronization group 2
1424	Driving spindle number of spindle synchronization group 3
1425	Driven spindle number of spindle synchronization group 3

9. Tool post related settings

1500	TCHK	TE00	TBC	TCC	TECK			
------	------	------	-----	-----	------	--	--	--

TCHK 0/1: After the tool change is completed, the tool number is not detected / detected

TE00 0/1: No.0 tool number is not allowed / allowed

TBC 0/1: After tool change, the relative coordinates are relative to those before/after tool change

TCC 0/1: When the target tool number is the same as the current tool number, the tool change will still be executed

TECK 0/1: Tool number error real-time detection, on/off

[Default setting] 1000 0000

1501	Tool post input setting 1							
	T08C	T07C	T06C	T05C	T04C	T03C	T02C	T01C

T08C 0/1: T08 is normally open / normally close signal

T07C 0/1: T07 is normally open / normally close signal

T06C 0/1: T06 is normally open / normally close signal

T05C 0/1: T05 is normally open / normally close signal

T04C 0/1: T04 is normally open / normally close signal

T03C 0/1: T03 is normally open / normally close signal

T02C 0/1: T02 is normally open / normally close signal

T01C 0/1: T01 is normally open / normally close signal

[Default setting] 0000 0000

1502	Tool post input setting 2							
	TCPE	TCPC			T12C	T11C	T10C	T09C

TCPE 0/1: do not detect / detect TCP signals

TCPC 0/1: TCP is normally open / normally close signal

T12C 0/1: T12 is normally open / normally close signal

T11C 0/1: T11 is normally open / normally close signal

T10C 0/1: T10 is normally open / normally close signal

T09C 0/1: T09 is normally open / normally close signal

[Default setting] 0000 0000

1510	Tool post type (0: line-up tool post 1: electric tool post)
------	---

[Default setting] 0

1511	Number of cutting tools
------	-------------------------

[Default setting] 4

1520	T01 input port
1521	T02 input port
1522	T03 input port
1523	T04 input port
1524	T05 input port
1525	T06 input port
1526	T07 input port
1527	T08 input port
1528	T09 input port
1529	T10 input port

Appendix 1: Parameter List [Tool post related settings]

1530	T11 input port
1531	T12 input port
1532	TCP input port
1540	Tool post clockwise rotation output port
1541	Tool post counterclockwise rotation output port
1542	Tool post locking output port
1543	Tool post loosening output port
1550	Upper limit of tool change time (ms)

[Default setting] 8000

1551	Delay between forward and backward rotation during tool change (ms)
------	---

[Default setting] 20

1552	The upper limit of time from backward rotation to receiving TCP during tool change (ms)
------	---

[Default setting] 1000

1553	Backward locking hold time after the tool position reaches (ms)
------	---

[Default setting] 200

10. Chuck related settings

1600	Chuck related settings							
	CLPP	UCLP			QPD	XQPH		

M10P 0/1: M10 output is level/pulse

M11P 0/1: M11 output is level/pulse

QPD 0/1: Chuck is internal/external card

XQPH 0/1: External clamping release is pulse/hold signal

[Default setting] 0000 0000

1601	Chuck interlock related settings							
	QPSL	MQPSL	MQPOP	QPEL		QPST	UQPCE	

QPSL 0/1: When the spindle rotates (judged by the output), it is impossible/possible to perform automatic chuck release

MQPSL 0/1: When the spindle rotates (judged by the output), it is impossible/possible to perform manual chuck release

MQPOP 0/1: automatic operation does not respond / responds to manual chuck

QPEL 0/1: When released, don't wait / waits for the spindle speed to be lower than the allowable speed

QPST 0/1: When released, it can/cannot start running circularly

UQPCE 0/1: When released, don't detect / detect that the spindle speed exceeds the allowable upper limit

[Default setting] 0001 1000

1602	Chuck power-on related settings							
	QPRS	QPON	QPOF					

QPRS 0/1: When powered on, the chuck does not return / returns to the state before power-off

QPON 0/1: When powered on, the chuck does not output / outputs clamping.

QPOF 0/1: When powered on, the chuck does not output / outputs release.

[Default setting] 0000 1000

1610	Chuck tightening output port
1611	Chuck loosening output port
1620	External chuck clamping input port
1621	External chuck release input port
1622	The input port for proper chuck clamping
1623	The input port for proper chuck loosening
1630	Upper limit of time to wait for chuck clamping in-place signal (ms)
1631	Upper limit of time to wait for chuck release in-place signal (ms)
1632	Delay time of chuck clamping in-place (ms)

[Default setting] 500

1633	Delay time of chuck loosening in-place (ms)
------	---

[Default setting] 500

1640	Upper limit of allowable actual speed for chuck release (r/min)
------	---

[Default setting] 500

1641	Chuck loosening: Upper limit of time to wait the rotating speed is lower than the allowable rotating speed (ms)
------	---

[Default setting] 10000

11. Tailstock related settings

1700	Tailstock related settings						
	M78P	M79P			TSRST		

M78P 0/1: M78 output is level/pulse

M79P 0/1: M79 output is level/pulse

TSRST 0/1: Tailstock does not retract / retracts

[Default setting] 0000 0000

1701	Tailstock interlock related settings						
	QPSL	MTSOP	MTSSL				

QPSL 0/1: Automatic tailstock retracting cannot/can be performed when the spindle is started

MTSOP 0/1: do not respond / respond to manual tailstock during automatic operation

MTSSL 0/1: Manual tailstock retracting cannot/can be performed when the spindle is started

[Default setting] 0000 0000

1710	Output port of tailstock advancing
1711	Output port of tailstock retracting
1720	External tailstock advancing and retracting input port
1721	External tailstock advancing and retracting input port
1722	Tailstock advancing in-place input port
1722	Tailstock retracting in-place input port
1730	Upper limit of time to wait for tailstock advancing in-place signal (ms)

[Default setting] 5000

1731	Upper limit of time to wait for tailstock retracting in-place signal (ms)
------	---

[Default setting] 5000

1732	Delay time of tailstock advancing in-place (ms)
------	---

[Default setting] 500

1733	Delay time of tailstock retracting in-place (ms)
------	--

[Default setting] 500

12. Lubrication-related settings

1800	Lubrication-related settings						
	LUBC	LASP	LBPO	MLBOP	LAST	LUBRST	

LUBC 0/1: Lubrication alarm is normally open / normally close

LASP 0/1: Do not stop / Stop processing in the event of lubricating alarm

LBPO 0/1: Turn-on lubrication off/on

MLBOP 0/1: Do not respond / Respond to manual lubrication during automatic operation

LAST 0/1: During machining without stopping lubrication alarm, machining can/cannot be started

LUBRST 0/1: Lubrication is not turned off/off during resetting

[Default setting] 0001 0000

1810	Lubrication alarm input port
1811	Lubrication alarm output port
1812	Lubrication output pressure arrives at the input port
1820	Lubrication output pressure reaches upper limit of signal waiting time

1821	M32 delay time (ms)
------	---------------------

[Default setting] 0

1822	M33 delay time (ms)
------	---------------------

[Default setting] 0

1825	Lubrication output time (ms)
------	------------------------------

[Default setting] 0

1826	Automatic lubrication time interval (ms)
------	--

[Default setting] 0

13. Settings related to system configuration

2000	Show relevant settings							
	MDIA	MDIC	MDIR		ALMS	EDTS	MDIS	

MDIA 0/1: During single line MDI, do not update / update multi-line MDI

MDIC 0/1: Do not clear / Clear multi-line MDI after execution

MDIR 0/1: Do not clear / Clear multi-line MDI after reset

ALMS 0/1: do not switch / switch to the alarm interface in event of alarm

EDTS 0/1: Do not switch to / Switch to EDIT interface when it is switched to EDIT mode.

MDIS 0/1: Do not switch to / Switch to MDI interface when the position interface is switched to MDI mode.

[Default setting] 1000 1100

2001	Show relevant settings 2							
	GRED							

GRED 0/1: Do not switch to / Switch to MDI interface when the graphical interface is switched to EDIT mode.

[Default setting] 0000 0000

2002	Workpiece count and timing related settings							
	RCPA	CSCT	WCPO	TCPO	M30CP	M30CC	M99CP	

RCPA 0/1: Enable/Disable workpiece count target detection

CSCT 0/1: Do not stop / Stop cycle time counting after workpiece counting

WCPO 0/1: Count is not cleared/cleared after power-on

TCPO 0/1: Running time is not cleared/cleared after power-on

M30CP 0/1: do not count / count when executing M30

M30CC 0/1: do not clear / clear the count when executing M30

M99CP 0/1: Do not count / Count during execution of M99 in the main program

[Default setting] 1000 1010

2003	Operating switch / Allow setting							
	PARSW	PRGSW	MVOPE	QMDI		RTPOS	KEY1	

PARSW 0/1: parameter switch is invalid/valid

PRGSW 0/1: program switch is invalid/valid

MVOPE 0/1: macro variables cannot/can be modified during machining

QMDI 0/1: Switch on/off the quick MDI function in the location interface

RTPOS 0/1: Return to the position interface while returning to the top button: off/on

KEY1 0/1: Do not use / Use KEY1 for storage protection

[Default setting] 0000 000

2004	Operation password setting							
	PARPS	PRGPS	CMCPS	POPS	O9KPS	O8KPS	MVPS	DOPS

PARPS 0/1: parameter password is invalid/valid

PRGPS 0/1: program password is invalid/valid

CMCPS 0/1: password is not / is required for clearing machine coordinates

POPS 0/1: power-on password invalid

O9KPS 0/1: the password edited by program O9xxx is invalid/valid

O8KPS 0/1: the password edited by program O8xxx is invalid/valid

MVPS 0/1: The macro variable password is invalid/valid.

DOPS 0/1: The output port manual setting is invalid/valid.

2005	Operation password setting 2						
	PRTPS						

PRTPS 0/1: The workpiece count adjustment password is invalid/valid.

[Default setting] 0000 0000

2006	Program editing related settings						
	SEQ						

SEQ 0/1: automatically insert line numbers when editing is turned off/on

[Default setting] 0000 0000

2007	Program display related settings						
	SO9K	SO8K					

SO9K 0/1: Show / Do not show the program of O9xxx

SO8K 0/1: Show / Do not show the program of O8xxx

[Default setting] 0000 0000

2007	Manual running related settings						
	MIR						

MIR 0/1: Manual intervention return function, invalid/valid

[Default setting] 0000 0000

2011	Language selection (0: Chinese, 1: English)						
2020	Edit the incremental sequence number						

[Default setting] 10

2031	Display delay of startup screen (ms)						
------	--------------------------------------	--	--	--	--	--	--

[Default setting] 1000

2032	Disply the number of spindles in the position interface						
2035	Number of spindles in the system						
2036	Number of axes in the system						
*2100	EtherCAT bus-related settings						
	ECF	EXG	ECRS	ECAD			

ECF 0/1:Use normal/fast connection method

EXG 0/1: Use ECAT/ENET port for connection

ECRS 0/1: When the power is turned on, do not perform / perform forced rest of the network port

ECAD 0/1: Use alias addresses / automatic incremental addresses for unknown slave stations.

[Default setting] 0000 0000

*2102	Bus communication period selection						
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[Default setting] 1

*2115	MODBUS bus related settings						
		MBPD	MBPE				MBNT

MBPD 0/1: with/without check

MBPE 0/1: odd parity check /even parity check

MBNT 0/1: use serial port / network port for modbus communication

[Default setting] 0000 0000

*2116	MODBUS slave station address						
*2117	Serial communication baud rate (4800, 9600, 19200, 38400, 57600, 115200)						

14. Program related settings

2200	Program related settings						
	GSB						

GSB 0/1: G code system A/B is selected for lathe system

[Default setting] 0000 0000

2201	Settings related to program mode						
	MG01	MG61	MFPR	MG17			

MG01 0/1: It is in G00/G01 mode when powered on

MG61 0/1: It is in G64/G61 mode by default during automatic operation

MFPR 0/1: It is in the per-minute feed / per revolution feed mode when powered on

MG17 0/1: It is in G18/G17 mode when powered on

[Default setting] 0000 0000

2202	Program mode reset related settings						
	MG01	MG61	MFPR	MG17		PGRS	

RG01 0/1: During resetting, do not reset / reset G00/G01 mode to power-on state

RG61 0/1: During resetting, do not reset / reset G61/G64 mode to power-on state

RFPR 0/1: During resetting, do not reset / reset per-minute feed / per revolution feed mode to power-on state

RG17 0/1: During resetting, do not reset / reset G18/G17 mode to power-on state

PGRS 0/1: Return to program header after reset

[Default setting] 0000 0000

2203	Program control related settings						
	AOCL	G00L	G107N				

AOCL 0/1: Circular arc center detection off/on

G00L 0/1: In G00 mode, each axis runs / carries out linear synchronization at the highest speed

G107N 0/1: G7.1(G107) rotating axis rotates backward/forward

[Default setting] 1000 0000

2205	Settings related to program pre-read control						
	TNB	M91NB	G10NB				

TNB 0/1: Executing tool change command does not inhibit/inhibits program buffer

M91NB 0/1: M91 command does not inhabit / inhibits program buffering

G10NB 0/1: G10 command does not inhabit / inhibits program buffering

[Default setting] 0100 0000

2209	Settings related to program at power-on						
	PNPO	MHPO					

PNPO 0/1: Open the current program / the designated program at power-on

MHPO 0/1: restore the position of the program before power-off / return to the top of the program at power-on

[Default setting] 0000 0000

2210	Maximum radius error during circular arc center inspection (mm)
2220	At power-on, open the designated program number
2221	Default setting speed of each spindle at power-on (mm/min)
2222	The feed speed (mm/min) is set by default at power-on

2223	The feed speed (mm/rev) is set by default at power-on.
2310	Transition starting speed ratio between G00

15. Tool compensation related settings

2500	Tool compensation related settings						
	CCC	CSBK	CCSN		TOEO		

CCC 0/1: During tool compensation, the connection mode of the outer corner is straight line / arc

CSBK 0/1: The program segment created inside the tool radius compensation is not stopped / stopped separately

CCSN 0/1: When the tool radius compensation is shortened compensation, do not judge / judge that the next section is too short

TOEO 0/1: When the tool compensation is modified during machining, the next T command / the next program segment will make the new tool compensation value effective

[Default setting] 0000 0000

2501	Settings related to tool compensation input						
	PNPO	MHPO					

TOIE 0/1: Tool offset interface, incremental input mode (UVW) off/on

TWAE 0/1: Tool wear interface, absolute input mode (XYZ) off/on

TWAI 0/1: Tool wear interface, quick input mode (XYZ) is used to switch on/off incremental input

[Default setting] 1000 0000

2510	Maximum value of tool wear compensation (mm)						
------	--	--	--	--	--	--	--

[Default setting] 0

2511	Maximum input value of tool wear compensation (mm)						
------	--	--	--	--	--	--	--

[Default setting] 1

2600	Settings related to tool life						
	TLEN	TLM6	TLFST				

TLEN 0/1: Tool life management function is invalid/valid

TLM6 0/1: Managing tool life through command T/M6

TLFST 0/1: Check remaining service life at tool change / program start

[Default setting] 0000 0000

2610	Lock time at the end of tool life (s)						
------	---------------------------------------	--	--	--	--	--	--

[Default setting] 0

2620	Tool load related settings						
	TLDEN	TLDM6	TLDSW				

TLDEN 0/1: Tool load management function is invalid/valid

TLDM6 0/1: Managing tool load through command T/M06

TLDSW 0/1: When the program starts, the load wear status is found to be invalid/valid.

[Default setting] 0000 0000

2621	Tool wear load learning amount						
2622	Minimum tool wear load (=0 means no limit)						
2623	Maximum tool wear load (=0 means no limit)						
2625	Tool damage load learning amount						
2627	Minimum tool damage load (=0 means no limit)						
2628	Maximum tool damage load (=0 means no limit)						

16. PLC related settings

2700	PLC related settings						
	ESPC	ESP2C					

ESPC 0/1: Emergency stop (ESP) is normally open / normally close

ESP2C 0/1: Emergency stop (ESP2) is normally open / normally close

[Default setting] 0000 0000

2710	Input signal width (ms)
------	-------------------------

[Default setting] 100

2711	Emergency stop input port
2712	Emergency stop 2 input port
2713	Emergency stop input port for each channel

*2720	Bus IO station address
*2721	Bus IO station X-axis initial address
*2722	Bus IO station Y-axis initial address
*2723	Input signal width of bus IO station (ms)
*2725	X-axis initial position of bus IO station AD

17. PLC related settings

3000	PLC related settings						
	PLCEN	EFPLCS					

PLCEN 0/1: use built-in/open PLC

EFPLCS 0/1: when the built-in PLC is open, turn off/on the built-in PLC

[Default setting] 0000 0000

3001	Interlock signal related settings						
	ITX						

ITX 0/1: Turn off/on the interlock function of each axis

[Default setting] 0000 0000

3300	PLC related function setting 1						
		MLEN		ALEN	JKU	RTM	EHDC

MLEN 0/1: Machine tool lock function off/on

ALEN 0/1: Auxiliary lock function off/on

JKU 0/1: Manual movement key customization of each axis is off/on

RTM 0/1: Manual shortcut key is not saved/maintained

EHDC 0/1: External feed keeps normally open / normally close

SPSP 0/1: After pressing Pause, the spindle does not stop / stops

[Default setting] 0000 0100

3301	PLC related function setting 2						
	CFM8	CFM32	CFM78	CFM10	CFSP		

CFM8 0/1: M8/M9 function is turned on/off when PLC is built in

CFM32 0/1: M32/M33 function is turned on/off when PLC is built in

CFM78 0/1: M78/M79 function is turned on/off when PLC is built in

CFM10 0/1: M10/M11 function is turned on/off when PLC is built in

CFSP 0/1: Spindle function is turned on/off when PLC is built in

[Default setting] 0000 0000

3302	Built-in PLC override-related settings						
	CFROV	CFFOV	CFSOV		RXOV	FXOV	SXOV

CFROV 0/1: When there is a built-in PLC, the fast speed override is enabled/disabled.

CFFOV 0/1: When there is a built-in PLC, the feed override is enabled/disabled.

CFSOV 0/1: When there is a built-in PLC, the spindle override is valid/invalid.

RXOV 0/1: When the built-in PLC fast speed override is valid, use the panel override / external

FXOV 0/1: When the built-in PLC feed override is valid, use the panel override / external

SXOV 0/1: When the built-in PLC spindle override is valid, use the panel override / external

[Default setting] 0000 0000

3303	Related settings of built-in PLC three-position switch						
	TSW	TSWS					

TSW 0/1: The three-position switch is invalid/valid

TSWS 0/1: It is invalid/valid for the three-position switch to directly start machining

[Default setting] 0000 0000

3304	Settings related to built-in PLC safety door						
	SFDR	SFDSP	SFDC	SFDL			

FDR 0/1: The protective door is invalid/valid

SFDSP 0/1: When the protective door gives an alarm, the machining is not stopped / stopped

SFDC 0/1: The protective door in-place signal is normally open / normally close

SFDL 0/1: The guard door does not execute / executes locking during automatic operation

[Default setting] 0000 0000

3305	Built-in PLC panel key shielding related settings							
	PSTM	PSPM						

PSTM 0/1: Panel start key shielding is invalid/valid

PSPM 0/1: Panel spindle control shielding is invalid/valid

[Default setting] 0000 0000

3310	Built-in M function reset related settings							
	SFDR	SFDSP						

M30M5 0/1: M05 is not output / output at M30

M30M9 0/1: M09 is not output / output at M30

RSTM5 0/1: M05 is not output / output at reset

RSTM9 0/1: M09 is not output / output at reset

[Default setting] 0000 0000

3311	Close the output port when the built-in PLC is reset							
	RO08	RO07	RO06	RO05	RO04	RO03	RO02	RO01
	RO16	RO15	RO14	RO13	RO12	RO11	RO10	RO09
	RO24	RO23	RO22	RO21	RO20	RO19	RO18	RO17
	RO32	RO31	RO30	RO29	RO28	RO27	RO26	RO25

Ro01 ~ Ro25 0/1: The built-in PLC does not close / closes the corresponding 1~32 at reset

3312	Built-in PLC power-on initialization related settings							
	WKLPO							

[Data type] bit channel type

WKLPO 0/1: Turn off/on the working light at power-on

[Default setting] 0000 0000

3313	Built-in PLC output settings							
	M09P							

[Data type] bit channel type

M09P 0/1: M08 output is level/pulse

[Default setting] 0000 0000

3315	Settings of USER key for calling programs							
	MCUK1	MCUK3	MCUK4	MCUK5				

[Data type] bit channel type

MCUK1 0/1: USER1 does not execute / executes shortcut macro command call (+0)

MCUK2 0/1: USER2 does not execute / executes shortcut macro command call (+1)

MCUK3 0/1: USER3 does not execute / executes shortcut macro command call (+2)

MCUK4 0/1: USER4 does not execute / executes shortcut macro command call (+3)

MCUK5 0/1: USER5 does not execute / executes shortcut macro command call (+4)

[Default setting] 0000 0000

Appendix 1: Parameter List [PLC related settings]

3320	Work light key reuse related settings						
	WLSC	WLOS	WLS2	WLS2C			WLEN

[Data type] bit channel type

WLSC 0/1: The work light is used to indicate that spindle 1 locking is invalid/valid

WLOS 0/1: The work light is used to indicate that the selective stop is invalid/valid

WLEN 0/1: The work light function is invalid/valid

WLS2 0/1: The work light is used to indicate that spindle 2 start/stop is invalid/valid

WLS2C 0/1: The work light is used to indicate that spindle 2 locking is invalid/valid

WLEN 0/1: The work light function is invalid/valid

[Default setting] 0000 0000

3330	External start input port
3331	External holding input port
3332	Minimum time of starting signal (ms)
3333	Upper limit of time to start signal (ms)
3334	Three-position switch operation allows input port
3335	Three-position switch spindle stop input port
3336	User-defined manual moving keys for each axis (0: none, 1~3:YXZ, 4~6:ABC)
3340	M08 output port
3341	M08 delay time (ms)
3350	Input port of protective door
3351	Output port of working light
3355	Output port of three-color lamp operation indicator
3356	Output port of three-color lamp alarm indicator
3357	Output port of three-color lamp stop indicator
3360	Input port of feed override switch *1
3361	Input port of feed override switch *2
3362	Input port of feed override switch *4
3363	Input port of feed override switch *8
3364	Upper limit of automatic cutting multiplying power input
3470	Input port of spindle override switch *1
3471	Input port of spindle override switch *2
3472	Input port of spindle override switch *4
3473	Input port of spindle override switch *8
3474	Upper limit of spindle override input
3480	Fast speed override switch*1 input port
3481	Fast speed override switch*2 input port

3470	Settings related to hydraulic starting							
	STKHP	SPKHP	HPPO					U1HP

[Data type] bit channel type

STKHP 0/1: When the cycle starts, do not detect / detect the hydraulic starting

SPKHP 0/1: When the spindle starts, do not detect / detect the hydraulic starting

HPPO 0/1: Do not start / Start hydraulic control at power-on

U1HP 0/1: The key USER1 used for hydraulic control is off/on

[Default setting] 0000 0000

3471	Hydraulic starting output port
3472	Hydraulic starting input port
3473	Hydraulic starting completion input port
3474	Upper limit of waiting time for hydraulic start-up completion (ms)

[Default setting] 4000

3520	Chip removal related settings							
	CHPRST							U1CHP

CHPRST 0/1: when reset, do not turn off / turn off the chip remover

U1CHP 0/1: The key USER1 used for hydraulic control is off/on

[Default setting] 0000 0000

3521	Forward rotation output port of chip remover
3522	Backward rotation output port of chip remover
3523	Forward rotation input port of external chip remover
3524	Backward rotation input port of external chip remover
3525	External chip remover stop input port
3526	Output time of chip remover (ms)
3527	Automatic forward rotation interval of chip remover (ms)

18. Thread related settings

5000	Thread related settings						
	THTT	THSM	THQU	THLAS	THFC		THFM

THTT 0/1: vanishing length, installation time constant (5012) / vanishing length coefficient (5016)

THSM 0/1: High-precision mode / Smooth mode during thread machining

THQU 0/1: the unit of starting angle Q in thread command is 1.0 degree / 0.001 degrees

THLAS 0/1: when the thread starts, the installation time constant (5012) / equal to the vanishing distance

THFC 0/1: When machining threads, do not detect / detect whether the cutting speed exceeds the limit

THHM 0/1: Thread circulation, do not use / use high-speed mode

THHC 0/1: When the thread circulates (G76), do not close / close the thread location height check

[Default setting] 0000 0000

5010	Upper limit of thread machining speed (mm/min)
5011	Speed smoothing coefficient during thread processing (0~100)
5012	Acceleration and deceleration time constant of each axis in thread processing (ms)
5015	Low speed FL of thread vanishing acceleration and deceleration (mm/min)
5016	Length coefficient of thread vanishing
5017	Thread vanishing angle
5025	Lower limit of thread machining spindle speed (r/min)
5026	Spindle speed error range when waiting thread processing (percentage)
5027	Upper limit of thread processing waiting time (ms)
5030	Minimum cutting amount of combined cycle G76 (mm)
5031	Finish cutting amount of combined cycle G76 (mm)
5032	Repeated times of finish cutting of combined cycle G76
5033	Vanishing length coefficient Pr of thread cycle G76 (lead)
5034	G76 螺纹循环的刀尖角度 Pa
5035	G76 thread cycle cutting mode (0: single side 1: staggered)
5036	G76 thread cycle cutting mode (0: standard 1: the tooth tip is consistent with G92 thread)
5037	At G76 thread circulation, tooth tip tilt compensation angle

19. Canned cycle related settings

5100	Canned cycle related settings						
	PDC	DRLR	DRLT	DRLA			

PDC 0/1: G83 and G87 are for high-speed deep holes / deep hole drilling cycles

DRLR 0/1: Do not return / Return when the drilling cycle is overloaded

DRLT 0/1: Do not retry / Retry after the drilling cycle returns due to overload

DRLA 0/1: Do not give an alarm / Give an alarm after drilling cycle returns due to overload

[Default setting] 0000 0000

5110	Return amount r of high-speed deep hole cycle (mm)
5111	Idle stroke c of feeding of high-speed deep-hole cycle (mm)
5112	Upper limit of load on each axis during drilling cycle
5113	During drilling cycle, the overload status returns a variable number

5120	Combined cycle related settings						
	X2DT	X1DT	BTAC				

X2DT 0/1: The second axis of G71 and G72 does not allow / allows non-monotonic path

X1DT 0/1: The first axis of G71 and G72 does not allow / allows non-monotonic path

BTAC 0/1: G71 and G72 feed along 45 degrees / the profile

[Default setting] 1100 0000

5130	Cutting amount of G71 and G72 combined cycle (mm)
5131	Return amount of G71 and G72 combined cycle (mm)
5132	Feeding idle stroke of G71 and G72 combined cycle (mm)
5133	Return distance of the combined and canned cycle G73 (the second axis of the plane) (mm)
5134	Return distance of the combined and canned cycle G73 (the first axis of the plane) (mm)
5135	Segmentation times of the combined and canned cycle G73
5136	Return amount of combined and canned cycles G74 and G75 (mm)

20. Tapping related settings

5200	Rigid tapping related settings						
	HSTC	TPSA	RTPA	RLTR	RTLTL	RTAL	

HSTC 0/1: The tapping cycle is a deep hole / high speed tapping cycle

TPSA 0/1: When the encoder taps with variable frequency, wait for the spindle speed to reach

RTPA 0/1: During rigid tapping, do not wait / wait for the position to reach

RLTR 0/1: Do not return / Return when the rigid tapping is overloaded.

RTLTL 0/1: Do not retry / Retry after the rigid tapping returns due to overload

RTAL 0/1: Do not give an alarm / Give an alarm after the rigid tapping returns due to overload

[Default setting] 0100 0000

5201	Spindle setting related to rigid tapping						
	RTPF	TPAC					

RTPF 0/1: During rigid tapping, use the synchronous tapping mode / follow-up tapping mode

TPAE 0/1: Enable/Disable tapping position compensation during tapping

[Default setting] 1100 0000

5202	Settings related to each axis during rigid tapping						
	TPAC						

TPAC 0/1: Carry out adjustment according to the custom adjustment parameters / automatically during tapping position compensation

[Default setting] 0000 0000

5210	Maximum lead during tapping (mm)
5211	Return amount of high-speed deep-hole tapping cycle (mm)
5225	During tapping, wait for the spindle speed to reach the window range
5226	Upper limit of waiting time at tapping
5230	Reference speed (rpm) of spindle during variable frequency tapping
5231	Stop time (ms) of spindle reference speed during variable frequency tapping
5232	Position compensation coefficient of feed shaft during tapping
5233	Servo position cycle gain of each axis during tapping (KP)
5234	System speed cycle gain of each axis during tapping
5237	Compensation distance for each axis when the tapping is reversed (>0 indicates the feed direction)
5240	During tapping, the acceleration and deceleration time constant of spindle (ms)
5240	During tapping, the acceleration and deceleration time constant of spindle (ms)
5241	During tapping, the acceleration and deceleration time constant of each axis
5246	In-position tapping detection distance for each axis (system equivalent)
5250	Upper limit of load during tapping of each axis
5251	During tapping, the overload status returns a variable number

21. Settings related to polygon processing / axis speed control

5300	Polygon processing related settings						
	PLPC	PLSD	PLST	PLRS	PLNW		

PLPC 0/1: control mode: read spindle encoder feedback / read spindle coordinate position

PLSD 0/1: slave axis runs in positive/negative direction

PLST 0/1: The slave axis must be a rotating axis / There is no restriction

PLRS 0/1: At emergency stop or reset, the spindle and slave axis stop at the same time / stop by acceleration and deceleration

PLNW 0/1: Waiting for synchronization completion during execution of the polygon processing command / Waiting for synchronization completion during cutting

[Default setting] 0000 0000

5310	Spindle number corresponding to G51.2 P (within the channel)
5311	Slave axis number corresponding to G51.2 Q (within the channel)
5312	Upper limit of rotation speed of the slave axis (rpm)
5313	Acceleration and deceleration time constant of slave axis (ms)
5314	Speed smoothing coefficient of slave axis (0~100)
5315	Spindle speed reaches the detection window range (percentage)
5316	Wait for the spindle speed to reach the upper time limit (=0 ignored)

5320	Gear hobbing function (EGB) related settings						
	EGPC	EGLD	EGPD	EGSS	EGRS	EGAC	

EGPC 0/1: control mode: read spindle encoder feedback / read spindle coordinate position

EGLD 0/1: slave axis runs in positive/negative direction

EGPD 0/1: Workpiece helix direction is the positive/negative direction.

EGSS 0/1: Workpiece axis does not carry out / carries out cutting speed smoothing

EGRS 0/1: At emergency stop or reset, the spindle and slave axis stop at the same time / stop by acceleration and deceleration

EGAC 0/1: Do not make / Make automatic position compensation for the slave axis

[Default setting] 0000 0000

5330	Spindle number corresponding to EGB tool axis (within the channel)
5331	Axis number corresponding to EGB workpiece rotating axis (within the channel)
5332	Axis number corresponding to the axial feed axis of the EGB workpiece (within the channel)
5333	Upper limit of EGB workpiece axis rotation speed (rpm)
5334	Acceleration and deceleration time constant of EGB workpiece axis (ms)
5335	Compensation filtering time of EGB workpiece axis (ms)
5336	Percentage of EGB tool spindle speed to the detection window range
5337	EGB waits for the spindle speed to reach the upper time limit (=0 ignored)

22. Electronic cam related settings

5340	Return related settings						
	ECPC 1	ECRS					

PLPC 0/1: control mode: read spindle encoder feedback / read spindle coordinate position

ECRS 0/1: Do not reset / Reset electronic cam control at emergency stop or reset

[Default setting] 0000 0000

5350	Spindle serial number of electronic cam (within the channel)
5351	Slave axis serial number of electronic cam (within the channel)
5352	Upper limit of rotation speed of the electronic cam slave axis (rpm)
5353	Acceleration and deceleration time constant of electronic cam slave axis
5354	Electronic cam slave axis smoothing factor
5355	The spindle speed reaches the detection window range during electronic cam processing
5356	Waiting for the spindle speed to reach the upper time limit during electronic cam processing

23. Skip function related settings

5510	Default input port of skip function G31
*5511	G31 skips the function load value (percentage)

[Default setting] 100

*5515	G160 skips the function load value (percentage)
-------	---

[Default setting] 80

*5516	Follow-up error of skip function G160 (0: do not check)
-------	---

[Default setting] 80

*5520	Torque control related settings						
	RSRQ 1						

RSTQ 0/1: Do not exit / Exit the torque control mode at reset or emergency stop

[Default setting] 0000 0000

*5521	Default speed for torque control (mm/min)
-------	---

[Default setting] 0

*5522	Servo load value corresponding to the maximum torque of the motor (percentage)
-------	--

[Default setting] 300

24. Settings related to polar interpolation

5530	Polar interpolation linear axis number (within the channel)
------	---

[Default setting] 0

5531	Polar interpolation rotating axis number (within the channel)
------	---

[Default setting] 0

5532	Offset in imaginary axis direction of polar interpolation (mm)
------	--

[Default setting] 0.000

5550	Axis number for normal control (milling machine)
------	--

5551	Rotational speed of the normal direction control axis (milling machine)
------	---

5600	Feed axis control related settings						
	ASE 1	ASMC	ASDP				

ASE 0/1: Axis synchronization is valid/invalid

ASMC 0/1: Do not use / Use machine coordinates to detect the maximum error value during axis synchronization

ASDP 0/1: Feed axis synchronization control related settings

[Default setting] 0000 0000

5610	Axis number of the master axis in feed axis synchronization control
------	---

5611	Maximum error value of machine coordinate detection during feed axis synchronization control
------	--

[Default setting] 0

5660	Axis exchange command number for each axis
------	--

[Default setting] 0

5700	Feed axis oscillation related settings						
	AOE	AOSP					

AOE 0/1: Axis oscillation function is valid/invalid

AOSP 0/1: Deceleration stops / It stops at the upper dead center at reset

[Default setting] 0000 0000

25. Position switch related settings

5910	Axis number for executing the first position switch function
5911	Axis number for executing the second position switch function
5912	Axis number for executing the third position switch function
5913	Axis number for executing the fourth position switch function
5914	Axis number for executing the fifth position switch function
5915	Axis number for executing the sixth position switch function
5916	Axis number for executing the seventh position switch function
5917	Axis number for executing the 8th position switch function

5930	Maximum range of the 1st position switch (mm)
5931	Maximum range of the 2nd position switch (mm)
5932	Maximum range of the 3rd position switch (mm)
5933	Maximum range of the 4th position switch (mm)
5934	Maximum range of the 5th position switch (mm)
5935	Maximum range of the 6th position switch (mm)
5936	Maximum range of the 7th position switch (mm)
5937	Maximum range of the 8th position switch (mm)

5950	Minimum range of the 1st position switch (mm)
5951	Minimum range of the 2nd position switch (mm)
5952	Minimum range of the 3rd position switch (mm)
5953	Minimum range of the 3rd position switch (mm)
5954	Minimum range of the 5th position switch (mm)
5955	Minimum range of the 6th position switch (mm)
5956	Minimum range of the 7th position switch (mm)
5957	Minimum range of the 8th position switch (mm)

26. Macro program related settings

9000	Macro program related settings						
	TCS						

TCS 0/1: The function to call subprogram during tool change is off/on

[Default setting] 0000 0000

9010	The number of subprogram called during tool change
------	--

9020	The number of macro programs called by G code
9021	The number of starting program called by G code macro program
9022	The G code number 0 called by macro program
9023	The G code number 1 called by macro program
9024	The G code number 2 called by macro program
9025	The G code number 3 called by macro program
9026	The G code number 4 called by macro program
9027	The G code number 5 called by macro program
9028	The G code number 6 called by macro program
9029	The G code number 7 called by macro program
9030	The G code number 8 called by macro program
9031	The G code number 9 called by macro program
9032	The G code number 10 called by macro program
9033	The G code number 11 called by macro program

9034	The number of macro programs called by G code (interval 1)
9035	The number of starting program called by G code macro program (interval 1)
9036	G code start number 0 for macro program call (interval 1)

9040	The number of M code subprograms called
9041	The number of starting program called by M code subprogram
9042	The M code number 0 called by subprogram
9043	The M code number 1 called by subprogram
9044	The M code number 2 called by subprogram
9045	The M code number 3 called by subprogram
9046	The M code number 4 called by subprogram
9047	The M code number 5 called by subprogram
9048	The M code number 6 called by subprogram
9049	The M code number 7 called by subprogram
9050	The M code number 8 called by subprogram
9051	The M code number 9 called by subprogram
9052	The M code number 10 called by subprogram

9053	The M code number 11 called by subprogram
9054	The number of M code subprograms called (interval 1)
9055	The number of starting program called by M code subprogram (interval 1)
9056	M code start number for subprogram call (interval 1)
9060	The number of M code macro programs called
9061	The number of starting programs called by M code macro program
9062	The M code number 0 called by macro program
9063	The M code number 1 called by macro program
9064	The M code number 2 called by macro program
9065	The M code number 3 called by macro program
9066	The M code number 4 called by macro program
9067	The M code number 5 called by macro program
9068	The M code number 6 called by macro program
9069	The M code number 7 called by macro program
9070	The M code number 8 called by macro program
9071	The M code number 9 called by macro program
9072	The M code number 10 called by macro program
9073	The M code number 11 called by macro program
9054	The number of M code macro programs called (interval 1)
9055	The number of starting programs called by M code macro program (interval 1)
9056	M code start number for macro program call (interval 1)
9080	Number of programs called by shortcut macro commands
9081	The number of starting program called by shortcut macro commands
9085	External shortcut macro call input port 0
9086	External shortcut macro call input port 1
9087	External shortcut macro call input port 2
9088	External shortcut macro call input port 3
9089	External shortcut macro call input port 4

27. *Multi-channel related settings

*9200	Multi-channel related settings						
	RTS	CWPB	CHMS	CHAL			

RST 0/1: When the reset key is pressed, all channels / the current channels are reset

CWPB 0/1: The channel waits for the Q value of G04.1 code, and uses channel number combination / binary combination

CHMS 0/1: Each channel uses independent working mode / same working mode

CHAL 0/1: The alarm is independent in various channels / All channels stop in case of alarm in one channel

[Default setting] 0010 0000

*9201	Multi-channel selection related settings (when PLC is built in)						
	CHUS	CHIS	CHIEE	CHIUU			

CHUS 0/1: Switch off/on the channel by pressing the key USER

CHIS 0/1: Switch off/on the channel through the external input port

CHIEE 0/1: directly select the channel through external input port / select the channel through encoding

CHIUU 0/1: When selecting channels with the key USER, the user-defined method is not used / used.

[Default setting] 1000 0000

*9210	The channel waits for the default Q value of command G04.1 (-1 means all channels)
-------	--

[Default setting] -1

*9211	Channel switch selection input port 1
*9212	Channel switch selection input port 2
*9213	Channel switch selection input port 3
*9214	Channel switch selection input port 4
*9220	Channel switching selection method (panel/external) selection input port
*9221	Select-all input port for channel operation
*9231	USER1 custom channel selection sequence number

[Default setting] 1

*9232	USER2 custom channel selection sequence number
-------	--

[Default setting] 2

*9233	USER3 custom channel selection sequence number
-------	--

[Default setting] 3

*9234	USER4 custom channel selection sequence number
-------	--

[Default setting] 4

*9235	USER5 custom channel selection sequence number
-------	--

[Default setting] 5

Appendix 2: Warning List

1. Program alarm

Alarm number	Alarm content
0001	System error
0002	Insufficient memory
0003	Too many data bits
0004	Address error
0005	Data error
0006	Wrong decimal point specified in data
0007	G code error
0011	M code error
0012	P designation error
0013	S designation error
0014	F designation error
0015	Q designation error
0016	N designation error
0017	R designation error
0018	D designation error
0019	S designation error
0020	There are too many commands, and they cannot be on the same line
0021	Plane designation error
0022	Plane axis designation error
0028	Specified axis does not exist
0029	Specified spindle does not exist
0030	Segment skip command error
0031	F 为 0
0032	G01 is too long
0033	lacks parameter
0034	There are too many axes of simultaneous motion
0035	G02 or G03 command radius is out of tolerance
0036	G02 or G03 command does not define plane
0037	R or IJK is not found in command G02 or G03
0038	R designation error in command G02 or G03
0039	L designation error in command G02 or G03
0040	There are no intersection points at G41G42
0041	Start cutting with circular arc at G41G42
0042	G31 is specified at G41G42
0043	Subsequent procedure segment was found at G41G42

Alarm number	Alarm content
0044	Cannot change the plane at G41G42
0045	Track interference occurs at G41G42
0050	Straight line chamfering error
0051	Circular arc chamfering error
0052	During angle programming, the path direction is inconsistent with the specified angle
0053	Class B angle programming, the second segment needs absolute programming
0054	Class B angle programming, the angle of the first segment and the second segment is too close
0055	Class B angle programming, the first segment length is too short
0056	Class B angle programming, the second segment is too short
0060	Default parameters of G31
0061	G53 cannot use relative coordinates
0070	Multiple circulation did not find PQ
0071	Illegal command for multiple circulation
0072	Default parameter of multiple circulation
0073	Multiple circulation parameter error
0074	Multiple circulation plane error
0075	There are no intersection points in multiple circulation
0076	The multiple circulation path change is not monotonous or the finish machining allowance is wrong
0077	The starting point of multiple circulation is wrong
0078	The first axis change of the multiple circulation plane is not monotonous
0079	The multiple circulation includes wrong commands
0080	PQ was not found in G70 finish machining cycle
0081	G76 gear height Pk is not specified
0082	The first cutting quantity Qd of G76 is not specified or too small
0090	G33 does not specify tapping axis
0098	M98 parameter is specified incorrectly
0100	Data source error
0101	Program not found
0102	Skip cannot be performed in DNC mode
0103	End-of-file error
0104	G65 does not specify P.
0105	M92 does not specify N.
0106	M92 has too many nesting levels
0107	M91 lacks parameters
0108	M35 lacks parameters or has wrong specification
0110	Program calls are nested too deeply

Alarm number	Alarm content
0111	Parentheses are nested too deeply
0112	Sequence number not found
0113	Parameter number error
0114	Divide by zero
0115	Inlet parameter error
0116	Wrong function
0117	Too many parameters
0118	Parameter error
0119	Empty variable
0120	System macro program number error
0121	Error in data specified by DO
0122	Error in data specified by END
0123	The WHILE statement does not specify DO
0124	Error in skipping END in GOTO statement
0130	Operator error
0131	Expression format error
0132	The expression is too complicated
0133	Keyword error
0140	G12.1/G13.1 designation error
0141	G12.1/G13.1 related parameter setting

2. System/Operation alarm

Alarm number	Alarm content
0002	System serial number error
0003	The probation period has expired or the setting is wrong
0004	The specified spindle does not exist
0005	There are keys pressed when starting up
0006	Wait timeout
0008	Axis zero returning function is not open
0009	Zero returning is not completed before automatic operation
0010	Spindle speed is too low during thread processing
0011	Thread is too short
0012	Thread parameter error
0013	Excessive fluctuation of spindle during thread processing
0014	Screw thread lead error
0015	Thread processing waiting timeout
0016	Overspeed in thread machining

3. Limit alarm

Alarm number	Alarm content
0001	Forward soft limit
0002	Backward soft limit
0003	Forward hard limit
0004	Backward hard limit

4. Drive alarm

Alarm number	Alarm content
0002	Drive alarm

5. Spindle alarm

Alarm number	Alarm content
0002	Spindle alarm

6. Built-in PLC alarm

Alarm number	Alarm content
0001	Chuck is not clamped
0002	Spindle is not stopped
0003	Tailstock does not advance
0004	Tool change timeout
0005	There is no in-place signal when the tool is changed and locked
0006	Tool number error after completing tool change
0007	Spindle gear error
0008	The protective door is not closed when starting
0009	The protective door is opened during operation
0010	Start signal time is too long
0011	Spindle positioning timeout
0012	M10 in-place signal timeout
0013	M11 in-place signal timeout
0014	M78 in-place signal timeout
0015	M79 in-place signal timeout
0016	M17 in-place signal timeout
0017	M18 in-place signal timeout
0018	M35 is not completed

Appendix 3: Upgrade system operation through USB flash drive

1. Upgrade the CNC system software through USB flash drive

- (1) The steps to upgrade the CNC system software through USB flash drive are described as below:
- (2) Save the upgrade file 31TD.app at the root directory of USB flash drive at first, and then insert the USB flash drive into the system.
- (3) Press and hold the key **Convert** of the CNC system, power on the CNC system, release **Convert** key till the CNC system pops up the password input interface, enter the password "RX7376", and then press **Input**.
- (4) After entering the correct password, the system will switch to the upgrade interface.
- (5) Press **S** key (select softwares to be upgraded), and then press **Input**. The system starts to read the upgrade file and display the reading progress.
- (6) After fully receiving the upgrade file, the system starts to program the upgrade codes and display the programming progress.
- (7) After completion of upgrade, the CNC system will give prompt completion of upgrade. In case of upgrade failure, the system will prompt unsuccessful upgrade, we need to check whether the format of USB flash drive files or the upgrade file is correct.

Note: The upgrade file 31TD.app is provided by our company.

2. Upgrade the start-up interface through USB flash drive

The steps to upgrade the CNC system interface through USB flash drive are described as below:

- (1) Save the upgrade file 31TD.JPG at the root directory of USB flash drive at first, and then insert the USB flash drive into the system.
- (2) Press and hold the key **Convert** of the CNC system, power on the CNC system, release **Convert** key till the CNC system pops up the password input interface, enter the password "RX7376", and then press **Input**.
- (3) After entering the correct password, the system will switch to the upgrade interface.
- (4) Press **P** key (select software upgrade), and then press **Input**. The system starts to read the upgrade file and display the reading progress.
- (5) After fully receiving the upgrade file, the system starts to program the upgrade codes and display the programming progress.
- (6) After completion of upgrade, the CNC system will give prompt completion of upgrade. In case of upgrade failure, the system will prompt unsuccessful upgrade, we need to check whether the format of USB flash drive files or the upgrade file is correct.

Appendix 3: Upgrade system operation through USB flash drive
[2. Upgrade the start-up interface through USB flash drive]

Appendix 4: Screw Pitch Error Compensation for relevant descriptions.

1. Pitch compensation function overview

Measuring pitch error should be carried out after the completion of the adjustment of the machine geometric accuracy (levelness, parallelism, perpendicularity, etc. of the machine tool), so as to minimize the impact of geometric accuracy on positioning accuracy.

Measuring the pitch error of a screw is a rigorous task that requires the use of precision instruments (such as a laser interferometer).

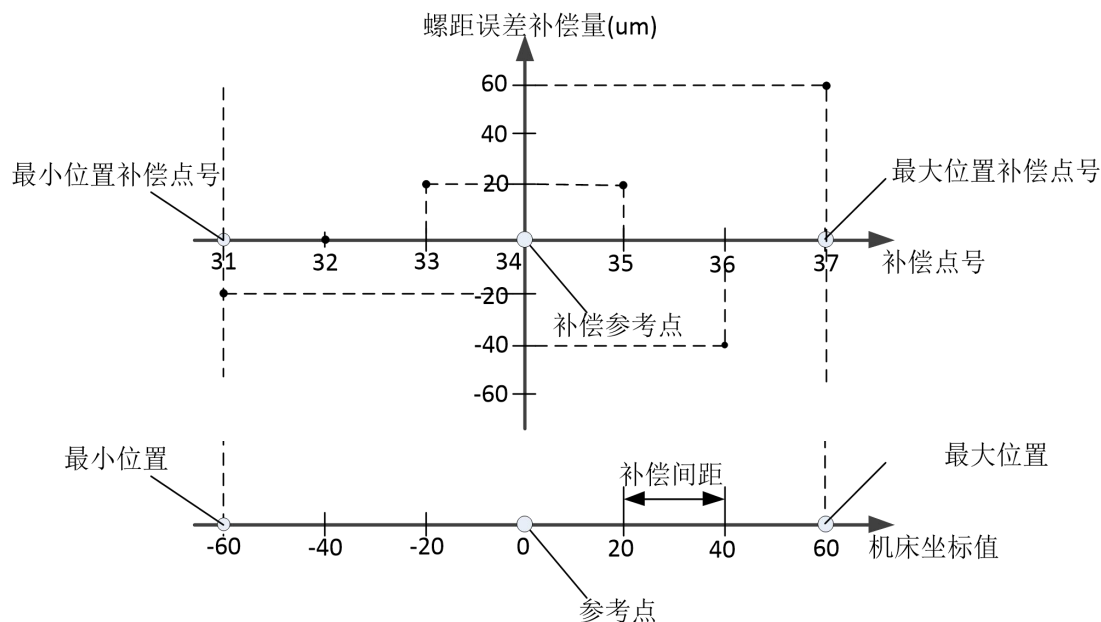
The system uses equally spaced bi-directional compensation, and the system can input up to 256 error compensation points for each axis. The equal spacing between points is called the compensation spacing. The compensation spacing is generally decided with reference to the maximum mechanical travel. For example, if the maximum mechanical travel is 1,000 mm, the compensation spacing can be set to 5mm, and each axis needs only 200 compensation points. When the machine tool is controlled by the system to move forward, it is compensated according to the forward compensation value in the compensation table, and compensated according to the reverse compensation value in the compensation table when moving backward.

2. Pitch compensation related parameters

System parameter number	Parameter description	Default value
0200	Pitch compensation import unit: um/mm	0
0201 Bit 2	Turn off/on the pitch compensation of each axis	0
0201 Bit 3	The pitch compensation is effective after power-on / zero returning	0
0220	Pitch compensation point number of reference point	0
0221	Pitch compensation point number of minimum position	0
0222	Pitch compensation point number of maximum position	0
0223	Compensation override percentage for pitch compensation	100
0224	Spacing distance of pitch compensation point	10.000(mm)
0225	Speed upper limit for pitch compensation	3000.000(mm/min)
0226	Pitch compensation acceleration/deceleration time constant (ms)	150
0227	Pitch compensation starting speed FL	200.000 (mm/min)

3. Pitch compensation principle description

Pitch compensation is based on the machine coordinate position and centered on the reference point (the reference point can be understood as the zero point of the machine coordinate). Before compensation, if the zero returning function is enabled, the operation of returning to the mechanical zero point (back to the reference point) is performed first.



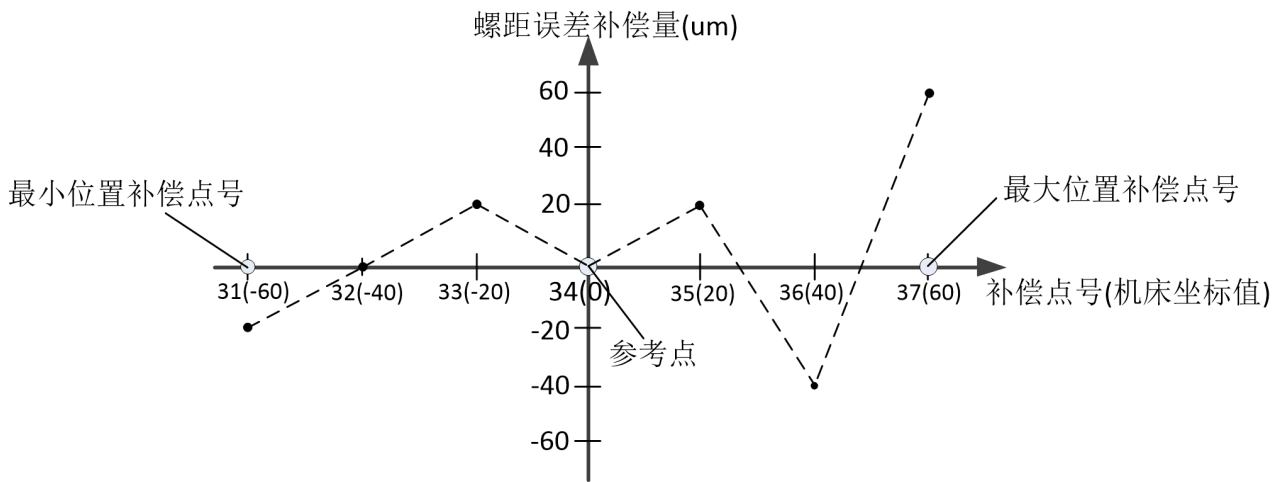
According to the above illustration:

1. Determine the interval for pitch compensation, which in the figure is 20 mm;
2. Determine the pitch compensation point number at the minimum position, which is compensation point 31 in the figure;
3. Determine the pitch compensation point number at the maximum position, which is compensation point 37 in the figure;
4. Determine the pitch compensation point number at the reference point, which is compensation point 34 in the figure;

Pitch compensation		
No.	Forward (um)	Backward (um)
000		
...		
...		
031	-20	-20
032	0	0
033	20	20
034 (reference point)	0	0
035	20	20
036	-40	-40
037	60	60
...		

Note:

1. There is no strict rule as to which compensation point to start from, and the starting number of the compensation number can be specified arbitrarily if there is enough consecutive address data.
2. The compensation value of the pitch compensation point number for the reference point is generally 0.
3. For the purpose of calculation, the forward compensation and backward compensation values in the above table are the same, and the actual values should be in accordance with the laser interferometer data.
4. If only unidirectional compensation data is available, the data in the other direction shall be regarded as the same.



Suppose the number of pulses required for one revolution of the motor is 10,000 and the screw pitch is 10 mm.

Movement	Compensation number	Machine coordinate value (mm)	Number of accumulated pulses of motor commands
Mechanical zero returning	34	0	0
Forward movement of 20 mm	35	20	20000 (theoretical) + 20 (No. 35 positive compensation value) = 20,020
Forward movement of 20 mm	36	40	40,000 (theoretical) + (-40) (No. 36 positive compensation value) = 39,960
Forward movement of 20 mm	37	60	60,000 (theoretical) + 60 (No. 37 positive compensation value) = 60,060
Mechanical zero returning	34	0	0
Backward movement of 20 mm	33	-20	-20,000 (theoretical) + 20 (No. 33 negative compensation value) = -19,980
Backward movement of 10mm	32	-40	-40,000 (theoretical) + 0 (No. 32 negative compensation value) = -40,000
Backward movement of 20 mm	31	-60	-60,000 (theoretical) + (-20) (No. 31 negative compensation value) = -60,020

From the above figure and the above table, it can be seen that the pitch compensation is a linear compensation

Appendix 4: Screw Pitch Error Compensation for relevant descriptions.
[3. Pitch compensation principle description]

Appendix 5: Input/Output Definition Table

Input port definition (motherboard):

诊断										0990 1 N00000		
输入口定义										显示端口		
端口	管脚	功能		端口	管脚	功能		端口	管脚	功能		显示地址
X0.0	XS37-14	X01	○	X1.7	XS45-16	X16	○	X3.6	XS37-06	X31	○	
X0.1	XS37-13	X02	○	X2.0	XS41-01	X17	○	X3.7	XS37-05	X32	○	
X0.2	XS37-12	X03	○	X2.1	XS41-02	X18	○					
X0.3	XS45-22	X04	○	X2.2	XS41-03	X19	○					
X0.4	XS45-09	X05	○	X2.3	XS41-04	X20	○					
X0.5	XS45-21	X06	○	X2.4	XS41-05	X21	○					
X0.6	XS45-08	X07	○	X2.5	XS41-06	X22	○					
X0.7	XS45-20	X08	○	X2.6	XS41-07	X23	○					
X1.0	XS45-07	X09	○	X2.7	XS41-08	X24	○					
X1.1	XS45-19	X10	○	X3.0	XS41-09	X25	○					
X1.2	XS45-06	X11	○	X3.1	XS41-10	X26	○					
X1.3	XS45-18	X12	○	X3.2	XS37-03	SP	○					
X1.4	XS45-05	X13	○	X3.3	XS37-02	ST	○					
X1.5	XS45-17	X14	○	X3.4	XS37-04	ESP	○					
X1.6	XS45-04	X15	○	X3.5	XS37-07	X30	○					

端口:1 地址:X0.0 管脚:XS37-14 功能:X01

就绪 手动 通道1 14:33:35 2023/02/09

系统诊断 输入输出 输入口 输出口 伺服诊断 波形诊断 按键诊断 关于..

Output port definition (motherboard):

诊断										0990 1 N00000		
输出口定义										显示端口		
端口	管脚	功能		端口	管脚	功能		端口	管脚	功能		显示地址
Y0.0	XS45-25	Y01	○									
Y0.1	XS45-12	Y02	○									
Y0.2	XS45-24	Y03	○									
Y0.3	XS45-11	Y04	○									
Y0.4	XS45-23	Y05	○									
Y0.5	XS45-10	Y06	○									
Y0.6	XS45-03	Y07	○									
Y0.7	XS45-15	Y08	○									

端口:1 地址:Y0.0 管脚:XS45-25 功能:Y01

就绪 手动 通道1 14:33:49 2023/02/09

系统诊断 输入输出 输入口 输出口 伺服诊断 波形诊断 按键诊断 关于..