In this instruction manual, we will try our best to describe various matters related to the operation of the CNC system. It is not possible to describe in detail all the operations that need not be done or cannot be done in the system due to length constraints and specific product usage. Therefore, anything not specifically indicated in this instruction manual shall be deemed to be the operation that is "impossible" or "not permitted".

CNCmakers Limited

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Preface

Dear Customers:

We are honored and grateful to you for choosing GSK25iMc/GSK25iTc Series Bus-type Milling/Turning CNC System

This manual describes in detail the connection and debugging of the GSK25iMc/GSK25iTc Series Bus-type Milling/Turning CNC System.

Improper operation will lead to accidents, thus personnel with appropriate qualifications are required to operate the system. Please read this instruction manual carefully before operation!

Special tip: The power supply installed on (in) the chassis is specially provided for the CNC Systems manufactured by our company.

Users are not allowed to use this power supply for other purposes. Otherwise, great danger will be caused!

Safety Warnings

Before installation, connection, programming and operation of the product, you must read this Instruction Manual and the Operation Manual provided by the machine manufacturer in detail, and carry out the relevant operations in strict accordance with the requirements in these manuals.

This manual contains safety precautions to protect the user and prevent damage to the machine. These precautions are divided into warnings and cautions according to the nature of the safety. Supplementary information is described as notes. Please read the warnings, cautions and notes carefully before operating the machine.

Warnings

Failure to follow the specified operating methods or steps may result in injury to the user or damage to the equipment.

Caution

Failure to follow the specified operating methods or steps may result in damage to the equipment.

Notes

Notes are used to indicate supplementary information in addition to warnings and cautions.

Statement

● This manual describes as many contents as possible, but it is not possible to cover all the operations that can or cannot be done due to too many possibilities involved. Consequently, the contents not specifically described in this manual are considered as not available.

Caution

● The product functions and technical indexes described in this manual (such as accuracy, speed, etc.) are only applicable to the product. For the CNC machine equipped with this product, the actual function configuration and technical performance are determined by the design of the machine manufacturer. The functional configuration and technical indexes of the CNC machine are subject to the operation manual of the machine manufacturer.

● Please refer to the Operating Manual provided by the machine manufacturer for the function and meaning of keys on the machine panel.

Precautions

■ **Transportation and storage**

- **The product packaging boxes shall not be stacked more than six layers**
- **Do not climb, stand or place heavy objects on the product packaging boxes**
- **Do not use any cables tied to the products to drag or carry them**
- **Do not collide with or scratch the panel and display screen**
- **The product packaging boxes shall be protected from moisture, sunlight and rain**

■ **Unpacking inspection**

- **Please confirm whether it is the product you purchased after opening the package**
- **Inspect whether the product is damaged in transit**
- **Confirm whether the components are complete and damaged based on the checklist**
- **Please contact our company promptly in case of any product model inconsistency, missing accessories or transport damage**

■ **Wiring**

- **Personnel in charge of wiring and inspection must be competent professionals**
- **The product must be grounded reliably, with a grounding resistance no greater than 0.1 Ω. Neutral wire shall not be used in place of grounding wire**
- **The wiring must be correct and firm so as not to cause product failure or unintended consequences**
- **The surge absorbing diodes must be connected to the product in the specified direction; otherwise the product will be damaged**
- **The product must be powered off before plugging or unplugging or opening the product chassis**

■ **Maintenance**

- **Personnel in charge of maintenance must be competent professionals**
- **Power supply must be cut off before repairing or replacing components**

- **The cause must be diagnosed in case of short circuit or overload, and the product can be restarted after troubleshooting**
- **The product shall not be frequently powered on or off. The interval shall be at least 1 min if re-energization is required after power-off**

Safety Responsibility

Manufacturer's Safety Responsibilities

——The manufacturer shall be responsible for the hazard of the supplied CNC system and accompanying accessories that have been eliminated and/or controlled in terms of design and structure.

——The manufacturer shall be responsible for the safety of the supplied CNC system and accompanying accessories.

——The manufacturer shall be responsible for the use information and advice provided for the user.

Users' responsibilities for safety

——Users shall be familiar with and master how to operate safely through learning and safe operation training on the CNC system.

——Users shall be responsible for the safety and hazards as a result of adding, changing or modifying the original CNC system and accessories by themselves.

——Users shall be responsible for any hazard caused by failure to operate, adjust, maintain, install, store and transport the products in accordance with the manual.

All specifications and designs are subject to changes without prior notice.

This manual shall be kept by final users.

Thank you very much for using the products of GSK CNC Equipment Co., Ltd., and your friendly support to our company!

Contents

Part I Installation and Connection

Part II Debugging

Appendix

Part I Installation and Connection

Precautions for installation and connection

1. Requirements for the electrical cabinet of the machine tool

The electrical cabinet of the machine tool where the system and the drive unit are installed should be fully enclosed and dust-proof. It must be able to effectively prevent dust, lubricating oil, coolant and other liquids from entering any part of the system. The difference between temperatures inside and outside the electrical cabinet should not exceed 10 ℃. If this requirement cannot be met, a heat exchange system must be installed. The ambient temperature for the system should not exceed 45 ℃.

2. Location of system installation

The CNC host, which is the control core of the entire CNC machine, must be installed in a location subjected to the smallest temperature rise and the smallest electromagnetic radiation interference. In the electrical cabinet of the machine tool, the high-power spindle drive unit and feed axis drive unit can generate a large amount of heat while working, so they should be installed at the top as much as possible, and the I/O unit should be installed below them.

3. Protective grounding

The electrical cabinet of the machine tool shall be provided with protective grounding, and the continuity of the protective grounding shall meet the requirements of GB/T 5226.1. Good grounding practices are also a necessary condition for the stable operation of the system. The grounding wires for each component of the system cannot be connected in series with each other. A grounding bar (which may be a copper plate with a thickness of ≥3 mm) should be arranged in the electrical cabinet, and connected to a grounding conductor in contact with the earth surface, and having a grounding resistance not greater than 0.1Ω. The protective grounding terminals for each component of the system are connected to the grounding bar separately by the thick and short yellow and green wires.

4. Interference suppression

Although the CNC system has taken anti-interference measures during design, which can prevent the influence of external interference factors on the CNC to a certain extent, the following measures must be adopted during installation and connection to ensure the reliable and stable operation of the CNC:

a) The isolating transformer should be used for the power supply to the CNC;

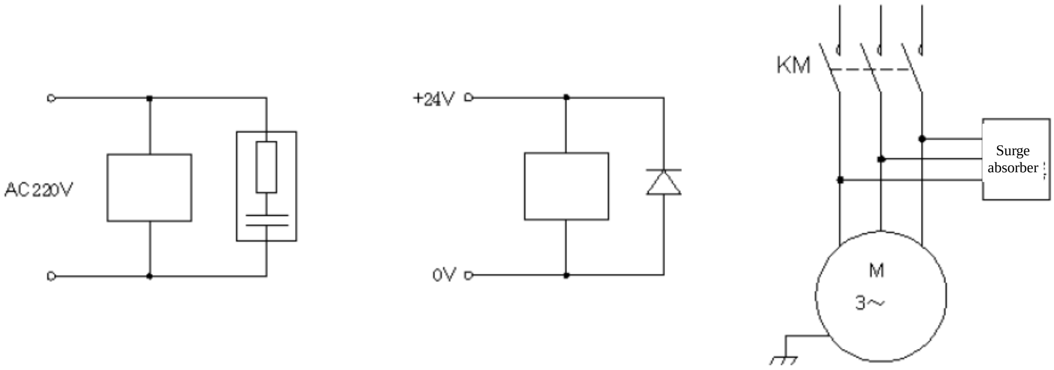
b) The installation of CNC equipment should be far away from devices easily causing interference;

c) The shielded cable should be used as the CNC signal cables and as short as possible. The shielding layer should be grounded. The installation should be far away from places subjected to strong electricity and strong electromagnetic interference.

d) The RC circuit should be connected in parallel at both ends of the AC coil, and installed as close as possible to the inductive load;

e) The free-wheeling diodes should be connected reversely in parallel at both ends of the DC coil;

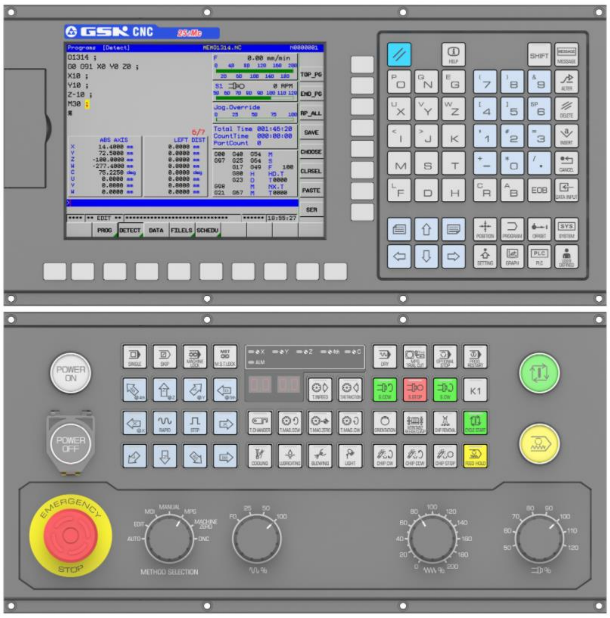
f) The surge absorbers should be connected in parallel at the winding end of the AC motor.



Wiring Diagram of the Protective Circuit

General Introduction to the System

1.1 Overview of GSK25iMc modules

The GSK25iMc CNC system consists of: Two parts, namely GSK25iMc (8.4-inch horizontal) host and GSK25i-MPU-08BH machine operation panel. Specification parameter: Installation structure: Horizontal Display: 8.4 inch LCD Power supply: DC24V Power: 35W	
The GSK25iMc CNC system consists of: Two parts, namely GSK25iMc (10.4 inch vertical) host and GSK25i-MPU-10BV machine operation panel. Specification parameter: Installation structure: Vertical Display: 10.4 inch LCD Power supply: DC24V Power: 38W	

I/O unit of the GSK25iMc series CNC system:

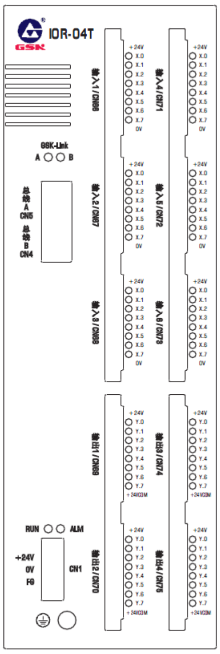
1. IOR-04T (standard)
   DI/DO:48/32
   Power supply: DC24V

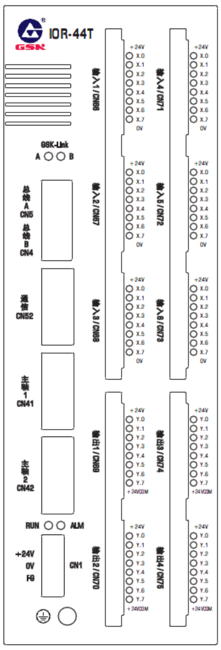
2. IOR-44T (optional)
   DI/DO:48/32
   Analog voltage output: 4 channels (0V~10V analog voltage)
   Power supply: DC24V

3. IOR-21F (optional)
   DI/DO:24/16
   Power supply: DC24V

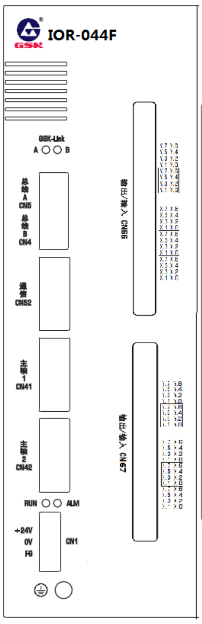
4. IOR-44F (optional)
   DI/DO:48/32
   AO: 4 channels (0V~10V analog voltage)
   Power supply: DC24V

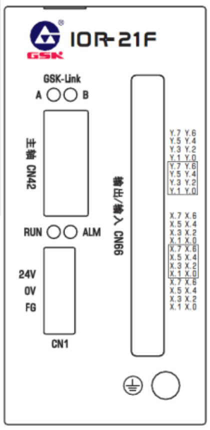
5. IOR-13T (optional)
   DI/DO:32/24
   Analog voltage output: 4 channels (0V~10V analog voltage)
   Analog voltage input: 4 channels (0V~10V analog voltage)
   Analog current input: 2 channels (4mA~20mA analog current)
   Power supply: DC24V





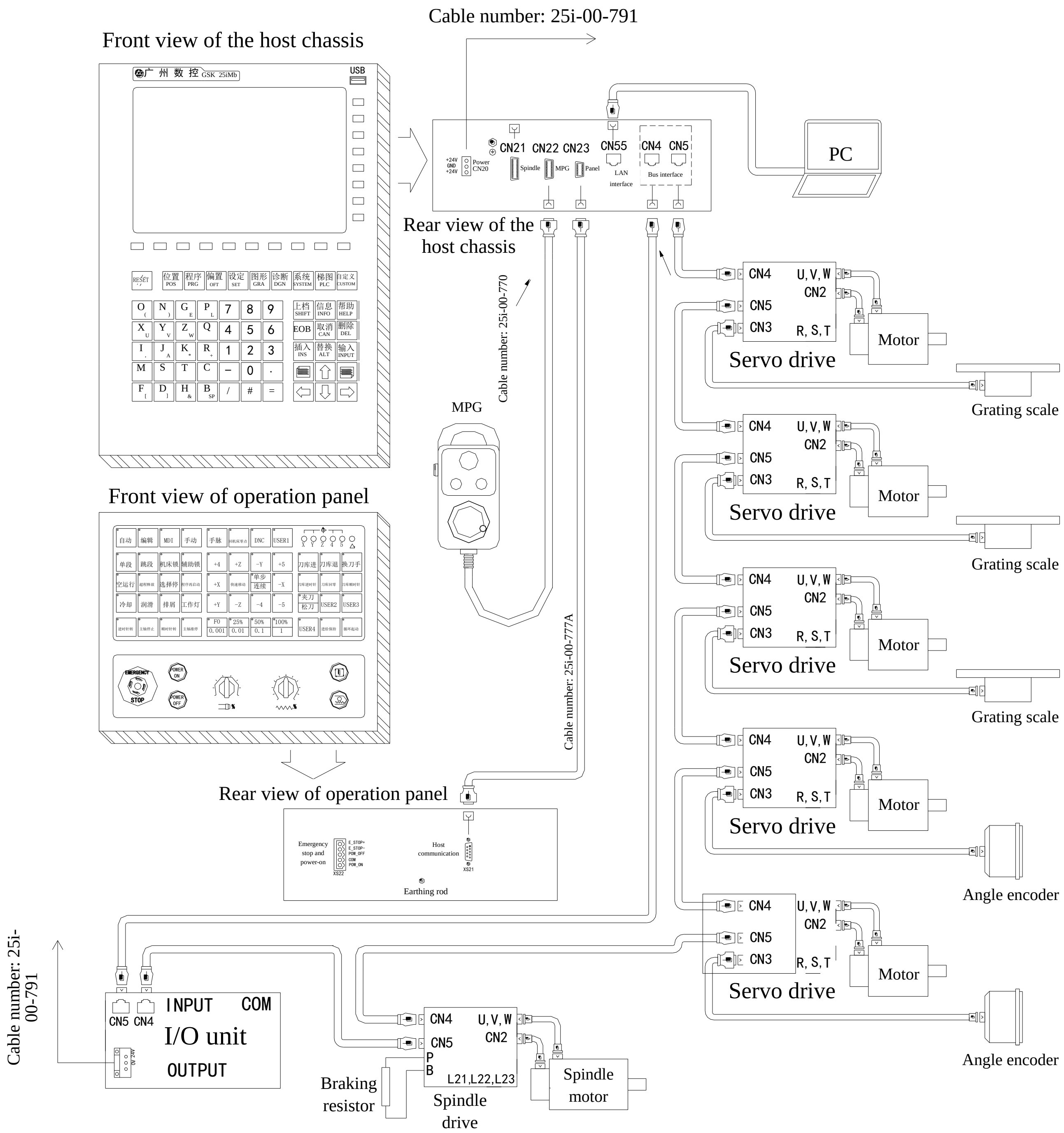
IOR-04T IOR-44T





IOR-44F IOR-21F

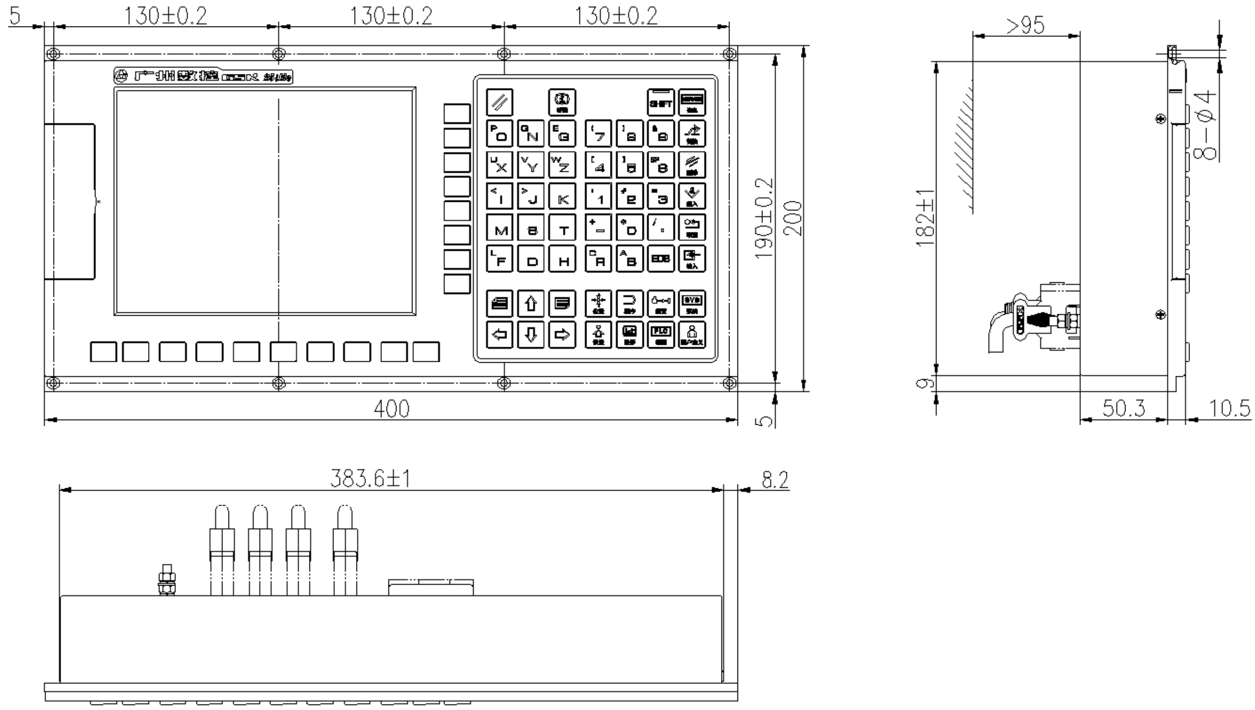
1.2 Interconnection diagram of GSK25iMc and GR series bus servo drive



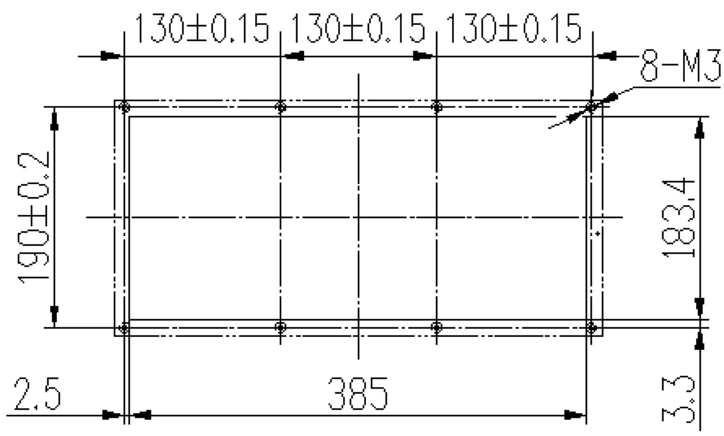
Part I Installation and Connection

Chapter II Installation Dimensions

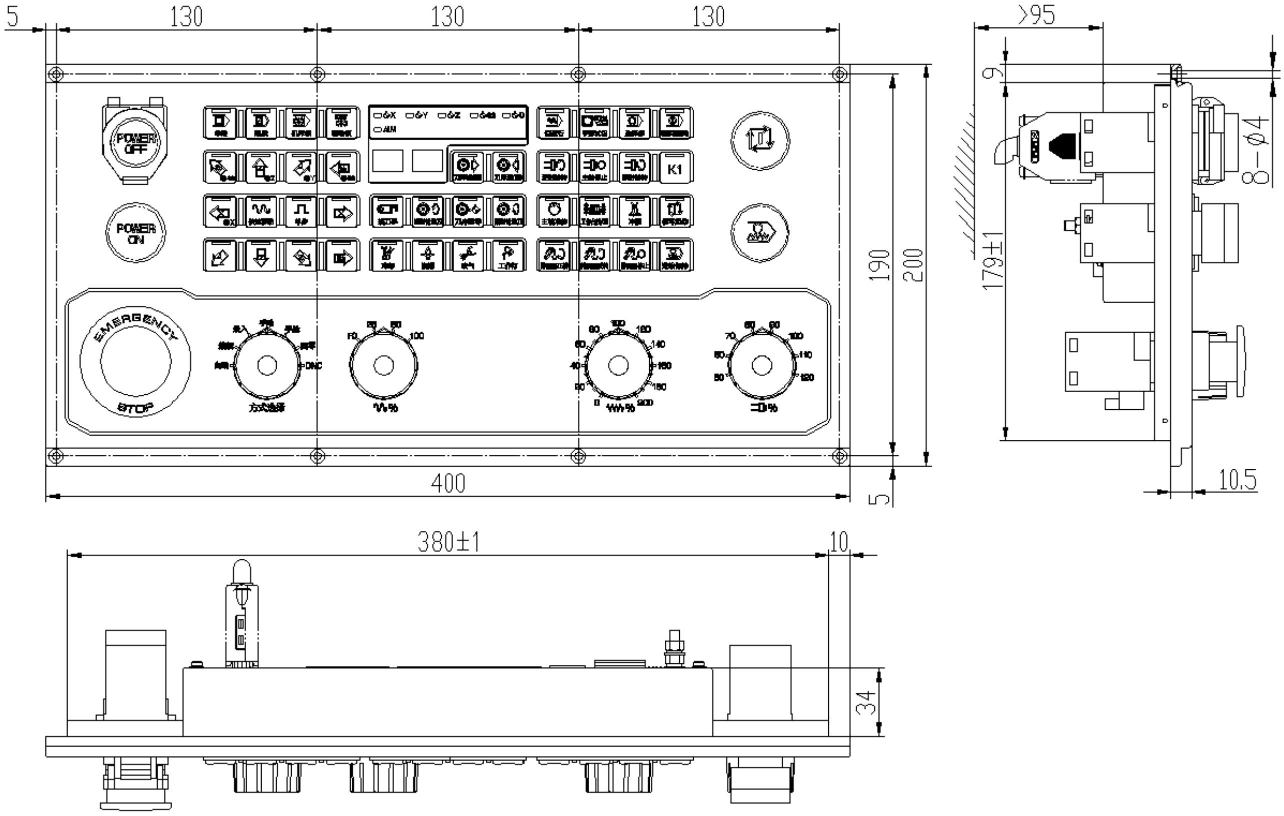
2.1 Host installation dimension of GSK25iMc-H08CDCB (8.4-inch, horizontal, independent keys)



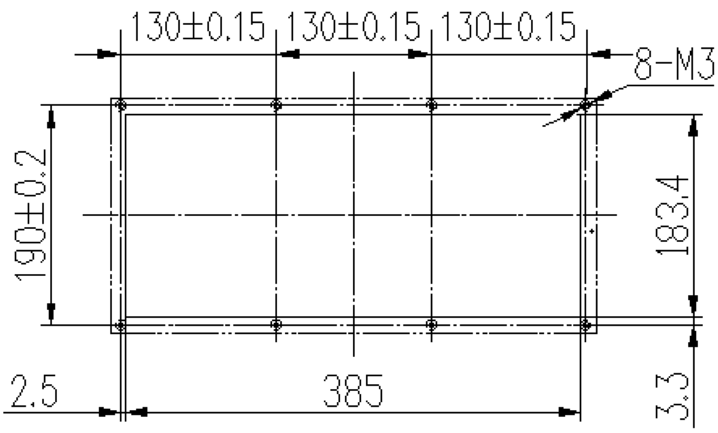
Hole Drilling Diagram for User Installation



2.2 Machine panel installation dimension of GSK25iMc-MPU-H08BDCB (8.4-inch, horizontal, independent keys)

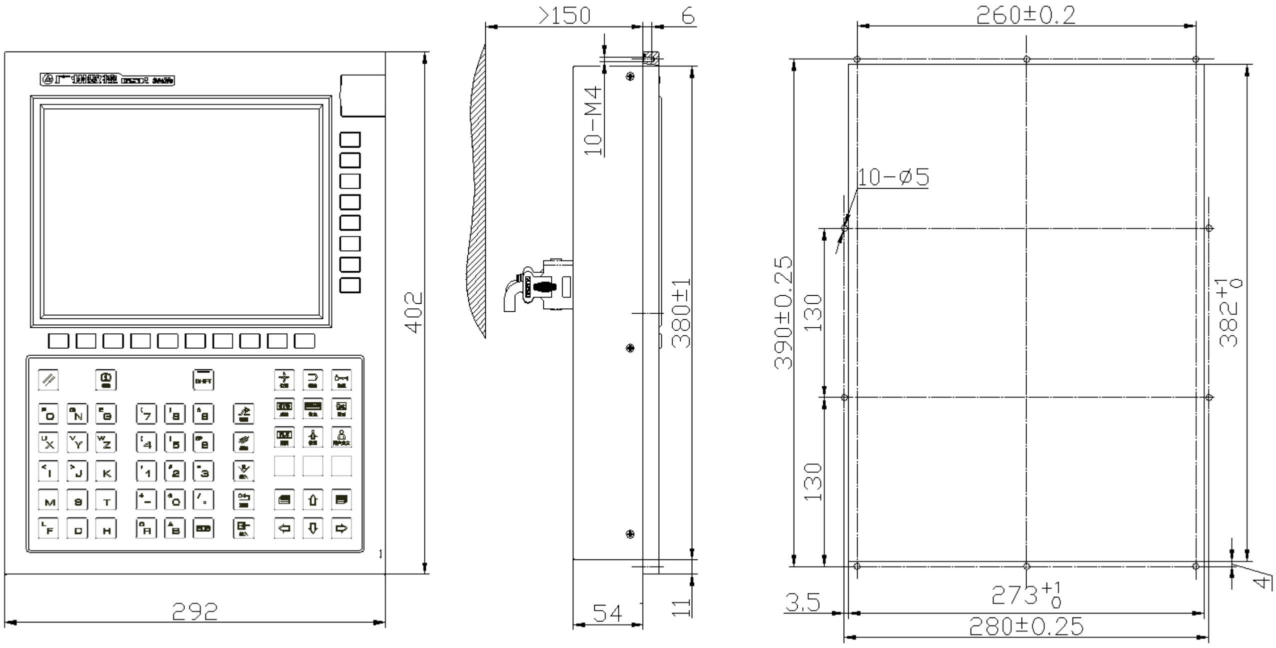


Hole Drilling Diagram for User Installation



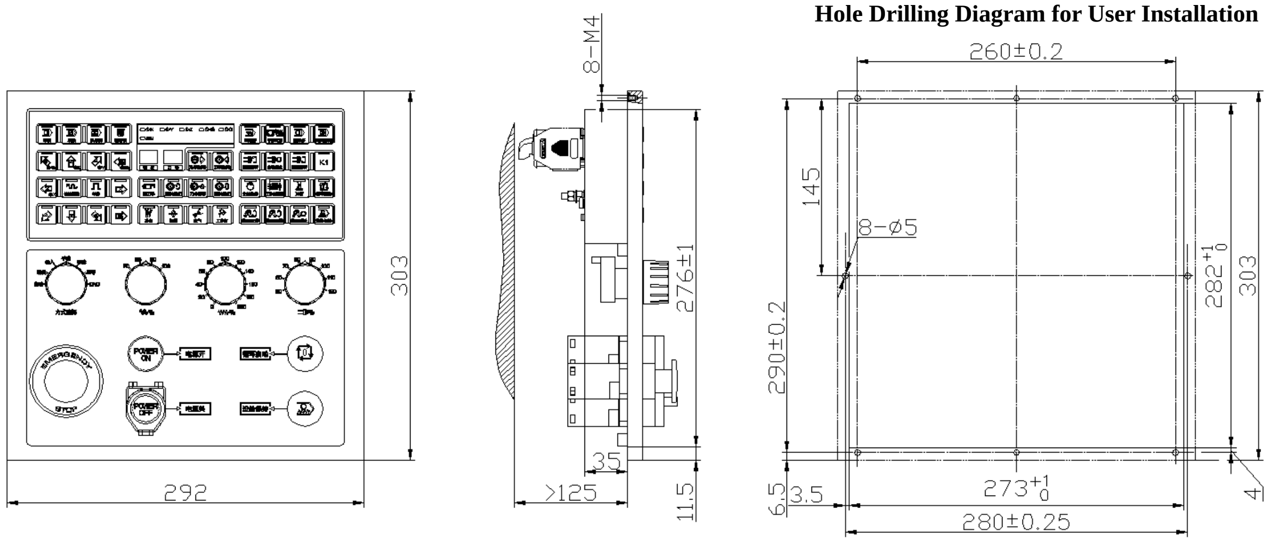
2.3 Host chassis installation dimension of GSK25iMc-V10CDCB (10.4-inch, vertical, independent keys)

Hole Drilling Diagram for User Installation

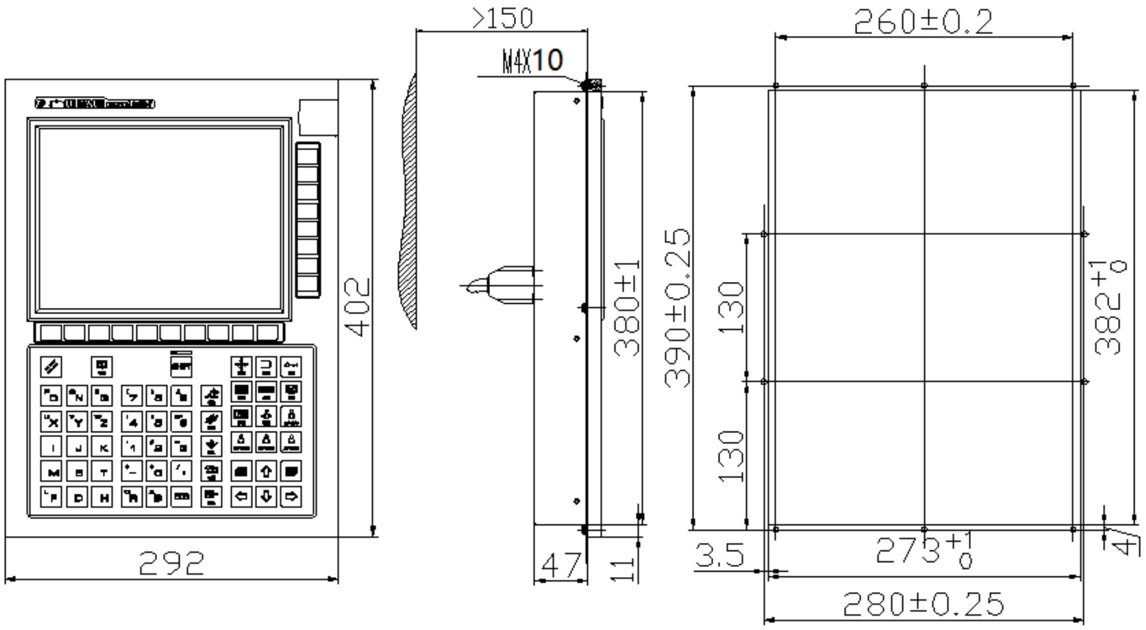


2.4 Machine panel installation dimension of GSK25iMc-MPU-V10BDCB (10.4-inch, vertical, independent keys)

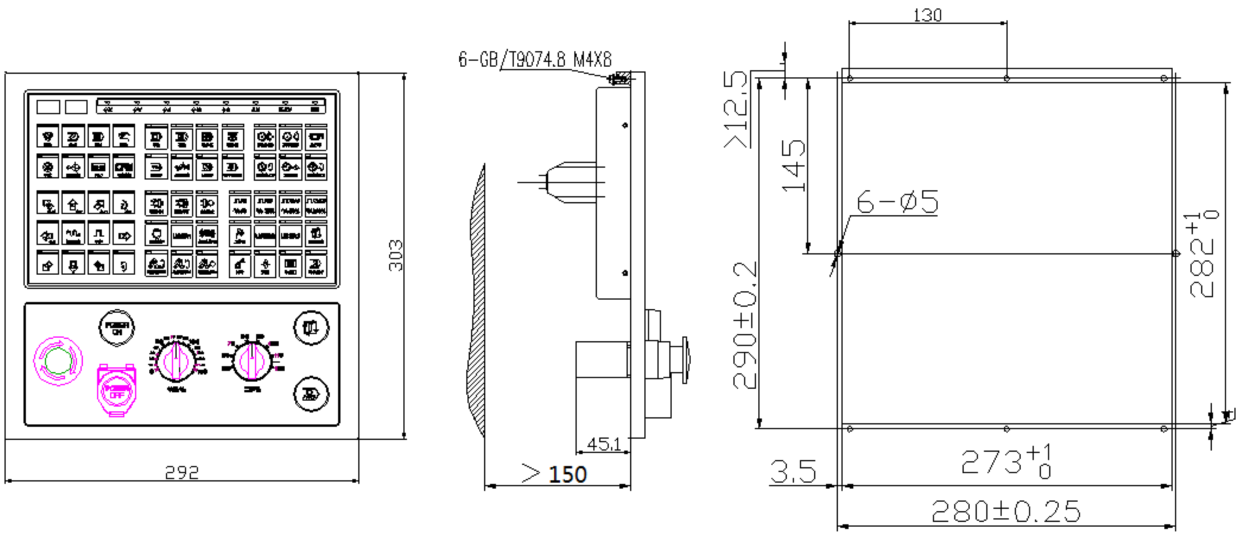
Hole Drilling Diagram for User Installation



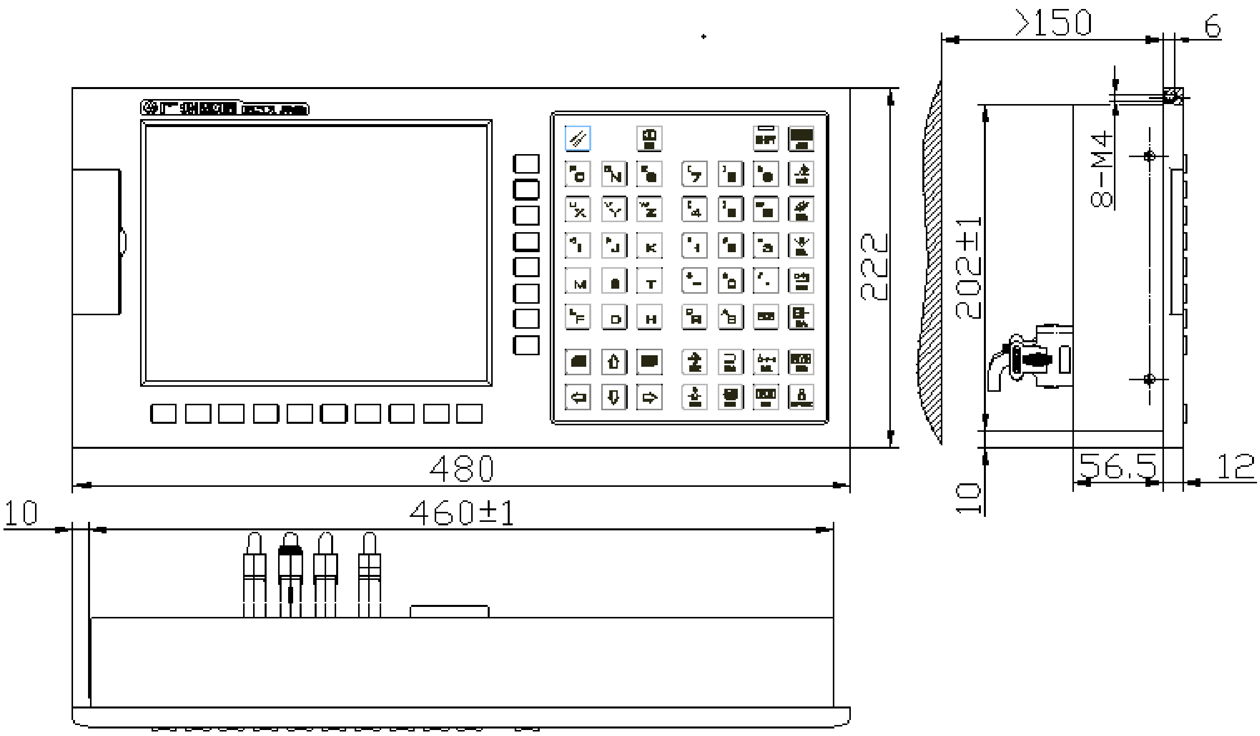
2.5 Host chassis installation dimension of GSK25iMc-V10DMC (10.4-inch, vertical, membrane keys)



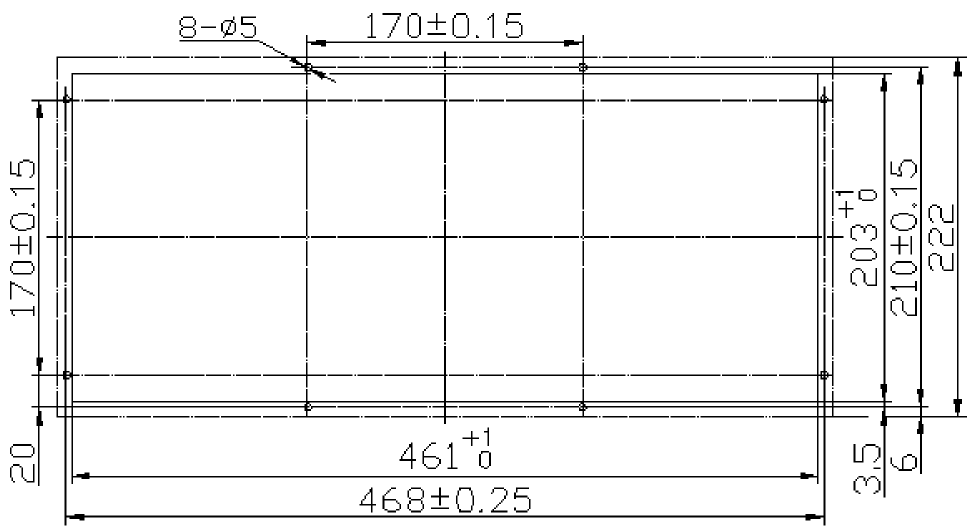
2.6 Machine panel installation dimension of GSK25iMc-MPU-V10BMC (10.4-inch, vertical, membrane keys)



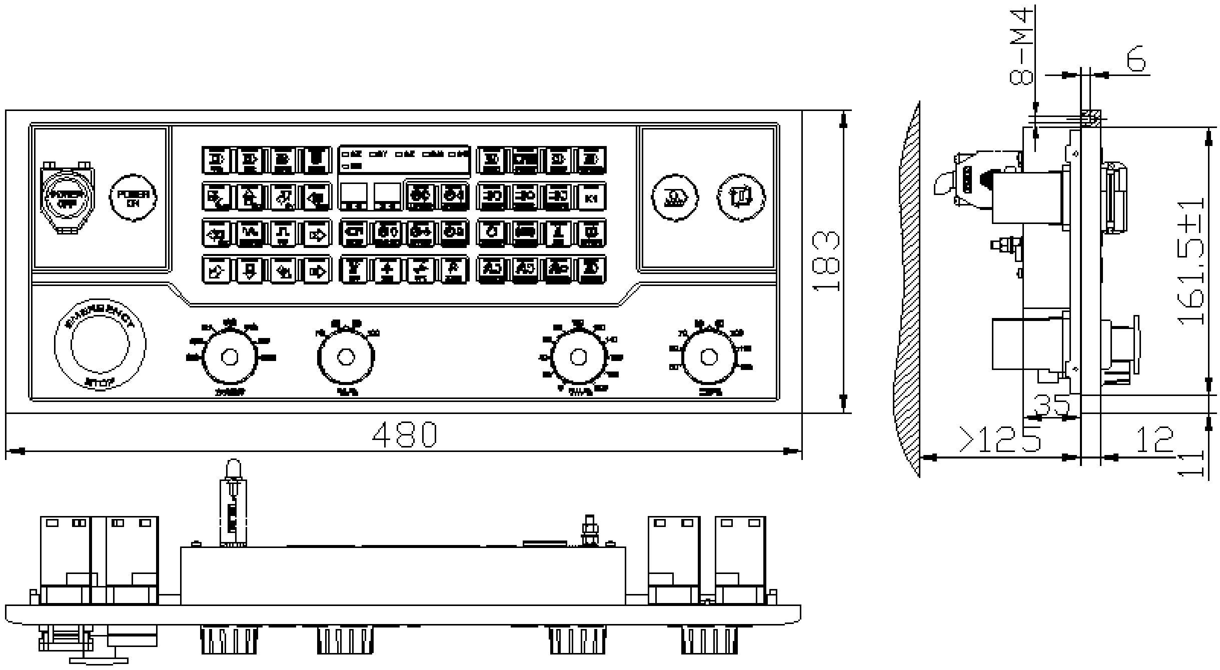
2.7 Host chassis installation dimension of GSK25iMc-H10CDCB (10.4-inch, horizontal, independent keys)



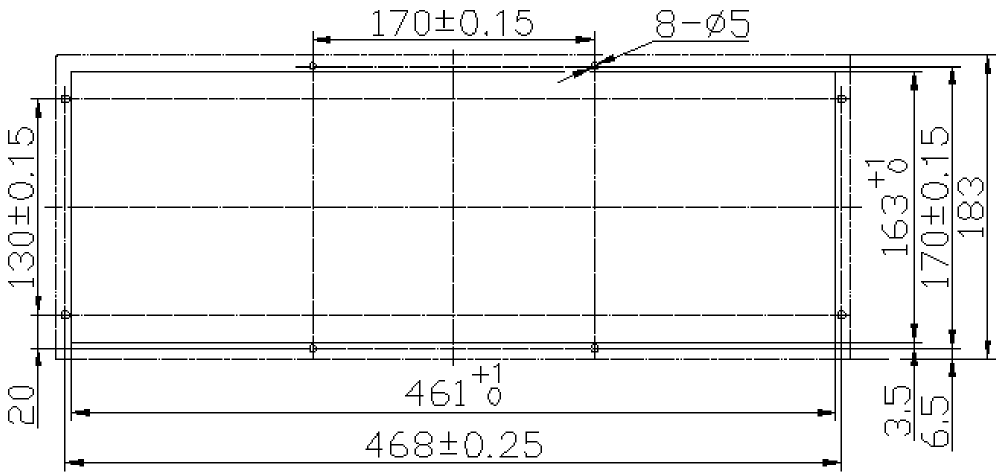
Hole Drilling Diagram for User Installation



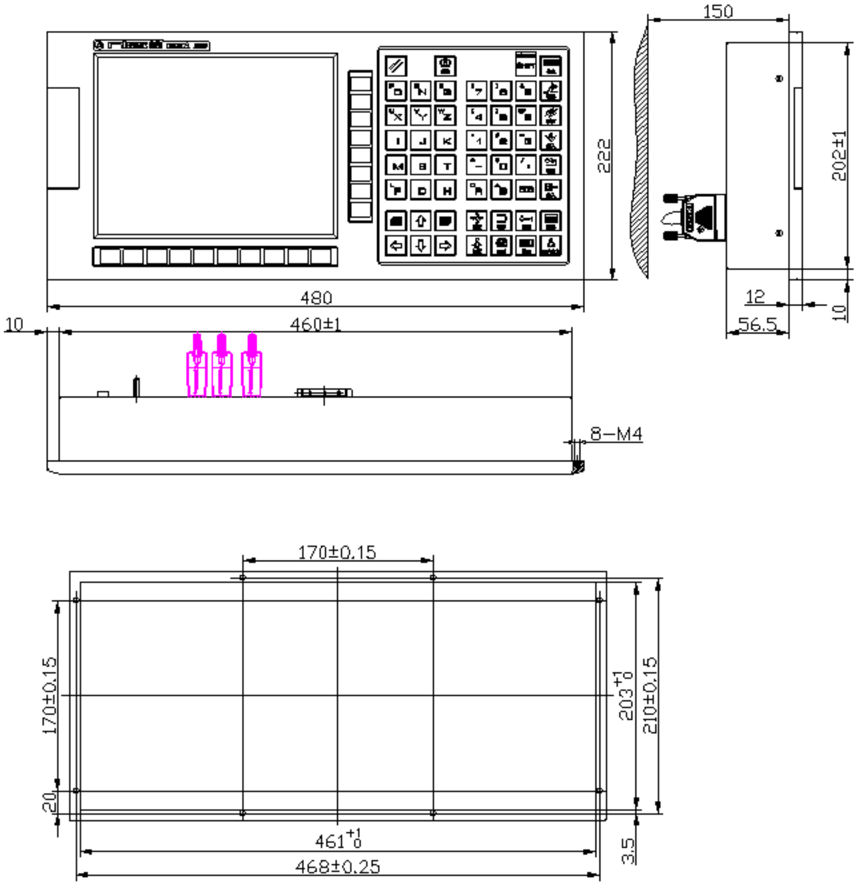
2.8 Machine panel installation dimension of GSK25iMc-MPU-H10BDCB (10.4-inch, horizontal, independent keys)



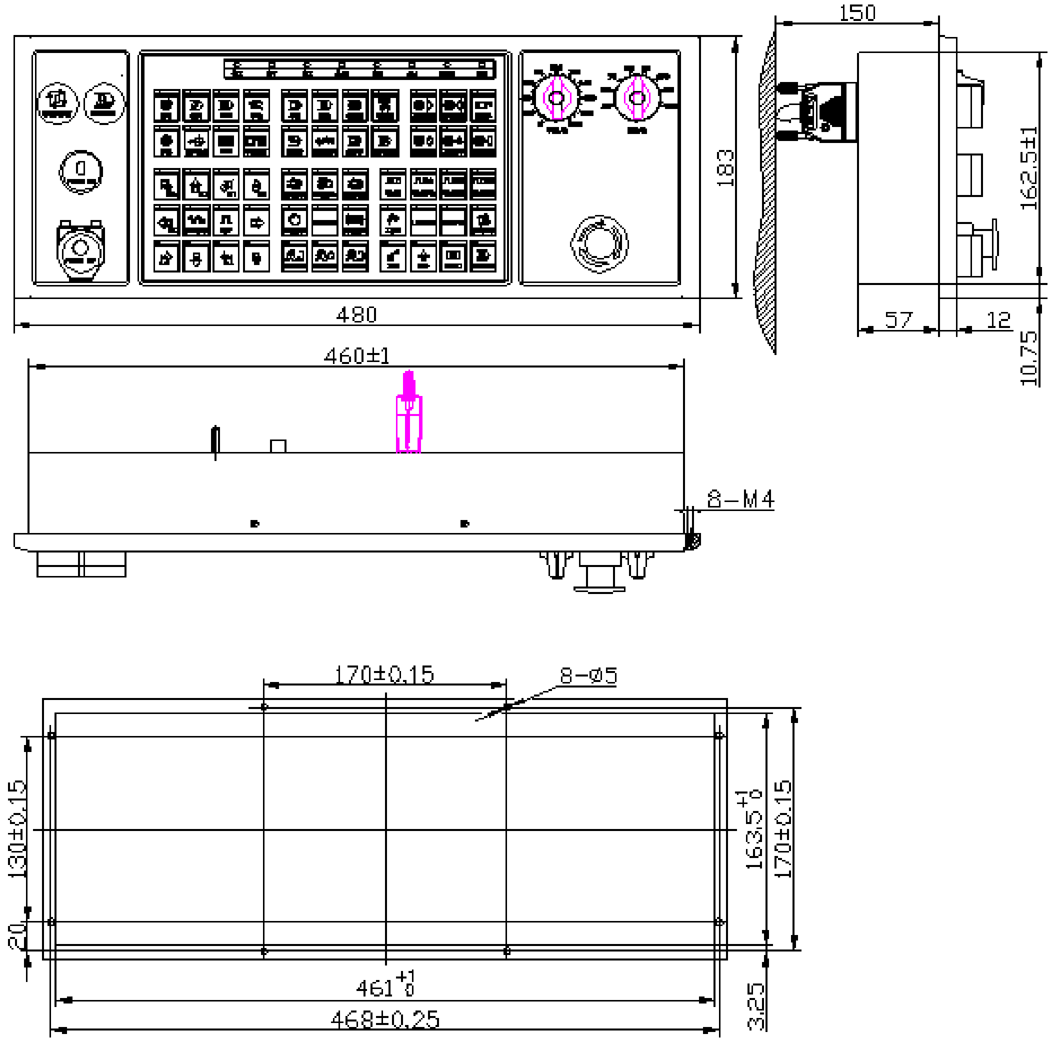
Hole Drilling Diagram for User Installation



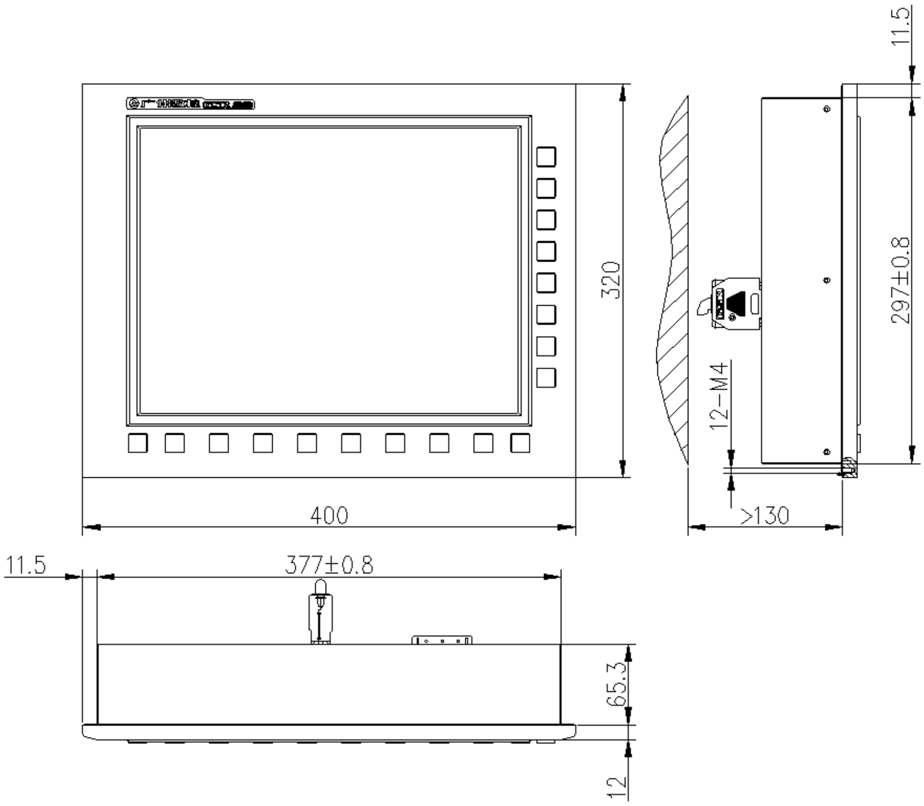
2.9 Host chassis installation dimension of GSK25iMc-H10DMC (10.4-inch, horizontal, mask structure)



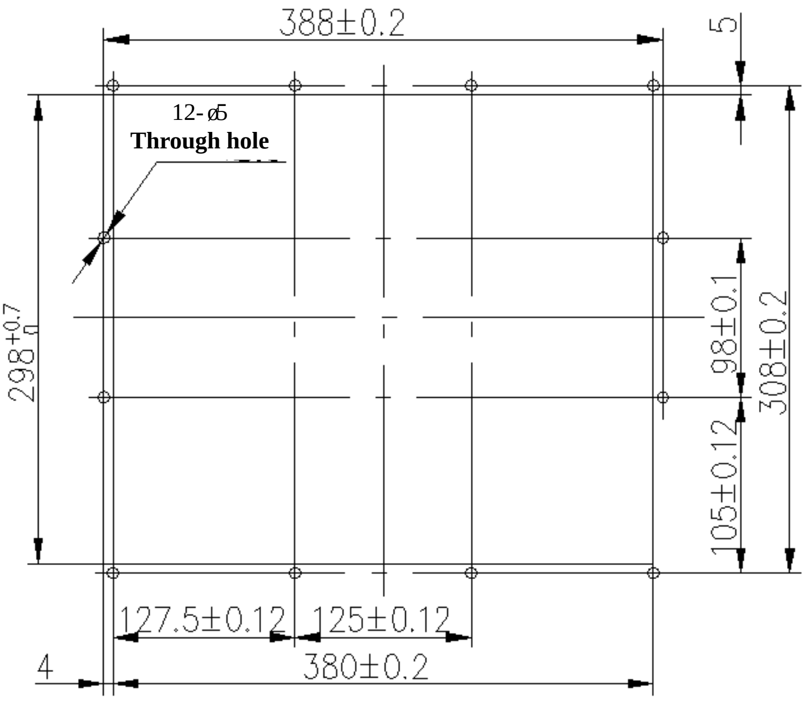
2.10 Machine panel installation dimension of GSK25iMc-MPU-10BHC (10.4-inch, horizontal)



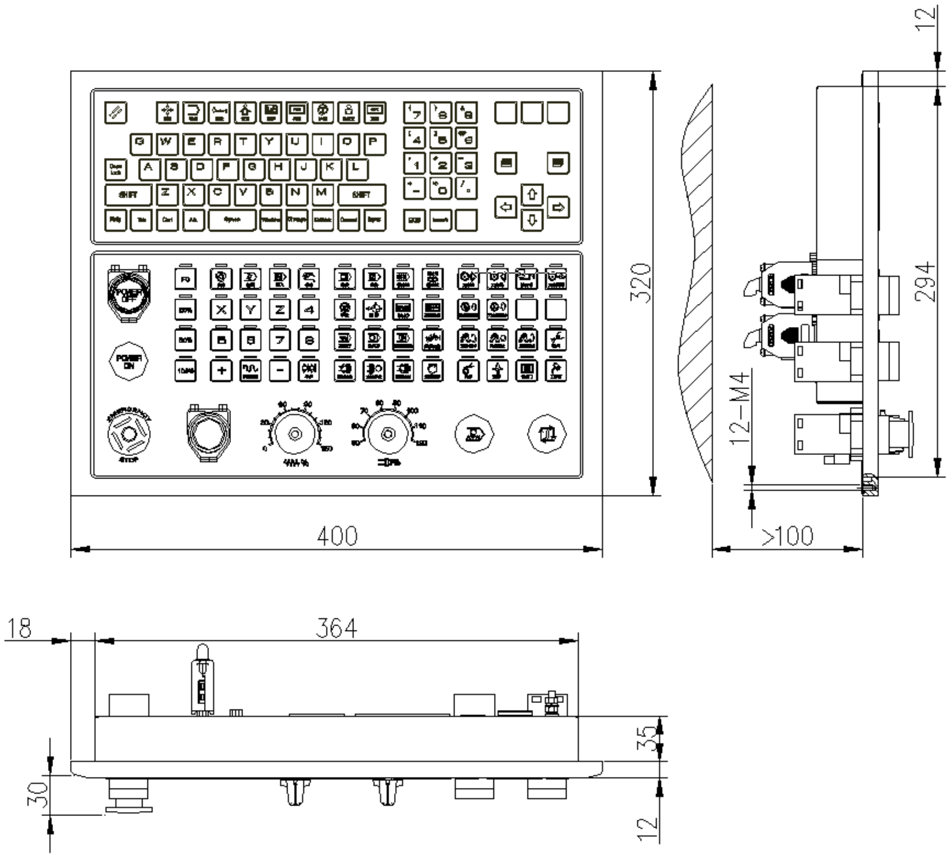
2.11 Host unit installation dimension of GSK25iMc-V15CDC CNC system (15-inch color screen)



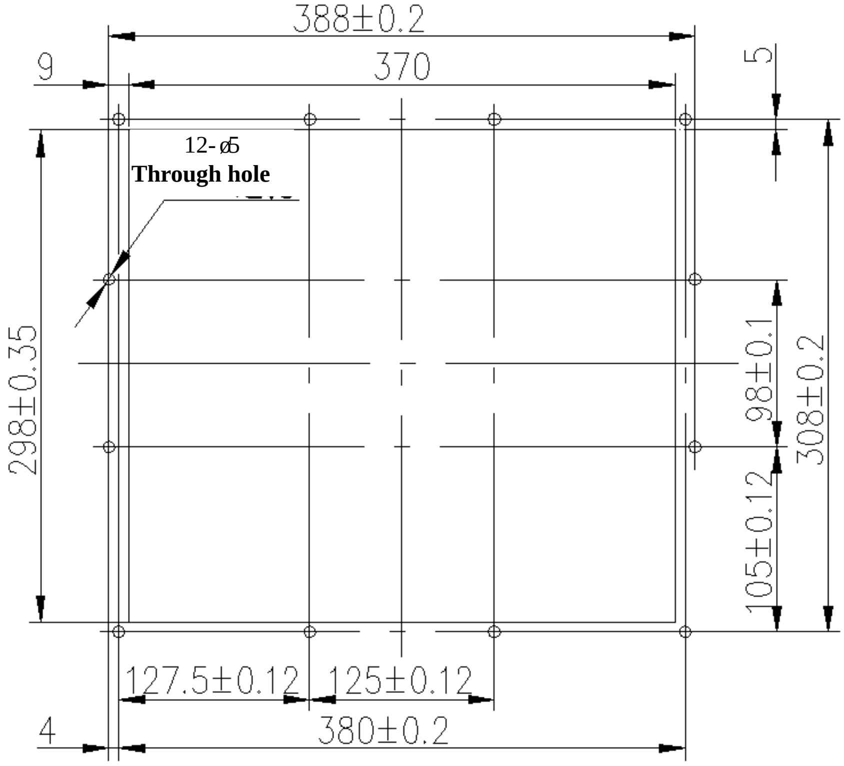
Hole Drilling Diagram for User Installation



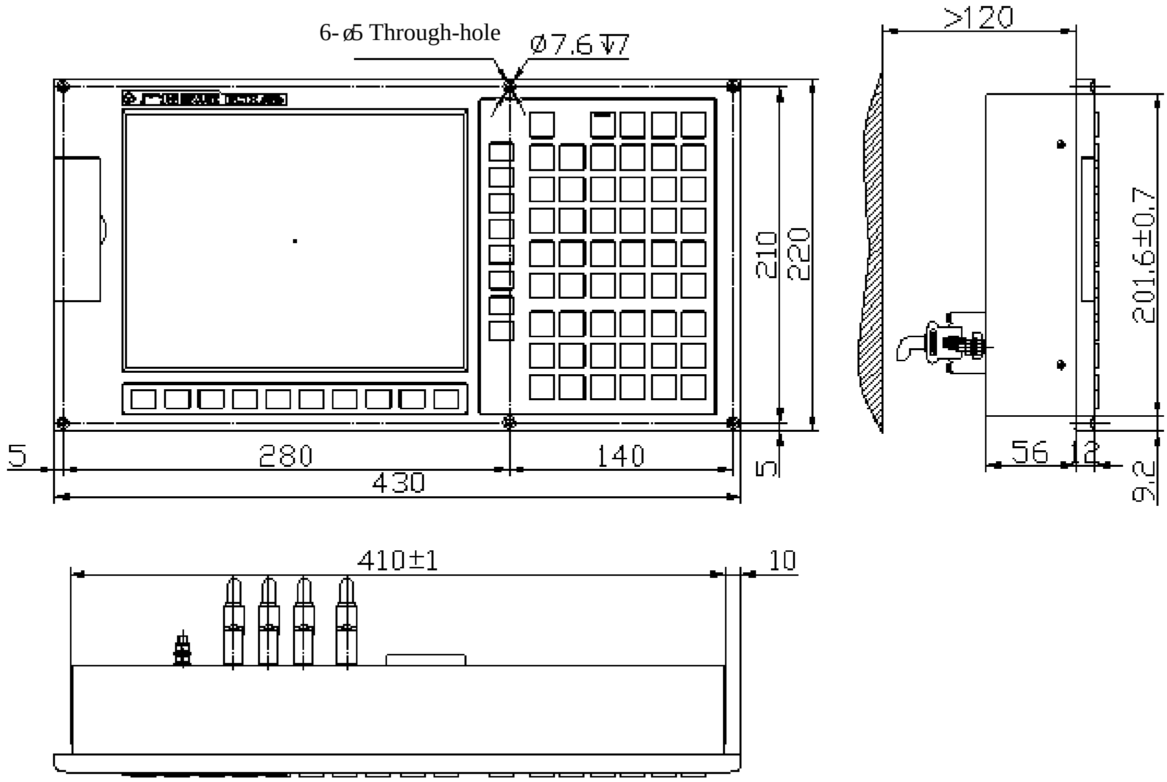
2.12 Operation panel unit installation dimension of GSK25iMc-MPU-H15BDC (15-inch)



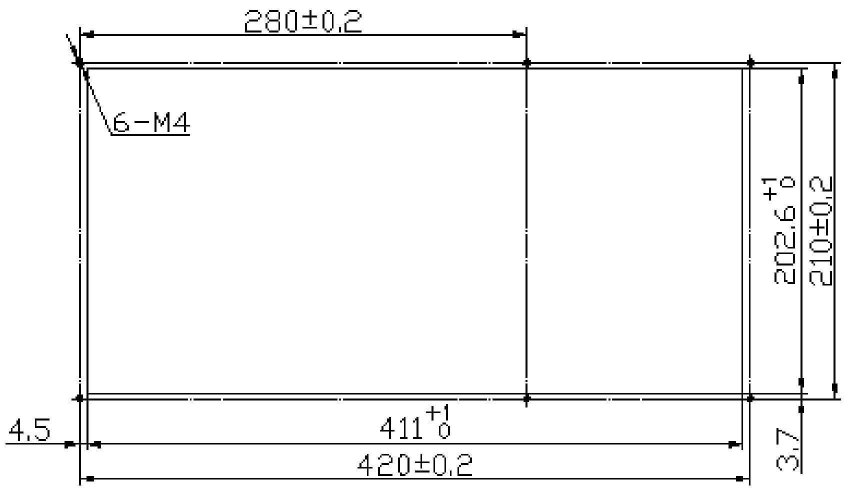
Hole Drilling Diagram for User Installation



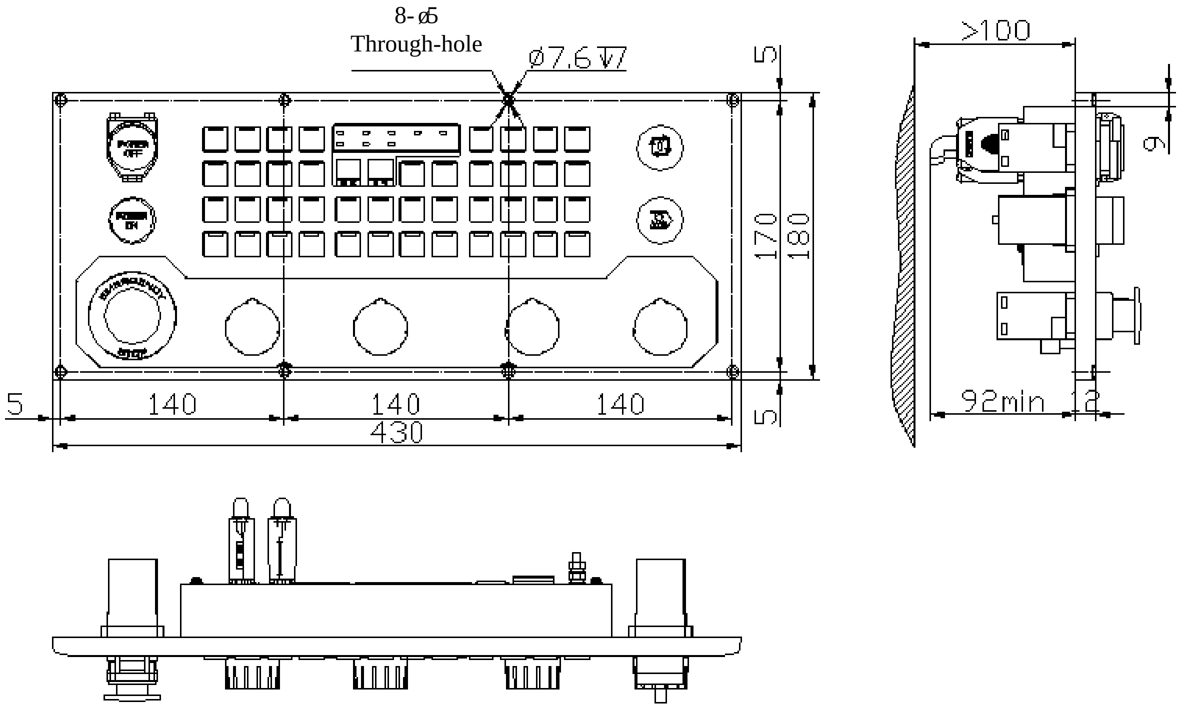
2.13 Host unit installation dimension of GSK25iMc-H10CJMC(G)/ GSK25iMc-H10CJDC(G) CNC system



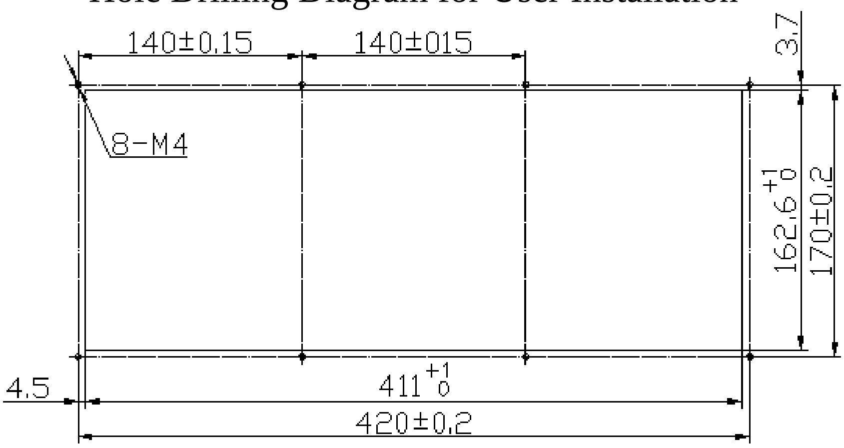
Hole Drilling Diagram for User Installation



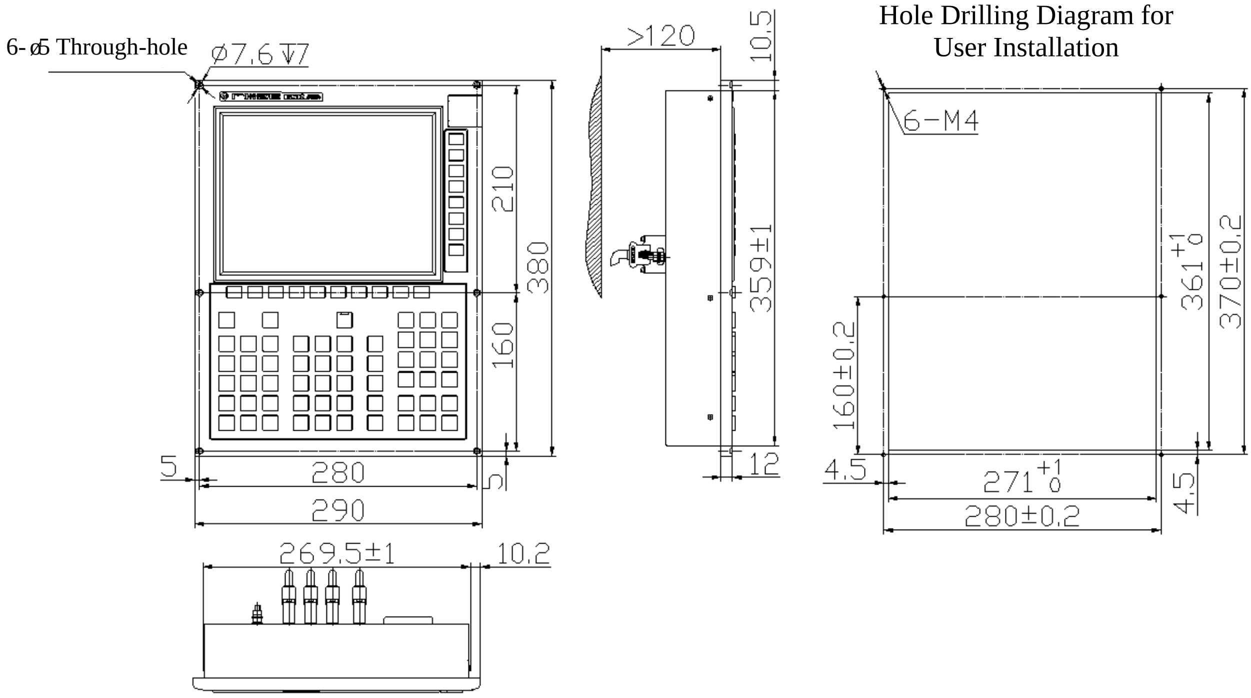
2.14 Operation panel unit installation dimension of GSK25iMc-MPU-H10BJMC/GSK25iMc-MPU-H10BJDC



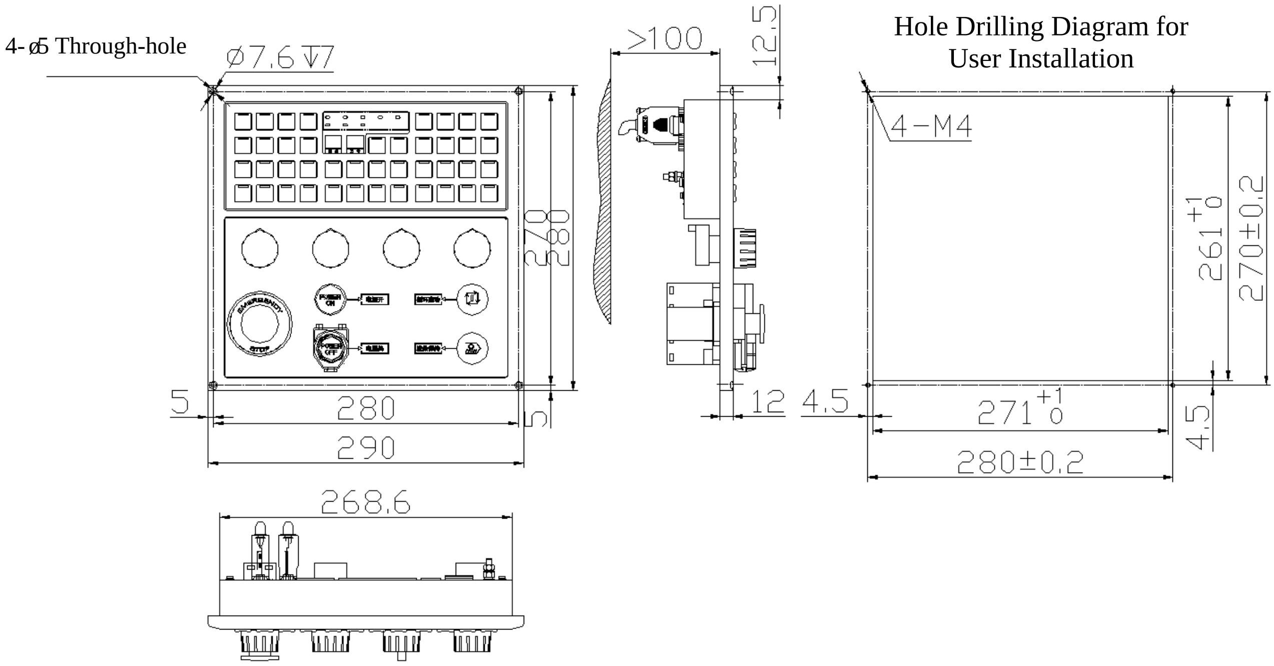
Hole Drilling Diagram for User Installation



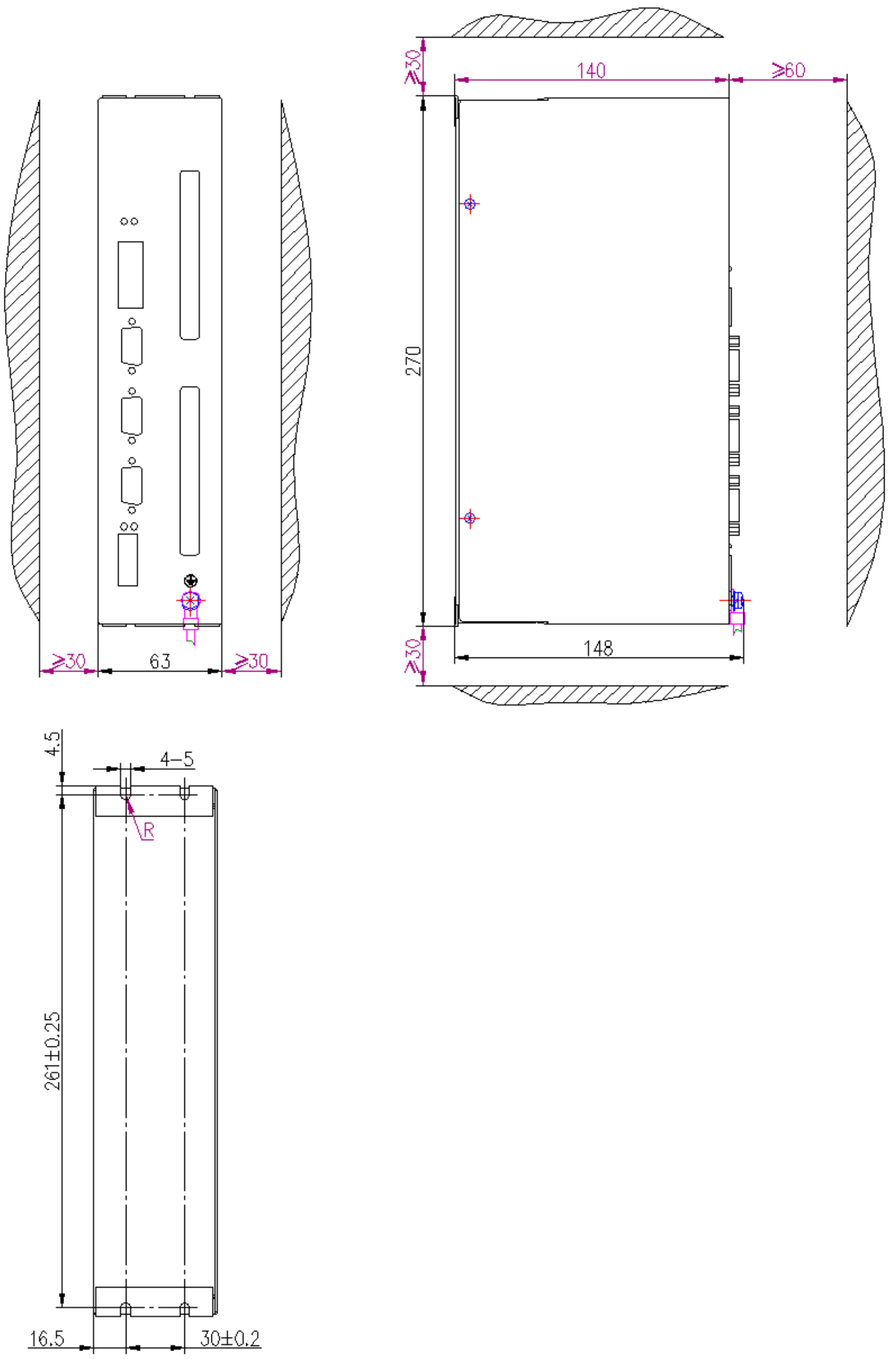
2.15 Host unit installation dimension of GSK25iMc-V10CJMC(G)/ GSK25iMc-V10CJDC(G) CNC system



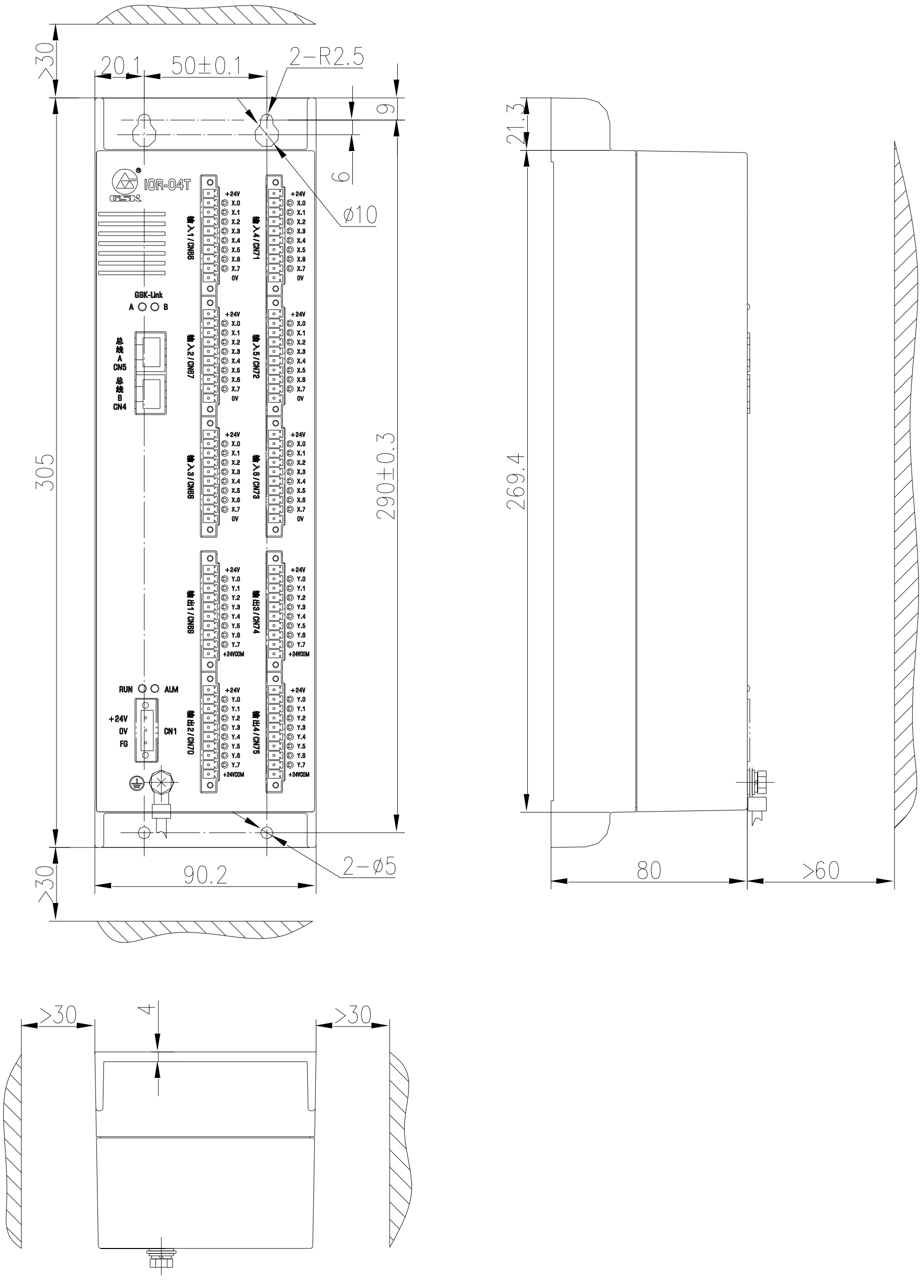
2.16 Operation panel unit installation dimension of GSK25iMc-MPU-V10BJMC/GSK25iMc-VPU-H10BJDC



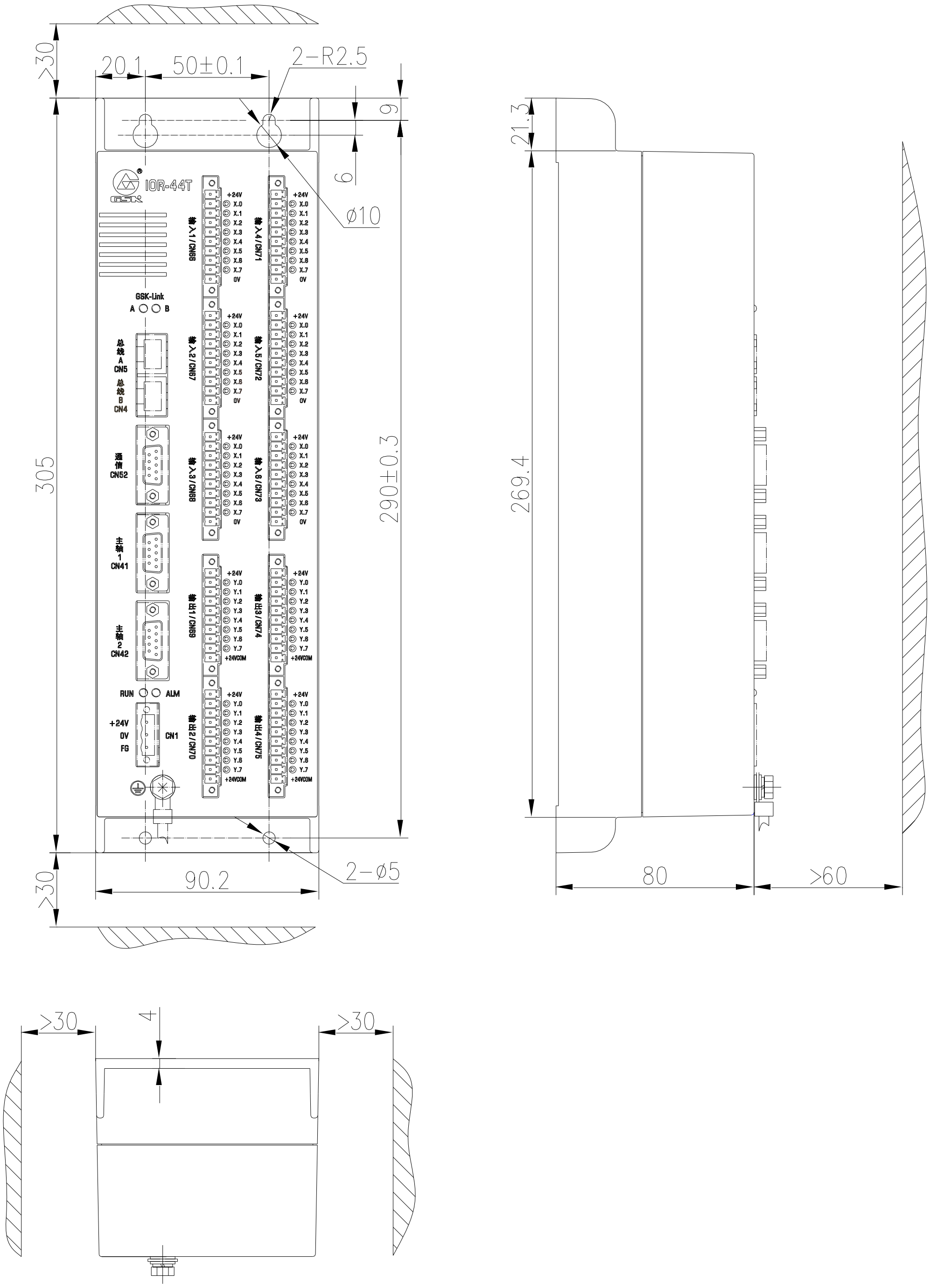
2.17 Installation dimension of I/O unit



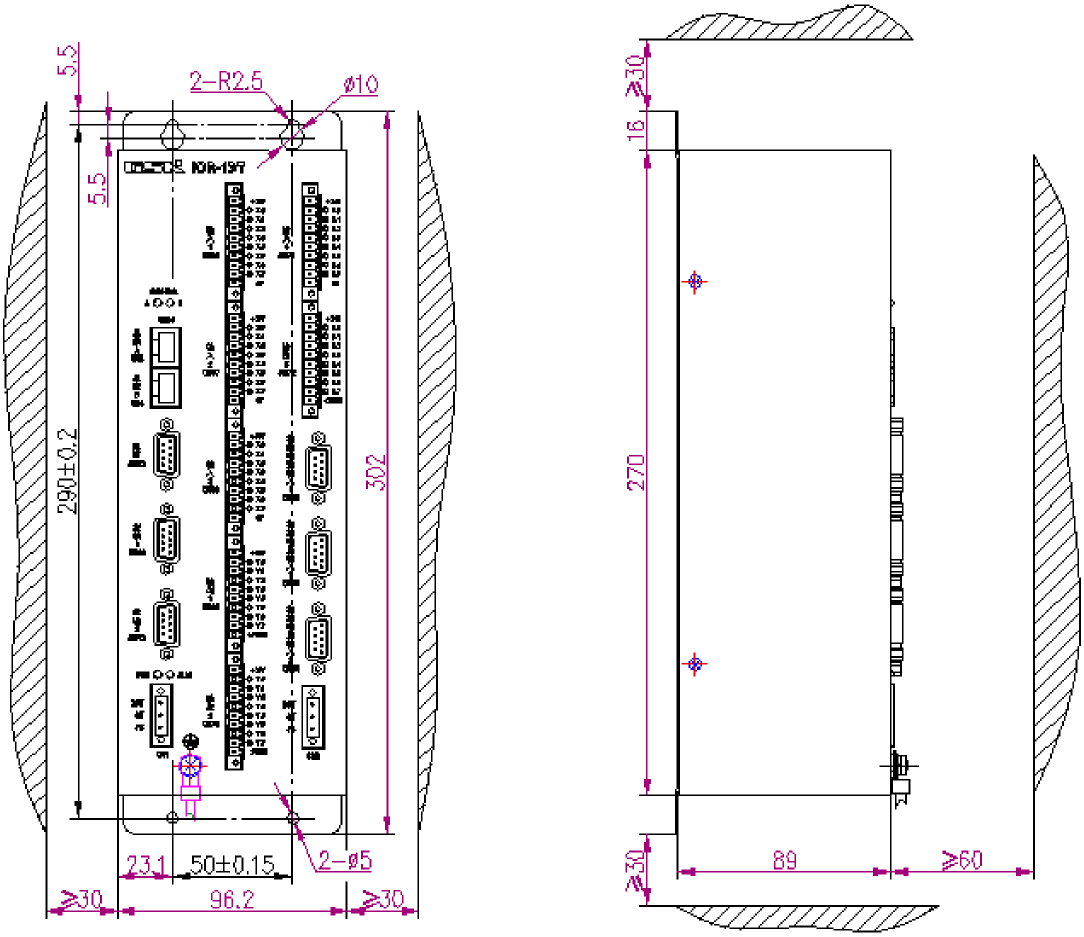
IOR-44F, IOR-44F(PMOS)


>30
20.1
50±0.1
2-R2.5
9
6
Ø10
IOR-04T
GSK-Link
305
290±0.3
21.3
269.4
RUN
ALM
+24V
0V
FG
CN1
2-Ø5
90.2
80
>60
>30
4

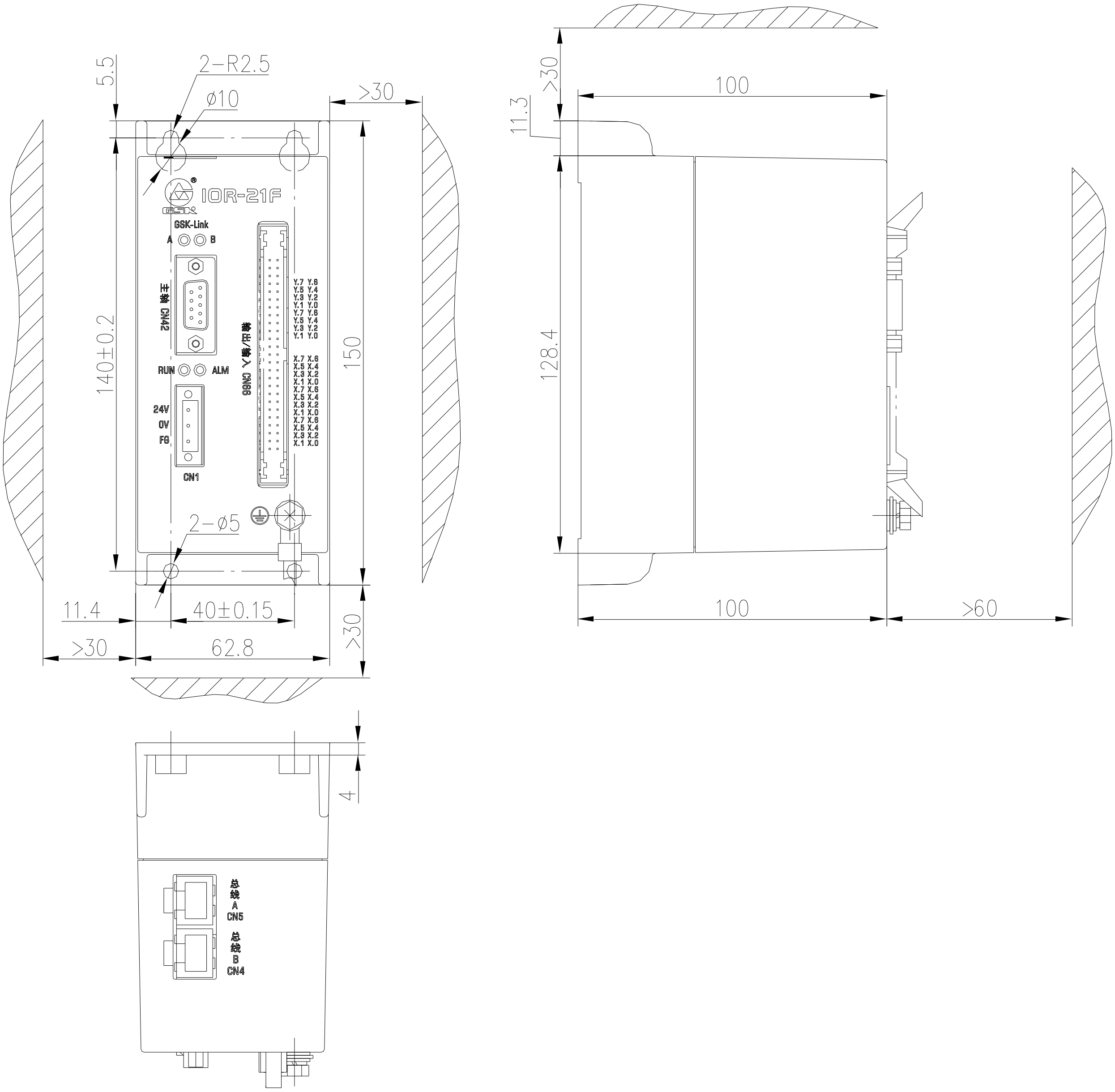
IOR-04T


≥30
20.1
50±0.1
2-R2.5
9
6
Ø10
305
290±0.3
90.2
2-Ø5
≥30
21.3
269.4
80
≥60
≥30
4
≥30
IOR-44T

IOR-44T

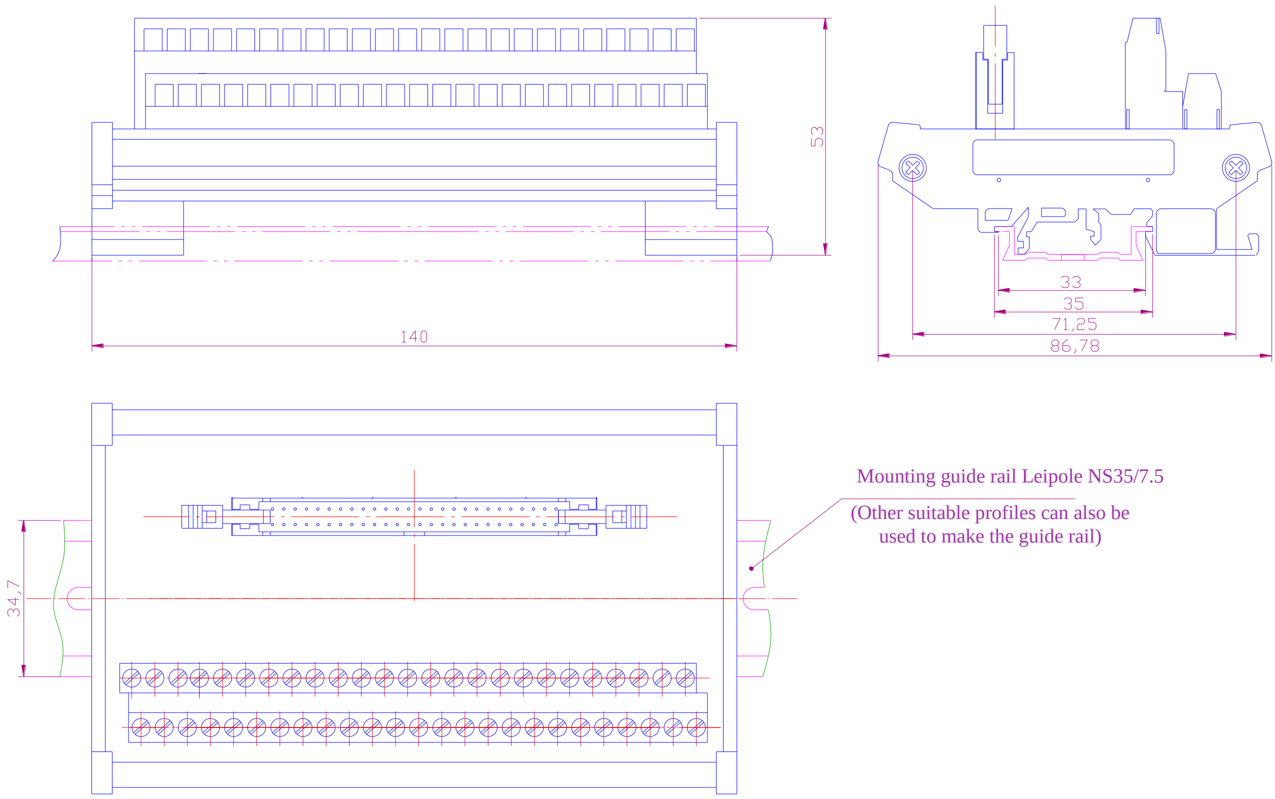

5.5
2-R2.5
ø10
IOR-13T
5.5
290±0.2
302
23.1
50±0.15
2-ø5
≥30
96.2
≥30
≥30
16
270
≥30
89
≥60

IOR-13T


5.5
2-R2.5
ø10
>30
IOR-21F
GSK-Link
A
B
主轴 CN42
RUN
ALM
24V
0V
FG
CN1
CN66
2-ø5
140±0.2
150
11.4
40±0.15
>30
62.8
>30
4
总线 A CN5
总线 B CN4
>30
100
11.3
128.4
100
>60

IOR-21F

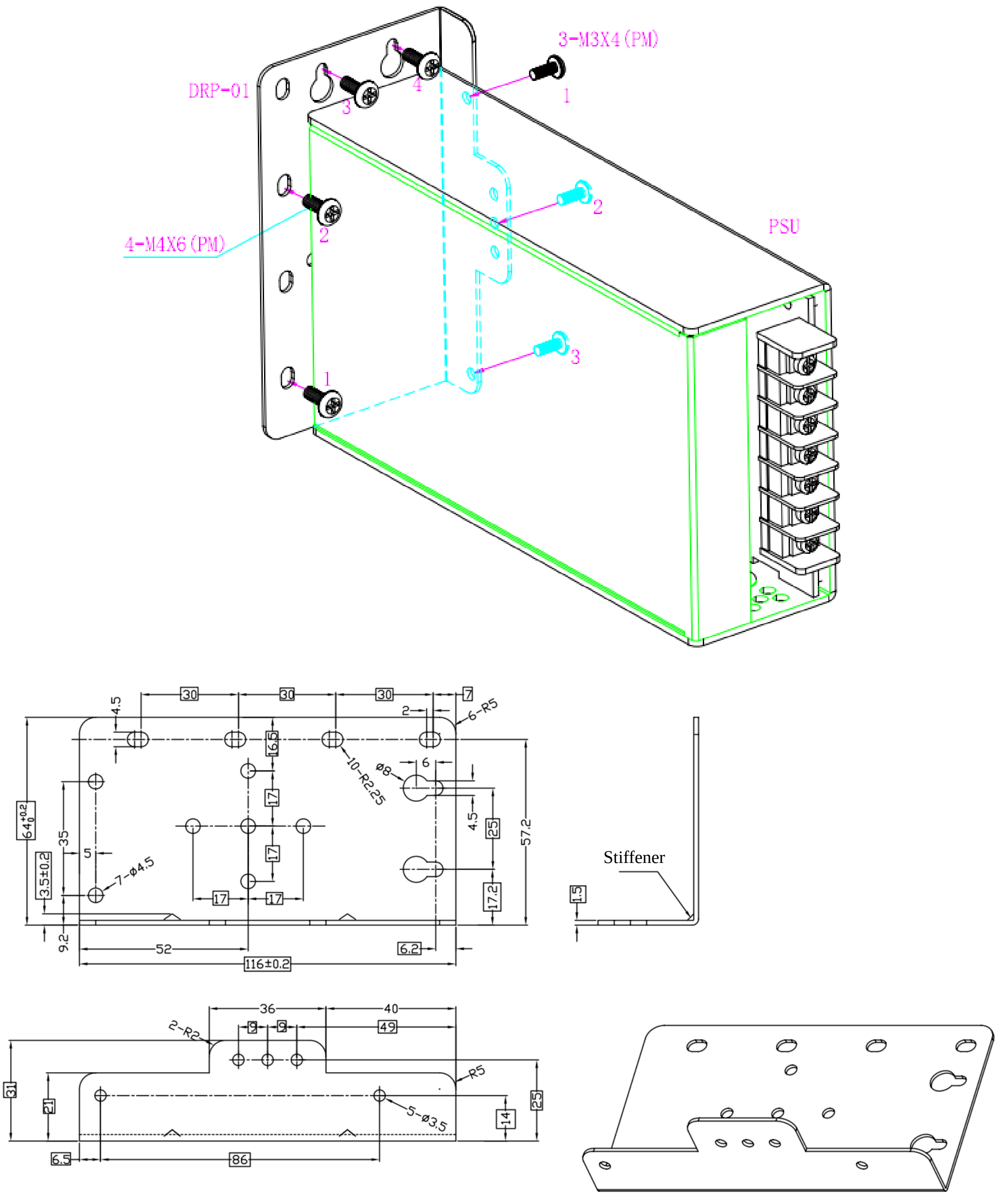
2.18 Splitter MCT07 (for IOL-02F/03F)



2.19 Installation method and dimension of switching power supply

Bracket installation method:

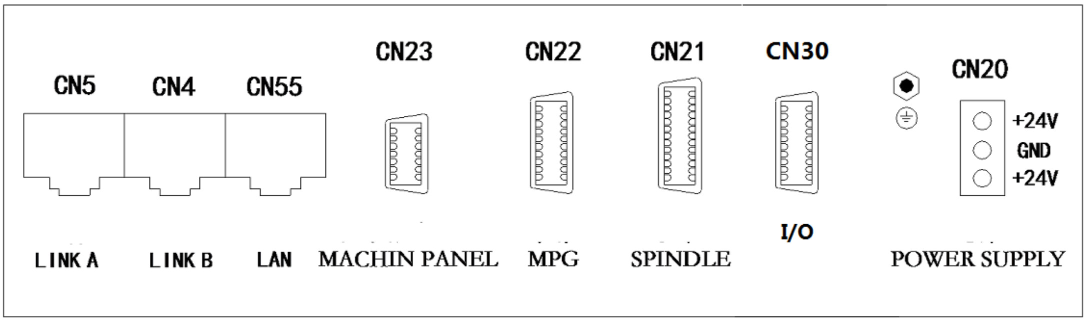
1. Use 3-M3X4 (PM) screws to fix the PSU and DRP-01.
2. Then use 4-M4X6 (PM) to fix the DRP-01 with the client system.



PDF-100 Series Mounting Bracket Assembly Diagram

Chapter III Host Interface of GSK25iMc/GSK25iTc System

3.1 System host interface



Note: CN30 is a standby I/O port that is currently not available to use. When a 15-inch host is used, this port will be the MDI panel communication port.

CN5: LINK A

Pin No.	Pin
1	TX1+
2	TX1−
3	RX1+
4	NC
5	NC
6	RX1−
7	NC
8	NC

CN4: LINK B

Pin No.	Pin
1	TX2+
2	TX2−
3	RX2+
4	NC
5	NC
6	RX2−
7	NC
8	NC

CN55: LAN

Pin No.	Pin
1	TX1+
2	TX1−
3	RX1+
4	NC
5	NC
6	RX1−
7	NC
8	NC

CN20: POWER SUPPLY

P24V
P0V
P24V

CN23: OPERATION PANEL INTERFACE

1	P24V	2	P24V
3	P0V	4	P0V
5	I03	6	RXD−
7	RXD+	8	DNCRX
9	DNCTX	10	P0V
11	P0V	12	I02
13	TXD+	14	TXD−

CN22: MPG INTERFACE

1	+5V	11	P_24V
2	HDCRX	12	HDCTX
3	STP	13	
4	LED	14	PB−
5	HX	15	PB+
6	HY	16	PA+
7	HZ	17	PA−
8	H4	18	X100
9	H5	19	X1
10	P_0V	20	X10

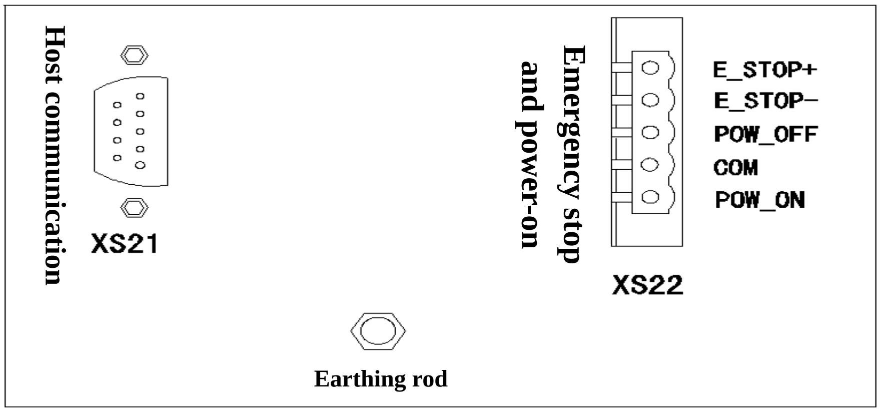
CN21: SPINDLE INTERFACE

1	SVC+	14	PZ−
2	I01	15	PZ+
3	SVC−	16	PB+
4	CP+	17	PB−
5	CP−	18	PA+
6	DIR−	19	PA−
7	DIR+	20	P_5V
8	ALM	21	P_0V
9	COIN	22	VP
10	ZSP	23	EN
11	VP0	24	STA0
12	SAR	25	ZSL
13	P_24V	26	ARST

Chapter IV Operation Panel Interface

The machine operation panel is divided into two types: mask structure and independent key structure. The biggest difference between them is that the independent key panel is a new design adding with an MPG pulse signal interface, a complete second MPG interface, 8-point 24V high-level input signal interface. For the 4-point low-level output signal, the power-on and -off control does not pass through the main board of the operation panel, but uses two independent keys and is wired by the customer. The mask structure operator panel remains the same as that used by the previous-generation GSK25iMb system.

4.1 Interface of mask structure machine operation panel



Machine Operation Panel Interface

1. Host communication interface XS21

1	P24V	2	—
3	P0V	4	PGND
5	—	6	RXD-
7	RXD+	8	DNC--RXD
9	DNC-TXD	10	GND
11	0V	12	—
13	TXD+	14	TXD-

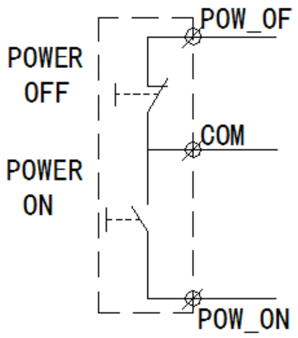
*TXD+, TXD-, RXD+, RXD-: Differential communication signals of RS485.

DNC-RXD, DNC-TXD: RS232 interface signals

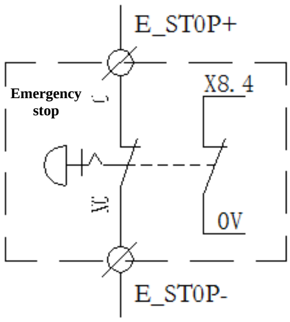
*0V: is the reference ground for the differential signals.

*P24V, P0V: 24V power input.

2. Emergency stop power-on interface XS22



Power-on interface

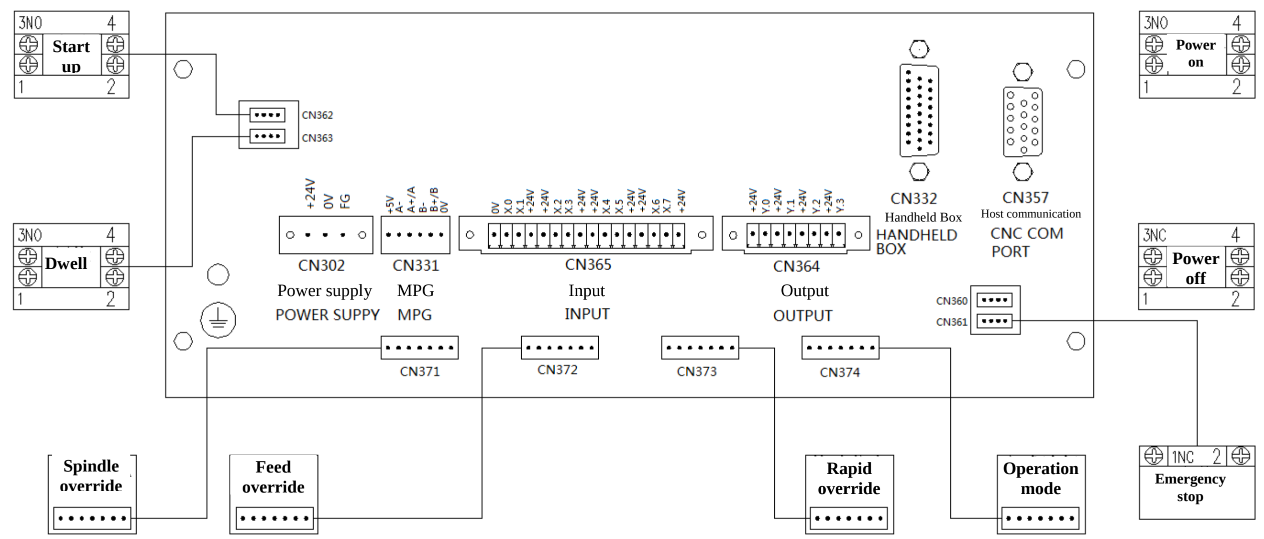


Description:
The emergency stop button has two groups of contacts
One group has connected the input signal X8.4 inside the operation panel
Another group is used for the emergency stop control of external equipment

Emergency stop interface

4.2 Interface of independent key structure machine operation panel

Independent Key Machine Operation Panel



1) Power supply CN302

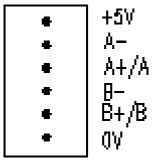
For the 24V power supply, the power interface adopts a 3-pin flanged 5.08-pitch socket, with FG connected to the ground, GND and 24V connected to the junction box, which is used for power-on on the operation panel.

<table>
<tr><td rowspan="4"></td><th colspan="3">CN302 Interface</th></tr>
<tr><th>Pin No.</th><th>Address</th><th>Function Description</th></tr>
<tr><td>1</td><td></td><td>24V</td></tr>
<tr><td>2</td><td></td><td>GND</td></tr>
</table>

	3		Earth

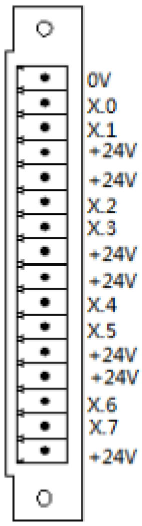
2) MPG interface

It can receive the TTL signal or the differential signal MPG. It is valid when Y121.7 is set to 0 in the PLC. When the system selection finishes, X121.7 will be automatically set to 0 to complete the selection.

	CN303 Interface		
	**Pin No.**	**Address**	**Function Description**
	1		5V
	2		A-
	3		A+/A
	4		B-
	5		B+/B
	6		0V

3) I/O input signal X

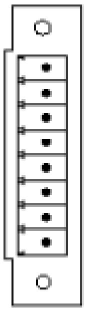
It has the same function as the I/O unit X signal, and is valid when a high level signal is connected.

	CN365 Interface		
	**Pin No.**	**PLC Address**	**Function Description**
	1		0V
	2	X122.0	X.0
	3	X122.1	X.1
	4		24V
	5		24V
	6	X122.2	X.2
	7	X122.3	X.3
	8		24V
	9		24V
	10	X122.4	X.4
	11	X122.5	X.5
	12		24V
	13		24V

	14	X122.6	X.6
	15	X122.7	X.7
	16		24V

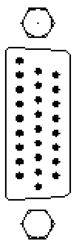
4) I/O output signal Y

It is the same as the Y signal of the I/O unit, and outputs 0V.

	CN364 Interface		
	Pin No.	**PLC Address**	**Function Description**
	1		24V
	2	Y121.0	Y.0
	3		24V
	4	Y121.1	Y.1
	5		24V
	6	Y121.2	Y.2
	7		24V
	8	Y121.3	Y.3

5) CN332 Interface of the Handheld Box

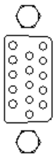
It is connected to the second MPG. It is valid when Y121.7 is set to 0 in the PLC. After the system selection finishes, X121.7 will be automatically set to 0 to complete the selection; HA+, HA-, HB+, HB- signals correspond to X124.0-X127.7. The signal between X124.0 and X127.7 will change when the MPG is turned.

	CN332 Interface								
	Pin No.	**PLC Address**	**Function Description**	**Pin No.**	**PLC Address**	**Function Description**	**Pin No.**	**PLC Address**	**Function Description**
 CN332 Handheld Box HANDHELD BOX	1	X124 ~ X127 Four bytes	HA+	10	——	GND	19	——	——
	2		HA-	11	——	GND	20	X123.4	MPGX2.1
	3		HB+	12	——	GND	21	——	——
	4		HB-	13	——	GND	22	X123.5	MPGX1.5
	5	X123.0	MPGX1.0	14	——	5V	23	X123.6	MPGX1.6
	6	X123.1	MPGX1.1	15	——	5V	24	X123.7	MPGX1.7
	7	——	——	16	——	5V	25	X121.2	MPGX1.3

	8	X123.2	MPGX1.2	17	——	24V	26	X121.3	MPGX2.0
	9	X123.3	MPGX1.4	18	——	24V			

6) Host communication CN357 interface

It is connected with the system host, and completes the transmission of input and output signals of the operation panel through 485 communication.



CN357
Host communication
CNC COM
PORT

CN357 Interface								
Pin No.	**Address**	**Function Description**	**Pin No.**	**Address**	**Function Description**	**Pin No.**	**Address**	**Function Description**
1		TXDA	6		GND	11		GND
2		TXDB	7		—	12		GND
3		GND	8		PGND	13		GND
4		RXDA	9		GND	14		PGND
5		RXDB	10		GND	15		PGND

7) The digital tube display and digital tube of the system operation panel corresponds to the PLC address

The first digit of the digital tube corresponds to

Y122.7	Y122.6	Y122.5	Y122.4
0	0	1	0

As shown in the table above, the binary 0010 is converted to 2 in decimal, and the first digit of the digital tube is 2.

The second digit of the digital tube corresponds to

Y122.3	Y122.2	Y122.1	Y122.0
0	0	1	1

As shown in the table above, the binary 0011 is converted to 3 in decimal, and the second digit of the digital tube is 3.

The third digit of the digital tube corresponds to

Y123.7	Y123.6	Y123.5	Y123.4
0	1	1	1

As shown in the table above, the binary 0111 is converted to 7 in decimal, and the third digit of the digital tube is 7.

The fourth digit of the digital tube corresponds to

Y123.3	Y123.2	Y123.1	Y123.0
1	0	0	0

As shown in the table above, the binary 1000 is converted to 8 in decimal, and the fourth digit of the digital tube is 8.

If set according to the above PLC parameters, the final digital tube display:

2	3	7	8

8) Operation panel switch:

Cycle Start Button Wiring		
CN362(J23)		Cycle Start Key Terminal Number
1 Input IN		3 (blue)
2 OUT 0V		2 (green)
3 24V		1 (red)
4 24V		4 (red)

Feed Hold Button Wiring		
CN363(J22)		Feed Hold Key Terminal Number
1 Input IN		3 (blue)
2 OUT 0V		2 (green)
3 24V		1 (red)
4 24V		4 (red)

Emergency Stop Button Wiring		
CN361 (J20)		Emergency Stop Switch Terminal Number
1 Input IN		1 (blue)
—		—

—		—
4 24V		2 (red)

Knob Switch Connection		
Emergency Stop Switch Terminal Number		Band Switch
CN371(J31)		Spindle override switch
CN372(J30)		Feed override switch
CN373(J29)		Fast override switch
CN374(J28)		Mode selection switch

Note: 1. The independent key structure panel and power-off control switch on the system adopt the two independent switches of power on (normally open) and power off (normally closed), which are directly available for use by the user through wiring. The 3rd and 4th pins of the button switch are switch contacts, and the 1st and 2nd pins are the 24V switching light power supply.

2. CN360 is reserved.

3. Facing the interface, the right side is the 1st pin.

Chapter V I/O Unit Interface

5.1 I/O unit specifications

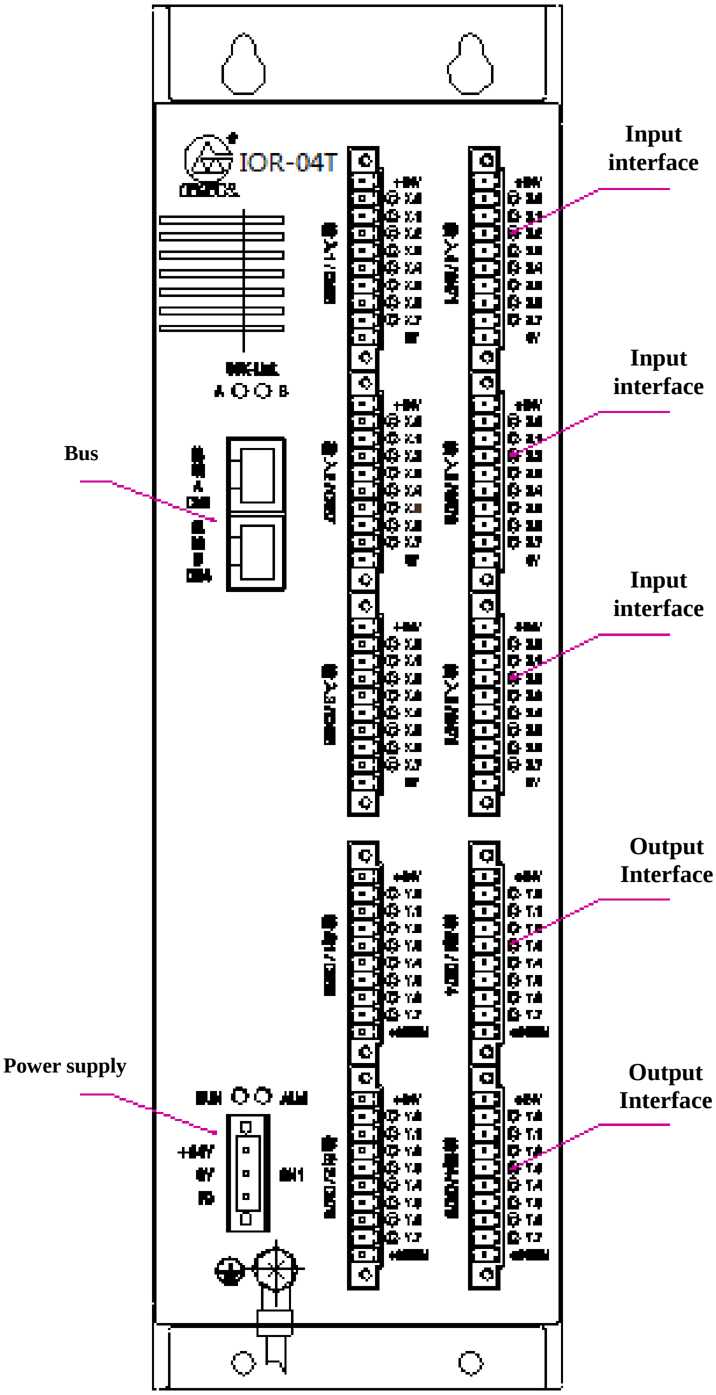
The GSK25iMc series products provide the following specifications of I/O units:

Table 5-1 I/O Unit Specification Table

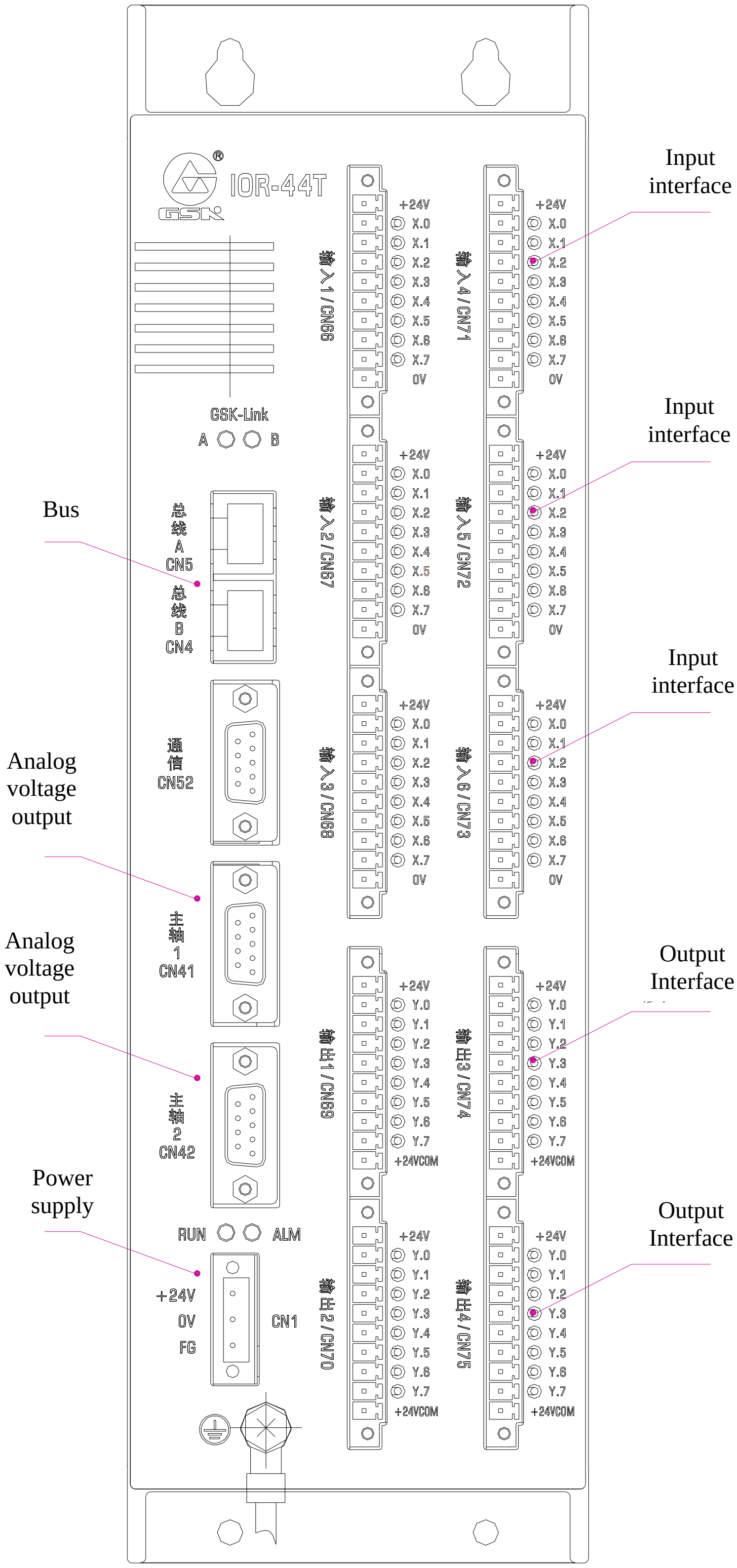
Name	I/O Points	Input/Output Type
IOR-44F	DI:48 DO:32 Analog voltage: 4 channels (0V~10V output)	50PIN horn socket High level input High level output
IOR-04T	DI:48 DO:32	Terminal wiring type High level input Low level output
IOR-44T	DI:48 DO:32 AO: 2 channels (0V~10V output)	Terminal wiring type High level input Low level output
IOR-21F	DI:24 DO:16 Analog voltage: 2 channels (0V~10V output)	50PIN horn socket High level input High level output
IOR-13T	DI:32 DO:24 Analog voltage: 4 channels (0V~10V output) Analog voltage: 4 channels (0V~10V input) Analog current: 4 channels (4mA~20mA input)	

Part I Installation and Connection

5.2 IOR-04T, IOR-44T interface

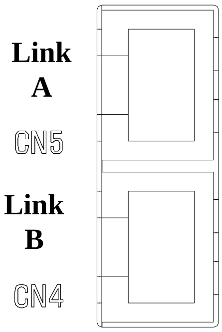


IOR-04T Interface

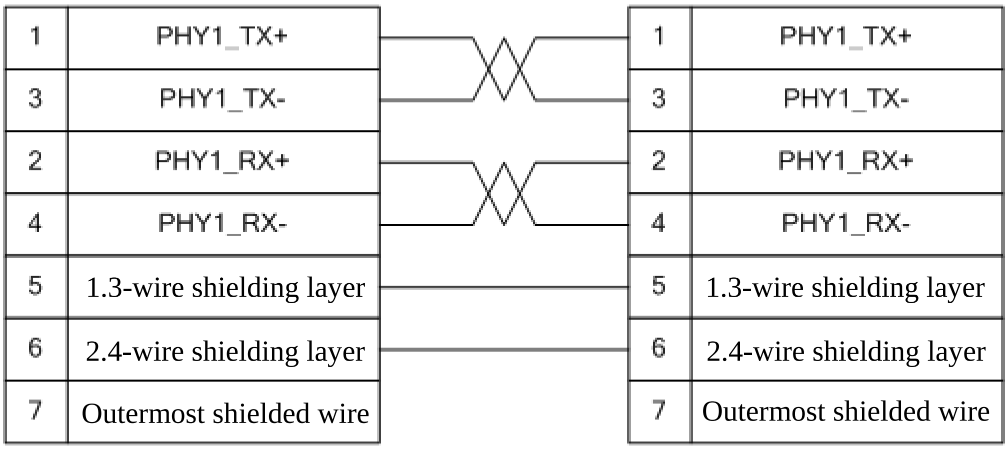


IOR-44T Interface

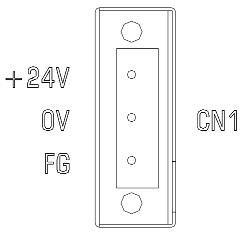
5.2.1 Industrial Ethernet bus interfaces CN5, CN4



The IOR series I/O unit and the CNC system are connected through the GSK-Link bus interface. The GSK-Link bus communication connection line is illustrated in the figure below:

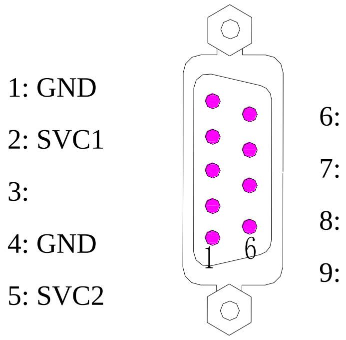


5.2.2 I/O unit power interface CN1



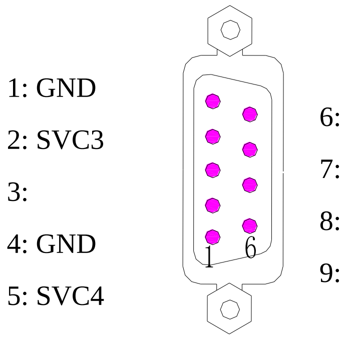
5.2.3 Analog voltage output interfaces CN41, CN42

- 1st spindle interface (9 pins)



Pin	Signal	Notes
1	GND	Signal ground
2	SVC1	1st channel analog output
4	GND	Signal ground
5	SVC2	2nd channel analog output

- 2nd spindle interface (9 pins)



Pin	Signal	Notes
1	GND	Signal ground
2	SVC3	3rd channel analog output
4	GND	Signal ground
5	SVC4	4th channel analog output

5.2.4 Input/output interface signal address

The system sets the input signal address on the I/O unit as X9~X14 by default, a total of 6 bytes and 48 points.

The system sets the output signal address on the I/O unit as Y8~Y11 by default, a total of 4 bytes and 32 points.

Among them, IOR-44T supports 4-channel analog voltage 0V~10V output.

When using multiple I/O expansion connections, according to the Ethernet connection sequence, the initial address can be set through parameters N2420 and N2421. The initial address of analog input and output can be set through parameters N2424 and N2425. For details about the settings, please refer to the following:

The first I/O: N2420=9, the input signal address is X9~X14, N2420=9; N2421=8, and the output signal address is Y8~Y11;

The second I/O: N2420=15, the input signal address is X15~X20, N2421=12, and the output signal address is Y12~Y15;

The third I/O: N2420=21, the input signal address is X21~X26, N2421=16, and the output signal address is Y16~Y19.

When using the analog voltage output, it must be continuously set in the order of the 1st, 2nd and 3rd I/O addresses, such as:

The first I/O analog output address, N2425=20, and the later I/O address needs to follow it and be set by at least 8 bytes.

1st channel analog output address: Y20-Y21.

2nd channel analog output address: Y22-Y23.

3rd channel analog output address: Y24-Y25.

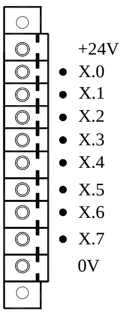
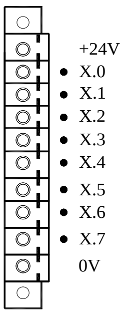
4th channel analog output address: Y26-Y27.

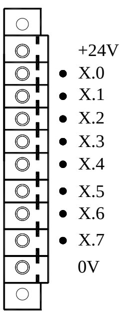
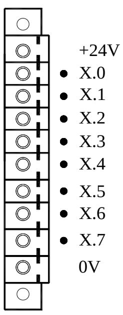
The analog voltage output corresponds to:

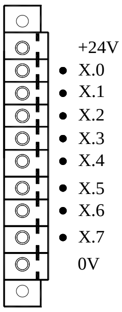
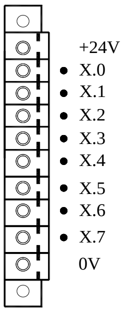
The analog voltage of 0V~10V corresponds to the two-byte output of Y20~Y21, which is proportional to 0~65535.

Note: The parameters should be correctly set according to the selected I/O input and output, and the address cannot be overlapped, with at least two setting intervals. The above example is used for reference only, and the current system software version shall prevail in actual use.

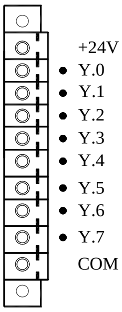
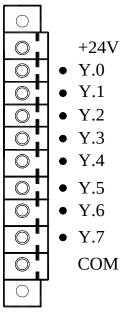
1) Definition of IOR-04T, IOR-44T input interface addresses

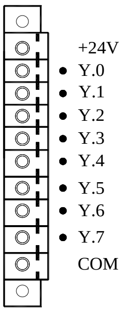
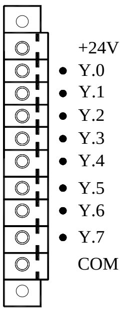
Input 1 (CN66)	Pin	Address	Input (CN71)	Pin	Address
	X.0	X9.0		X.0	X12.0
	X.1	X9.1		X.1	X12.1
	X.2	X9.2		X.2	X12.2
	X.3	X9.3		X.3	X12.3
	X.4	X9.4		X.4	X12.4
	X.5	X9.5		X.5	X12.5
	X.6	X9.6		X.6	X12.6
	X.7	X9.7		X.7	X12.7

Input 2 (CN67)	Pin	Address	Input (CN72)	Pin	Address
	X.0	X10.0		X.0	X13.0
	X.1	X10.1		X.1	X13.1
	X.2	X10.2		X.2	X13.2
	X.3	X10.3		X.3	X13.3
	X.4	X10.4		X.4	X13.4
	X.5	X10.5		X.5	X13.5
	X.6	X10.6		X.6	X13.6
	X.7	X10.7		X.7	X13.7

Input 3 (CN68)	Pin	Address	Input (CN73)	Pin	Address
	X.0	X11.0		X.0	X14.0
	X.1	X11.1		X.1	X14.1
	X.2	X11.2		X.2	X14.2
	X.3	X11.3		X.3	X14.3
	X.4	X11.4		X.4	X14.4
	X.5	X11.5		X.5	X14.5
	X.6	X11.6		X.6	X14.6
	X.7	X11.7		X.7	X14.7

2) Definition of IORL-04T, IOR-44T output interface addresses

Output 1 (CN69)	Pin	Address	Output (CN74)	Pin	Address
	Y.0	Y8.0		Y.0	Y10.0
	Y.1	Y8.1		Y.1	Y10.1
	Y.2	Y8.2		Y.2	Y10.2
	Y.3	Y8.3		Y.3	Y10.3
	Y.4	Y8.4		Y.4	Y10.4
	Y.5	Y8.5		Y.5	Y10.5
	Y.6	Y8.6		Y.6	Y10.6
	Y.7	Y8.7		Y.7	Y10.7

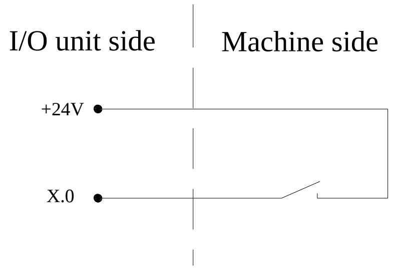
Output 2 (CN70)	Pin	Address	Output (CN75)	Pin	Address
	Y.0	Y9.0		Y.0	Y11.0
	Y.1	Y9.1		Y.1	Y11.1
	Y.2	Y9.2		Y.2	Y11.2
	Y.3	Y9.3		Y.3	Y11.3
	Y.4	Y9.4		Y.4	Y11.4
	Y.5	Y9.5		Y.5	Y11.5
	Y.6	Y9.6		Y.6	Y11.6
	Y.7	Y9.7		Y.7	Y11.7

The input signal can be extended up to X119, and the output signal can be extended up to Y119.

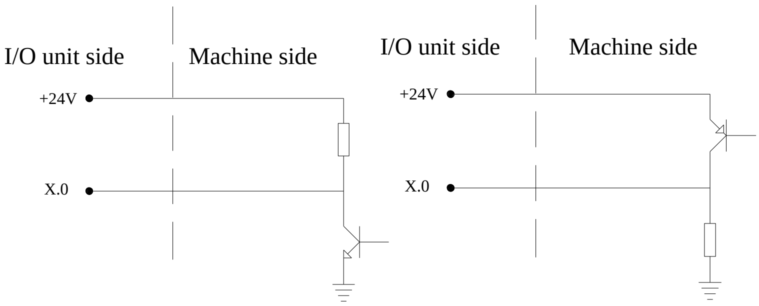
5.2.5 Input signal circuit connection

The input signal refers to the signal from the machine to the I/O unit. When the input signal is connected to 24V, the input is valid; when the input signal is disconnected from 24V, the input is invalid.

There are two methods for the external input of the input signal: one is to use the contact switch input, with the signal coming from the key on the machine side, limit switch and relay contact, etc. The connection is shown in the following figure:



Another method uses a contactless switch (transistor) input, with the connection illustrated as follows:



NPN type PNP type

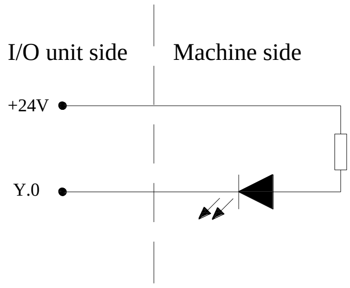
5.2.6 Output signal circuit connection

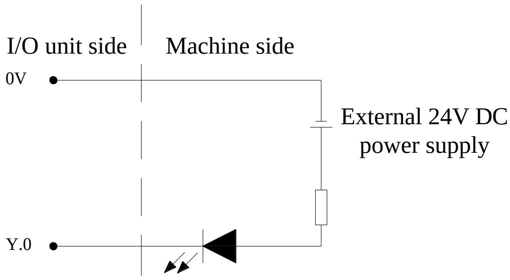
The output signal is used to drive the relay and indicator light on the machine side. When the output signal is connected to 0V, the output function is valid; when it is disconnected from 0V, the output function is invalid.

There are a total of 32 output signal points, all of which are output by ULN280-3, and the maximum current flowing through each point is 200mA.

- Drive LED

  The output signal to drive the LED requires a resistor in series to limit the current flowing through the LED (usually about 10mA). As shown in the following figure:

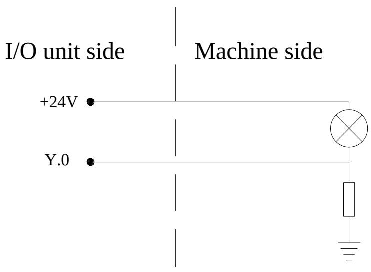


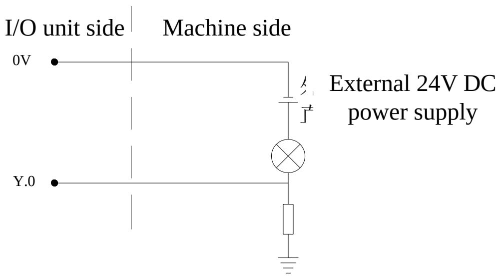


No external power supply   Use of an external DC power supply

- Drive filament type indicator light

  The output signal to drive the filament type indicator light requires an external preheating resistor to reduce the current impulse when it is connected. The preheating resistor should have a resistance value to ensure that the indicator light does not light up in principle, as shown in the figure below:

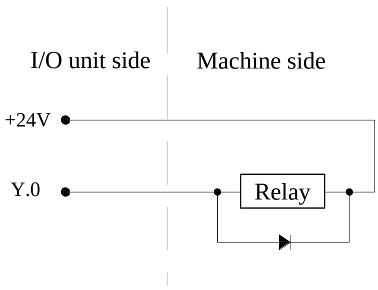


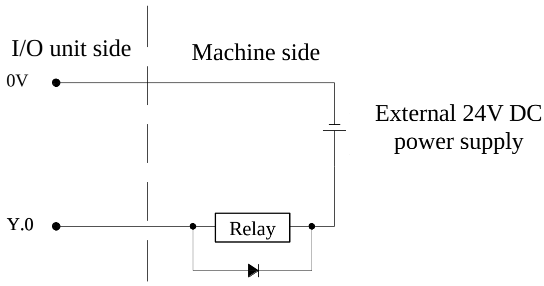


No external power supply   Use of an external DC power supply

- Drive inductive loads (such as relays)

  The output signal to drive an inductive load now requires a free-wheeling diode connected near the coil to protect the output circuit and reduce interference. As shown in the following figure:

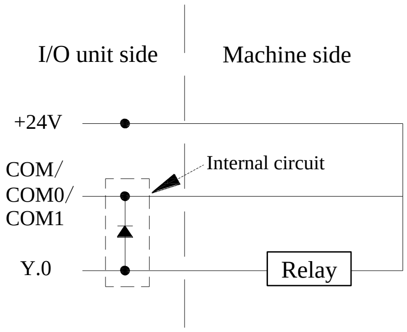




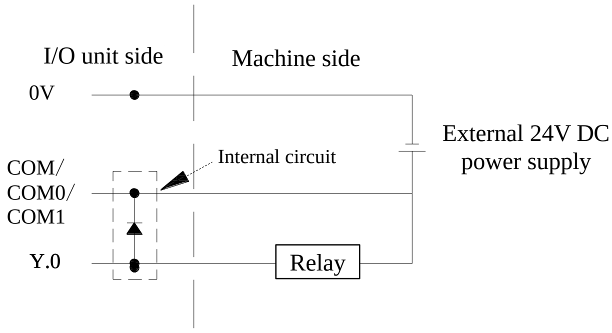
No external power supply   Use of an external DC power supply

5.2.7 COM ports for output signal

The COM, COM0, COM1 terminals in the output interface can be used when the output signal drives an inductive load without a free-wheeling diode. Its function is equivalent to a free-wheeling diode, and the wiring is shown in the following figure:



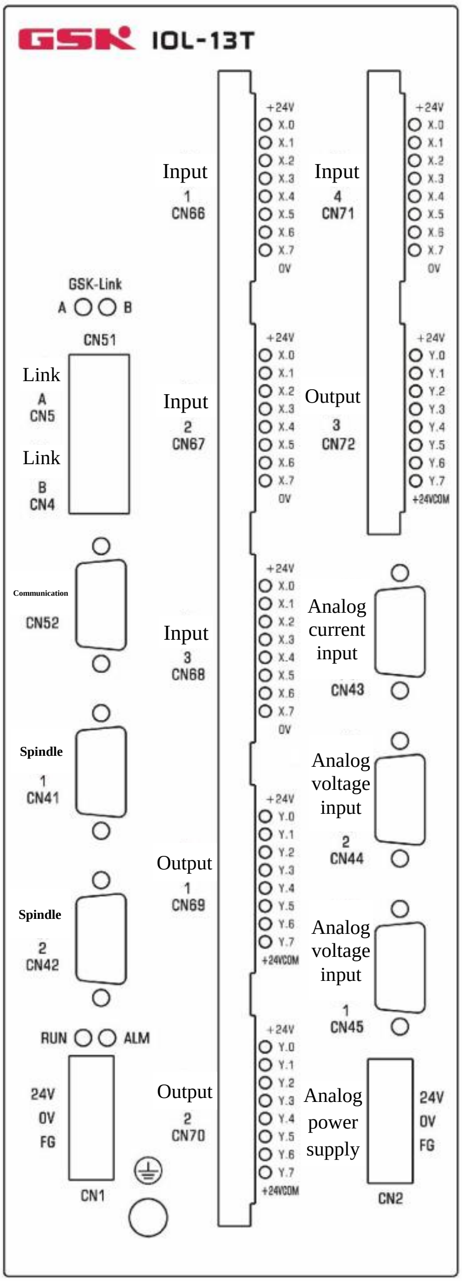
No external power supply



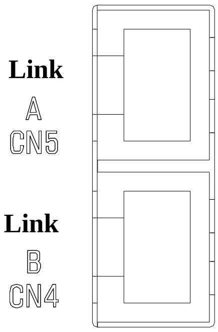
Use of an external DC power supply

Note: COM, COM0, COM1 terminals cannot be short-circuited with 0V.

5.3 IOR-13T interface



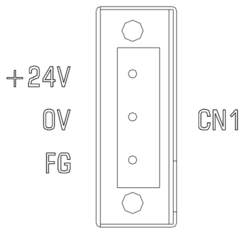
5.3.1 Industrial Ethernet bus interfaces CN5, CN4



The IOR series I/O unit and the CNC system are connected through the GSK-Link bus interface. The GSK-Link bus communication connection line is illustrated in the figure below:

1	PHY1_TX+	1	PHY1_TX+
3	PHY1_TX-	3	PHY1_TX-
2	PHY1_RX+	2	PHY1_RX+
4	PHY1_RX-	4	PHY1_RX-
5	1.3-wire shielding layer	5	1.3-wire shielding layer
6	2.4-wire shielding layer	6	2.4-wire shielding layer
7	Outermost shielded wire	7	Outermost shielded wire

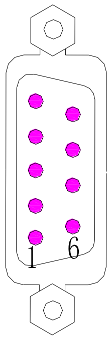
5.3.2 I/O unit power supply interface CN1



5.2.3 0V~10V analog voltage output interfaces CN41, CN42

■ 1st spindle interface CN41 (9-pin socket)

1: GND
2: SVC1
3:
4: GND
5: SVC2

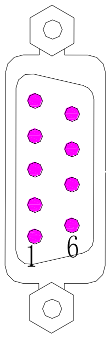


6:
7:
8:
9:

Pin	Signal	Notes
1	GND	Signal ground
2	SVC1	1^{st} channel analog output
4	GND	Signal ground
5	SVC2	2^{nd} channel analog output

■ 2^{nd} spindle interface CN42 (9-pin socket)

1: GND
2: SVC3
3:
4: GND
5: SVC4



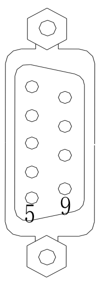
6:
7:
8:
9:

Pin	Signal	Notes
1	GND	Signal ground
2	SVC3	3^{rd} channel analog output
4	GND	Signal ground
5	SVC4	4^{th} channel analog output

5.3.4 0V~10V analog voltage input interfaces CN44, CN45

■ CN44 analog voltage input interface 1 (9-hole socket)

1:
2:
3:
4:
5:

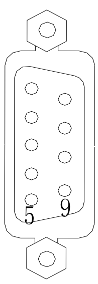


6: AV_IN1
7: GND
8: AV_IN2
9: GND

Pin	Signal	Notes
6	AV_IN1	1^{st} channel analog input
7	GND	Signal ground
8	AV_IN2	2^{nd} channel analog input
9	GND	Signal ground

■ CN45 analog voltage input interface 2 (9-hole socket)

1:
2:
3:
4:
5:

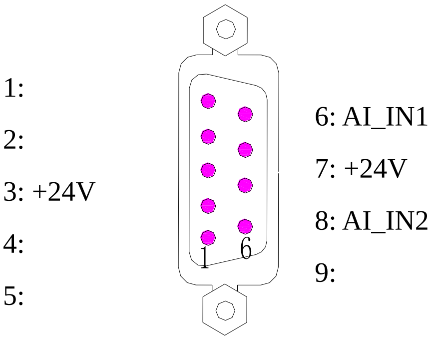


6: AV_IN1
7: GND
8: AV_IN2
9: GND

Pin	Signal	Notes
6	AV_IN1	3^{rd} channel analog input
7	GND	Signal ground
8	AV_IN2	4^{th} channel analog input
9	GND	Signal ground

5.3.5 4mA~20mA analog current input interface CN43

- 1st spindle interface (9-pin socket)



Pin	Signal	Notes
3	24V_OUT	24V analog power output
6	AI_IN1	1st channel analog current input
7	24V_OUT	24V analog power output
8	AI_IN2	Second channel analog current input

5.3.6 Input/output interface signal addresses

The system sets the input signal address on the I/O unit as X9~X12 by default, with a total of 4 bytes and 32 points.

The system sets the output signal address on the I/O unit as Y8~Y10 by default, with a total of 3 bytes and 24 points.

It supports quad-channel 0V~10V analog voltage output.

It supports quad-channel 4mA~20mA analog current input.

When using multiple I/O expansion connections, according to the Ethernet connection sequence, the initial address can be set through parameters N2420 and N2421. The initial address of analog input and output can be set through parameters N2424 and N2425. For details about the settings, please refer to the following:

First I/O: N2420=9, the input signal address is X9~X12, N2420=9; N2421=8, the output signal address is Y8~Y10;

Second I/O: N2420=15, the input signal address is X15~X18, N2421=12, the output signal address is Y12~Y14;

Third I/O: N2420=21, the input signal address is X21~X24, N2421=16, and the output signal address is Y16~Y18.

When the analog voltage output is used, it must be continuously set in the order of the 1st, 2nd and 3rd I/O addresses, such as:

The first I/O analog output address, N2425=20, and the later I/O address needs to follow it and be set by at least 8 bytes.

1st channel analog output address: Y20~Y21.

2nd analog output address: Y22~Y23.

3rd analog output address: Y24~Y25.

4th analog output address: Y26~Y27.

When the analog input is used, it must be continuously set in the order of the 1st, 2nd and 3rd I/O addresses, such as:

For the first I/O analog output address, N2424=20, the subsequent I/O address needs to follow it and be set by at least 8 bytes.

The addresses corresponding to the quad-channel 0 V~10V analog voltages are eight bytes from X20 to X27, with two bytes in sequence as one output.

The double-channel voltage of 4mA~20mA corresponds to the two-byte output of X28~Y29, X30~X31, which is proportional to 4000~20000.

1st channel analog voltage input address: X20~X21.

2nd channel analog voltage input address: X22~X23.

3rd channel analog voltage input address: X24~X25.

4th channel analog voltage input address: X26~X27.

1st channel analog current input address: X28~X29.

2nd channel analog current input address: X30~X31.

The analog voltage output corresponds to:

The 0V~10V current corresponds to two-byte input, in unit of 0.001mV.

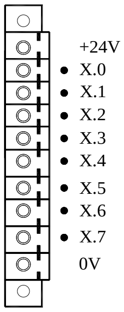
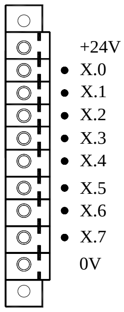
The analog current output corresponds to:

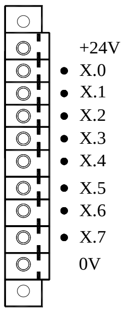
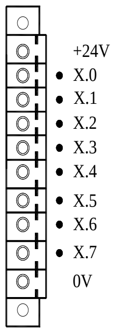
The 4mA~-20mA current corresponds to two-byte input, in unit of 0.001mA.

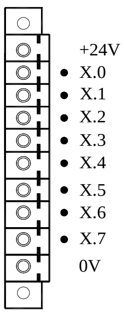
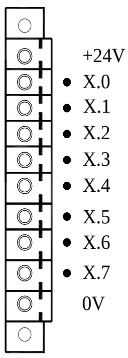
Note: 1. The parameters should be correctly set according to the selected I/O input and output, and the address cannot be overlapped, with at least two setting intervals. The above example is used for reference only, and the current system software version shall prevail in actual use.

2. The parameters should be correctly set according to the selected I/O input and output and the number of analog input and output points, and the addresses cannot be overlapped, with at least two setting intervals. The above example is used for reference only, and the current system software version shall prevail in actual use.

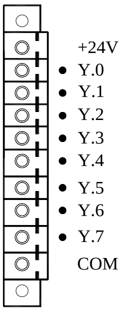
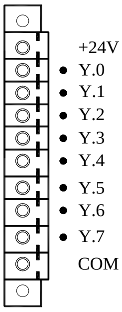
Definition of IOR-04T, IOR-44T input interface addresses

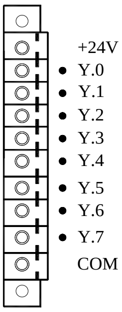
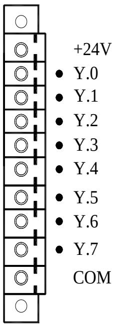
Input 1 (CN66)	Pin	Address	Input (CN71)	Pin	Address
	X.0	X9.0		X.0	X12.0
	X.1	X9.1		X.1	X12.1
	X.2	X9.2		X.2	X12.2
	X.3	X9.3		X.3	X12.3
	X.4	X9.4		X.4	X12.4
	X.5	X9.5		X.5	X12.5
	X.6	X9.6		X.6	X12.6
	X.7	X9.7		X.7	X12.7

Input 2 (CN67)	Pin	Address	Input (CN72)	Pin	Address
	X.0	X10.0		X.0	X13.0
	X.1	X10.1		X.1	X13.1
	X.2	X10.2		X.2	X13.2
	X.3	X10.3		X.3	X13.3
	X.4	X10.4		X.4	X13.4
	X.5	X10.5		X.5	X13.5
	X.6	X10.6		X.6	X13.6
	X.7	X10.7		X.7	X13.7

Input 3 (CN68)	Pin	Address	Input (CN73)	Pin	Address
	X.0	X11.0		X.0	X14.0
	X.1	X11.1		X.1	X14.1
	X.2	X11.2		X.2	X14.2
	X.3	X11.3		X.3	X14.3
	X.4	X11.4		X.4	X14.4
	X.5	X11.5		X.5	X14.5
	X.6	X11.6		X.6	X14.6
	X.7	X11.7		X.7	X14.7

1) Definition of IORL-04T, IOR-44T output interface addresses

Output 1 (CN69)	Pin	Address	Output (CN72)	Pin	Address
	Y.0	Y8.0		Y.0	Y10.0
	Y.1	Y8.1		Y.1	Y10.1
	Y.2	Y8.2		Y.2	Y10.2
	Y.3	Y8.3		Y.3	Y10.3
	Y.4	Y8.4		Y.4	Y10.4
	Y.5	Y8.5		Y.5	Y10.5
	Y.6	Y8.6		Y.6	Y10.6
	Y.7	Y8.7		Y.7	Y10.7

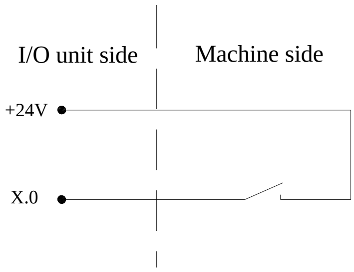
Output 2 (CN70)	Pin	Address	Output (CN75)	Pin	Address
	Y.0	Y9.0		Y.0	Y11.0
	Y.1	Y9.1		Y.1	Y11.1
	Y.2	Y9.2		Y.2	Y11.2
	Y.3	Y9.3		Y.3	Y11.3
	Y.4	Y9.4		Y.4	Y11.4
	Y.5	Y9.5		Y.5	Y11.5
	Y.6	Y9.6		Y.6	Y11.6
	Y.7	Y9.7		Y.7	Y11.7

The input signal can be extended up to X119, and the output signal can be extended up to Y119.

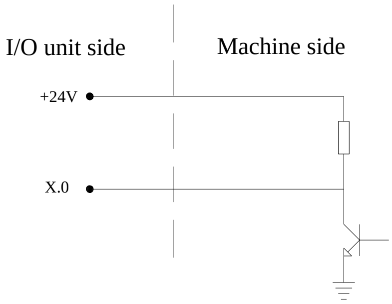
5.3.7 Input signal circuit connection

The input signal refers to the signal from the machine to the I/O unit. When the input signal is connected to 24V, the input is valid; when the input signal is disconnected from 24V, the input is invalid.

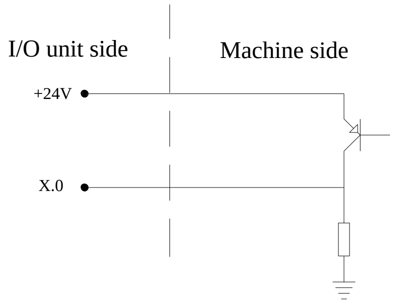
There are two methods for the external input of the input signal: one is to use the contact switch input, with the signal coming from the key on the machine side, limit switch and relay contact, etc. The connection is shown in the following figure:



Another method uses a contactless switch (transistor) input, with the connection illustrated as follows:



NPN type



PNP type

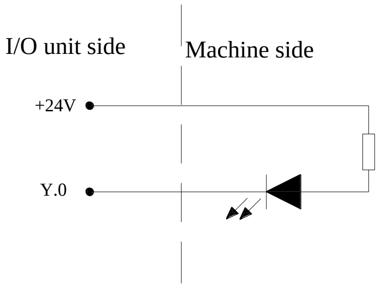
5.3.8 Output signal circuit connection

The output signal is used to drive the relay and indicator light on the machine side. When the output signal is connected to 0V, the output function is valid; when it is disconnected from 0V, the output function is invalid.

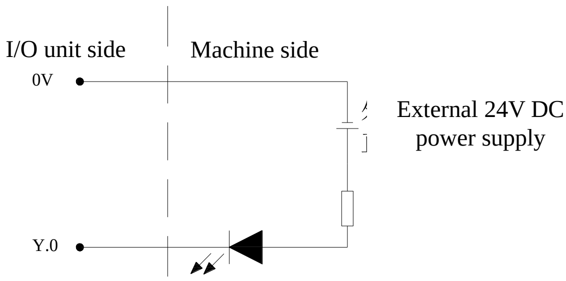
There are a total of 32 output signal points, all of which are output by ULN280-3, and the maximum current flowing through each point is 200mA.

- Drive LED

  The output signal to drive the LED requires a resistor in series to limit the current flowing through the LED (usually about 10mA). As shown in the following figure:



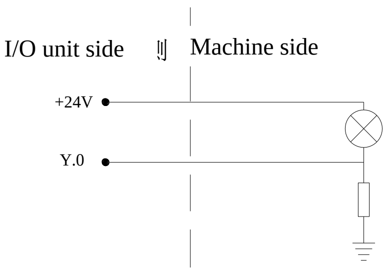
No external power supply



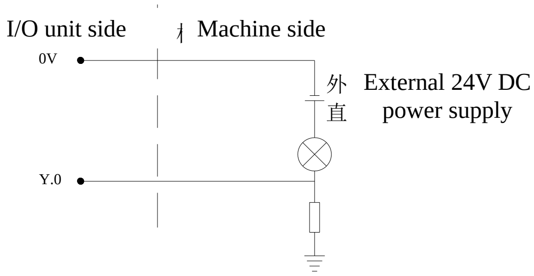
Use of an external DC power supply

- Drive filament type indicator light

  The output signal to drive the filament type indicator light requires an external preheating resistor to reduce the current impulse when it is connected. The preheating resistor should have a resistance value to ensure that the indicator light does not light up in principle, as shown in the figure below:

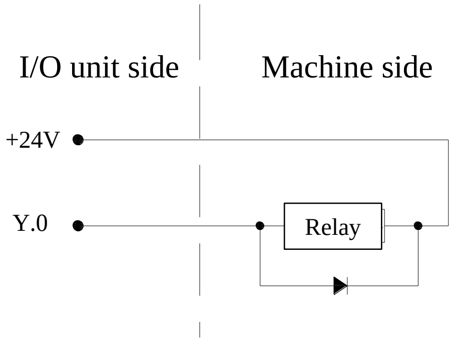


No external power supply

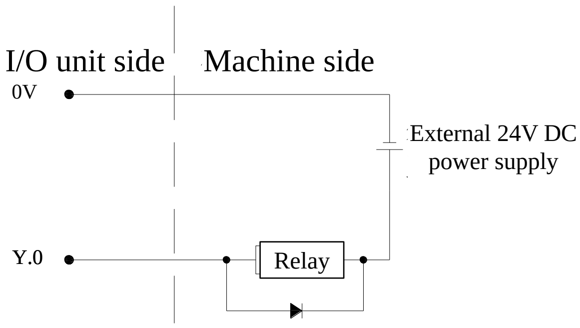


Use of an external DC power supply

- Drive inductive loads (such as relays)
  The output signal to drive an inductive load now requires a free-wheeling diode connected near the coil to protect the output circuit and reduce interference. As shown in the following figure:



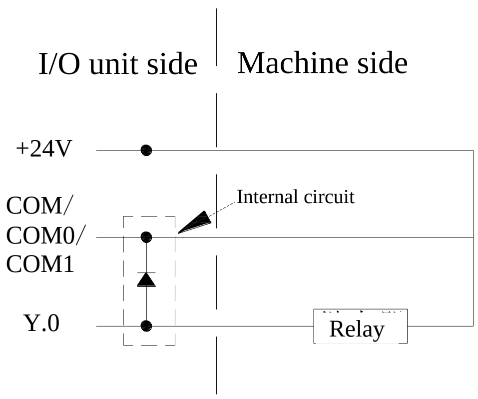
No external power supply



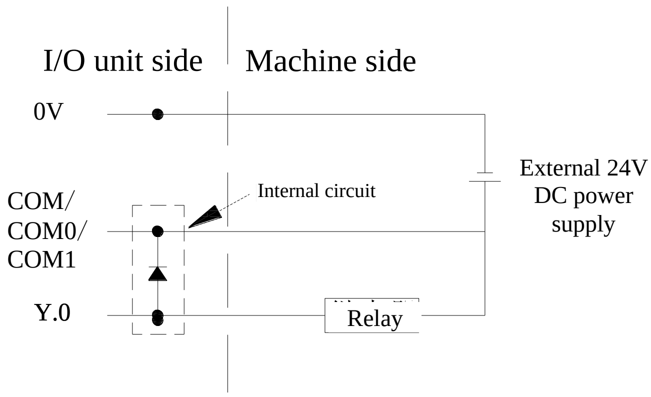
Use of an external DC power supply

5.3.9 COM interface for output signal

The COM, COM0, COM1 terminals in the output interface can be used when the output signal drives an inductive load without a free-wheeling diode. Its function is equivalent to a free-wheeling diode, and the wiring is shown in the following figure:



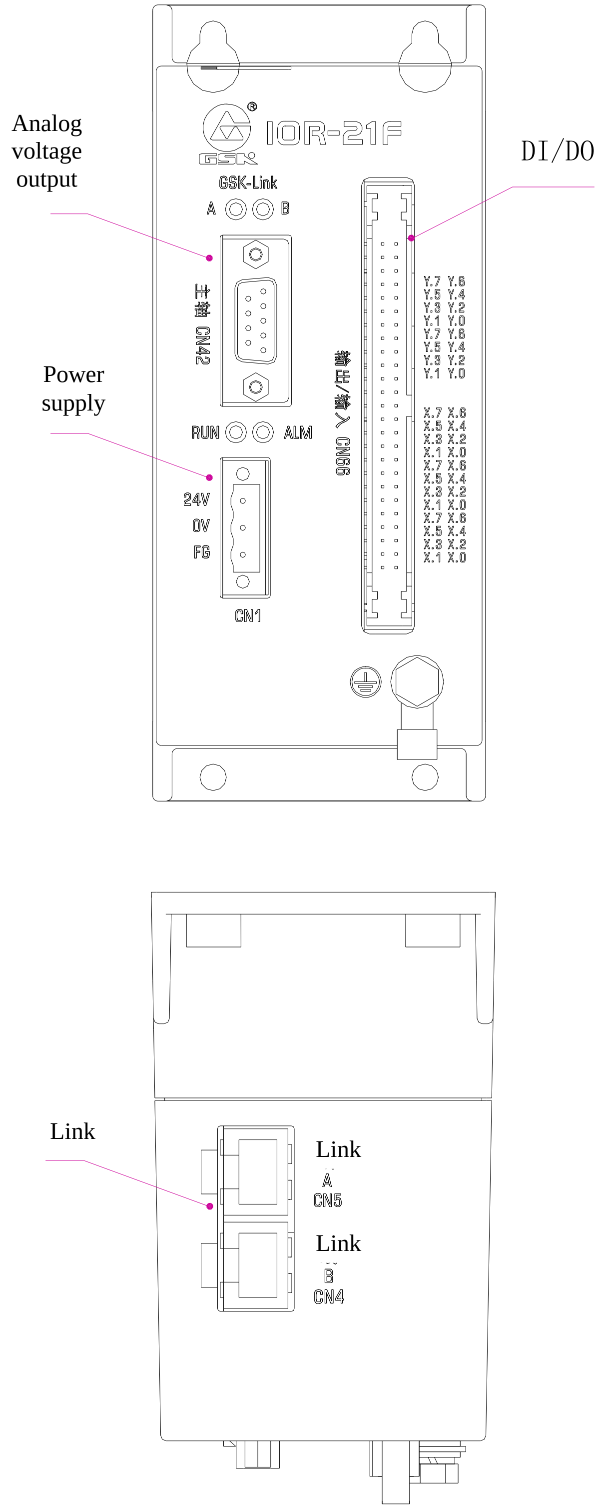
No external power supply



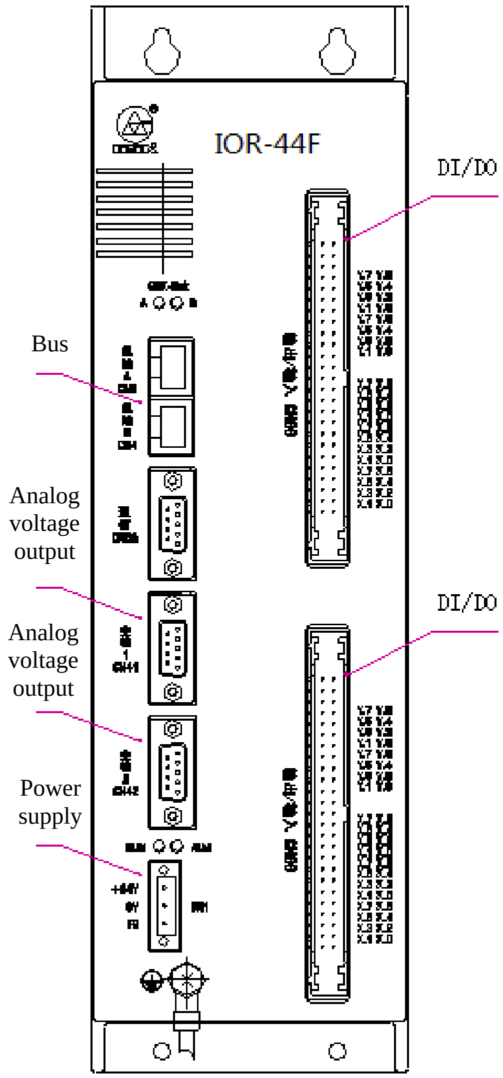
Use of an external DC power supply

Note: COM, COM0, COM1 terminals cannot be short-circuited with 0V.

5.4 IOR-21F, IOR-44F, IOR-44F (PMOS) interfaces

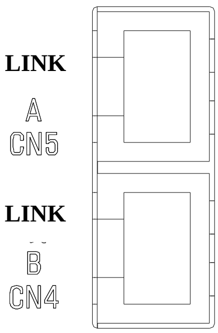


IOR-21F Interface

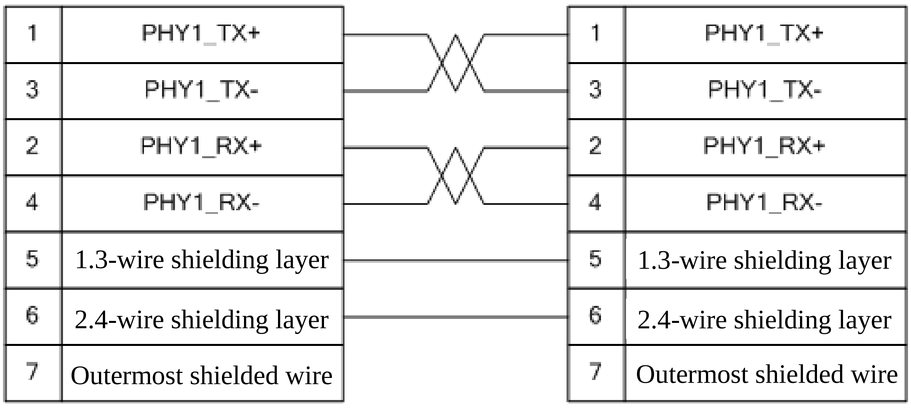


IOR-44F Interface

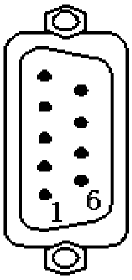
5.4.1 Industrial Ethernet bus interfaces CN5, CN4



The IOR series I/O unit and the CNC system are connected through the GSK-Link bus interface. The GSK-Link bus communication connection line is illustrated in the figure below:



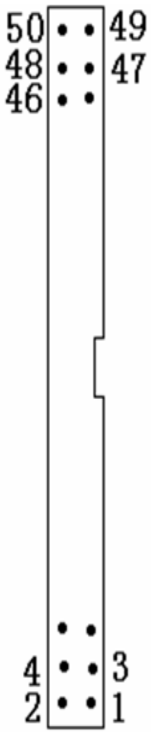
5.4.2 Analog output interface CN42



Signal Definition	Signal Description
1: GND	Analog voltage output ground
2: I/O-AOT1	0V~10V analog voltage output
4: GND	Analog voltage output ground
5: I/O-AOT0	0V~10V second channel analog voltage output

5.4.3 Digital input and output signal interfaces CN66, CN67

The I/O point is a single 50PIN horn socket, which is valid for high-level input, with high-level output.

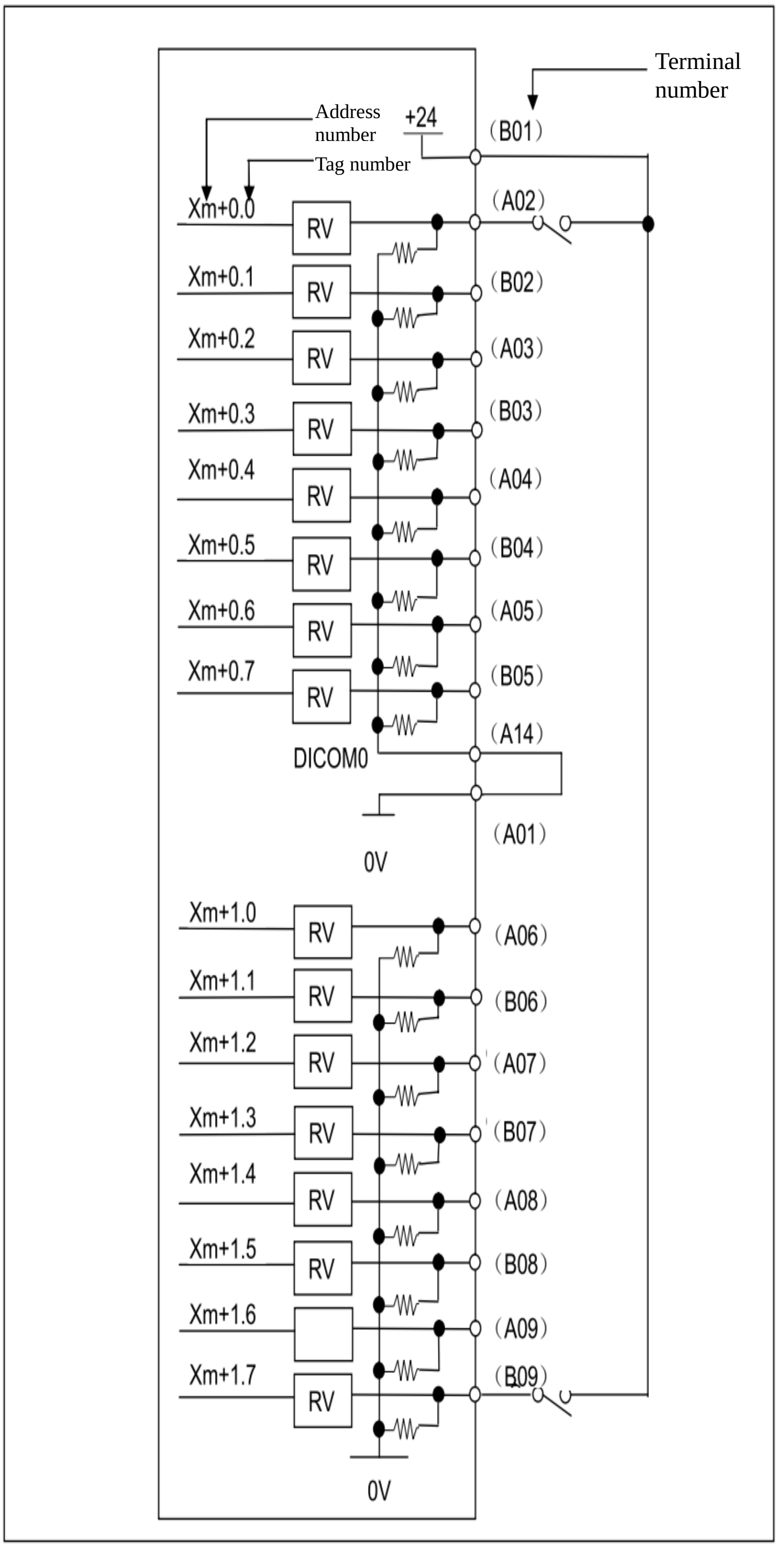


Input 1/Output 1 CN66	1: 0V 2: 24V 3~26: X9.0~X11.7 27~30: Empty 31~46: Y8.0~Y9.7 47~50: VCOM
Input 2/Output 2 CN67	1: 0V 2: 24V 3~26: X12.0~X14.7 27~30: Empty 31~46: Y10.0~Y11.7 47~50: VCOM

CN66, CN67 Plug Pin Assignment

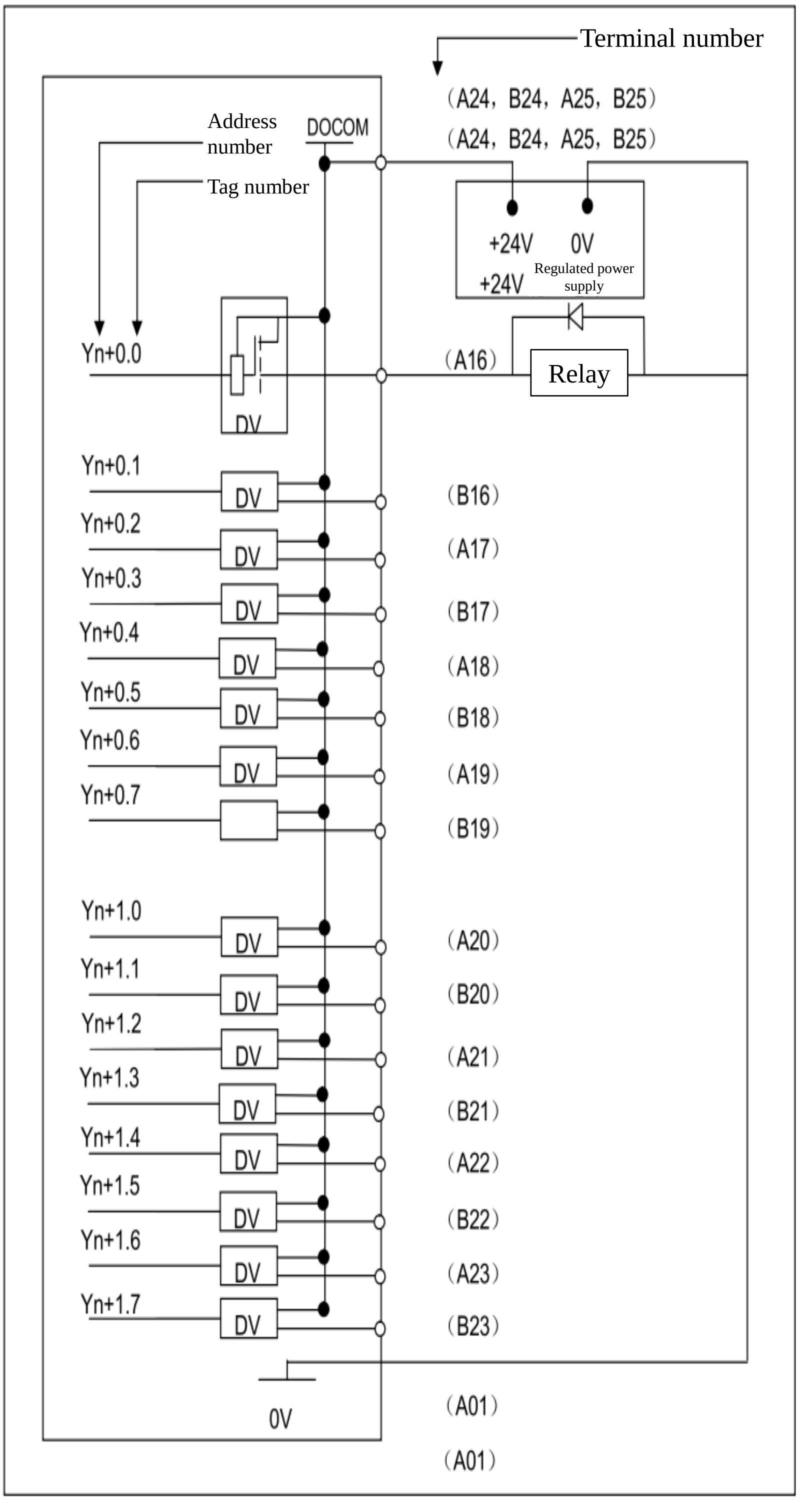
Note: The signal is IOR-44F (PMOS), the pins 47-50 are overhead, and the I/O unit has been internally connected to 24V.

- **Input signal connection**

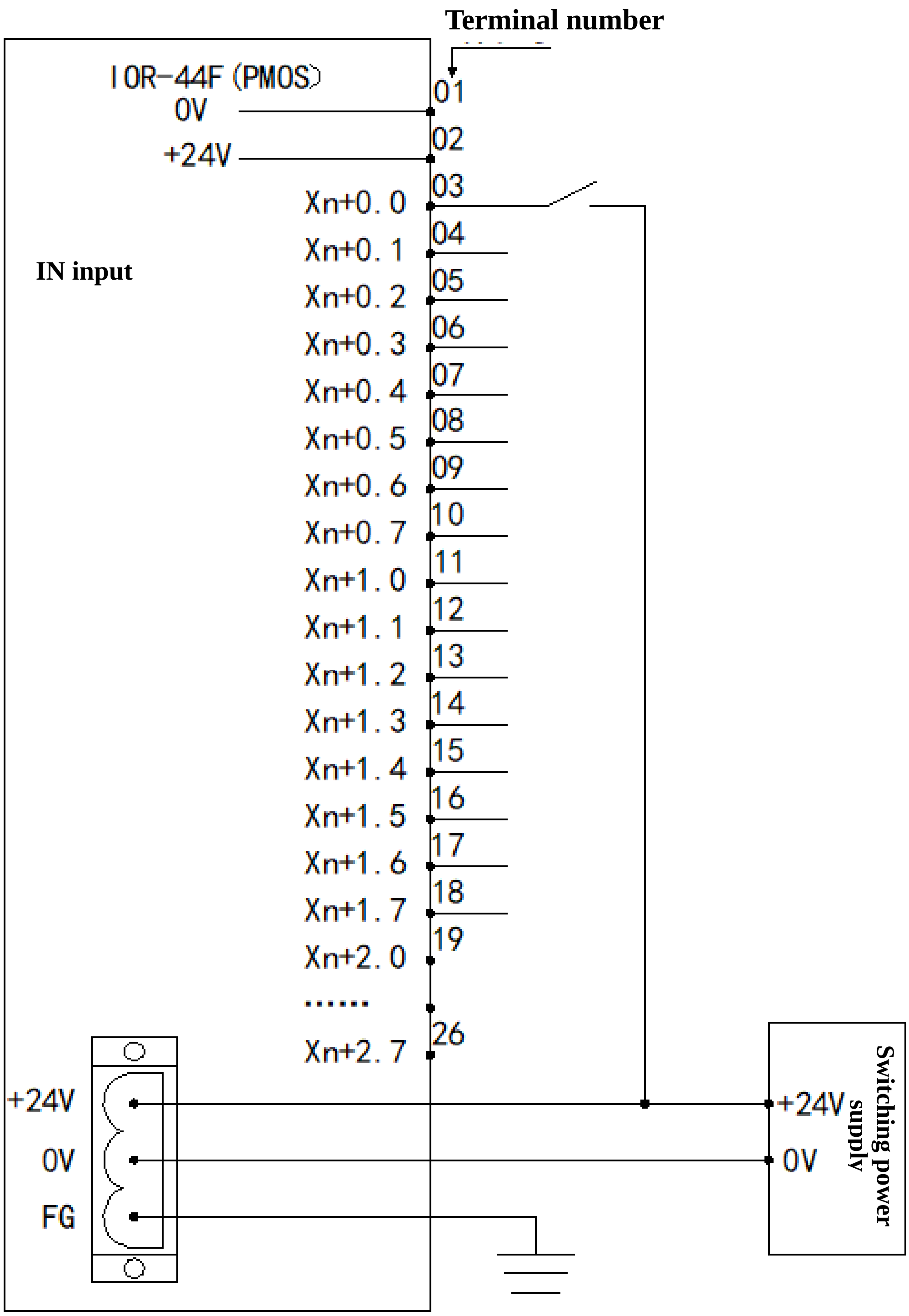


IOR-44F Input Signal Connection Diagram

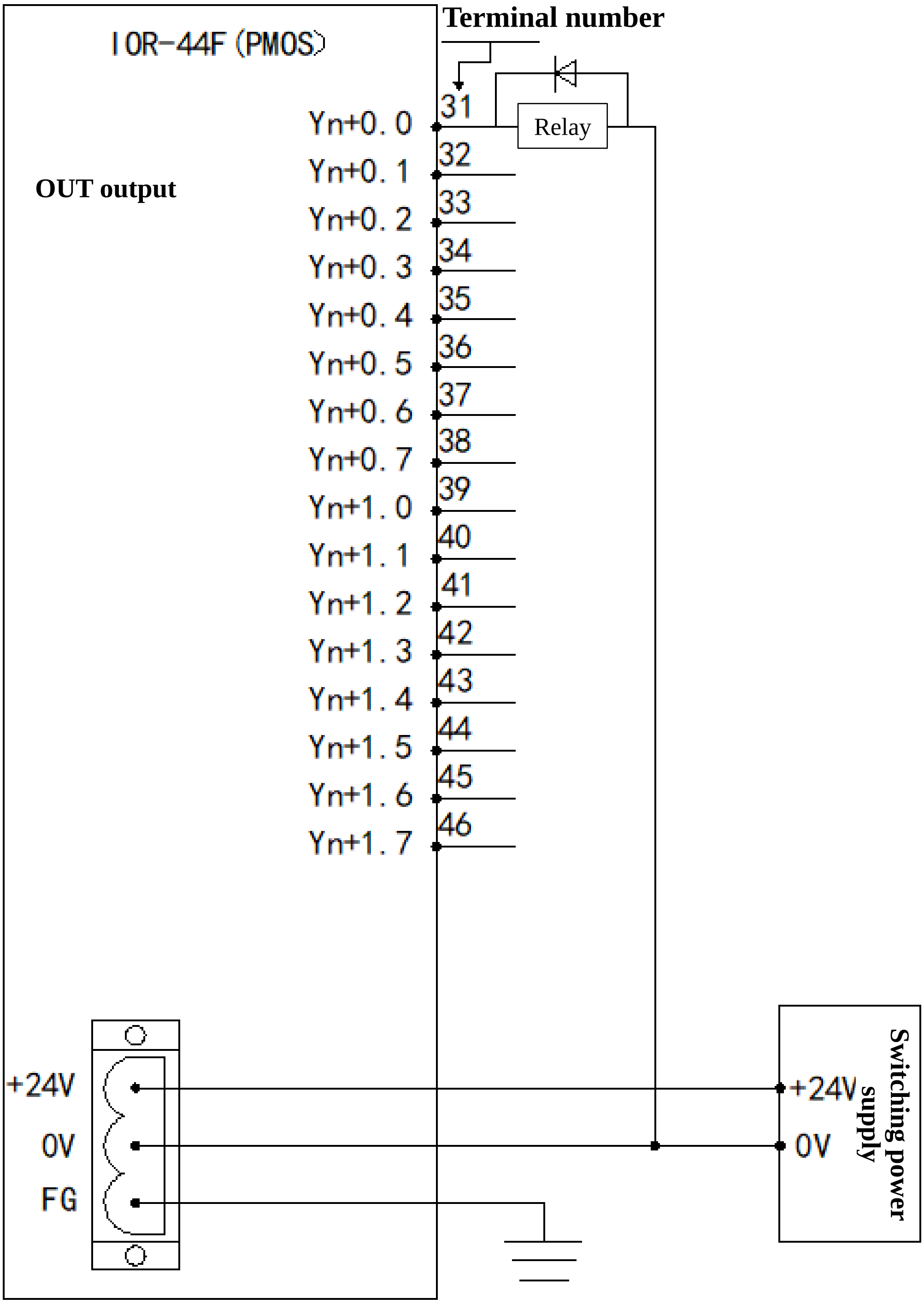
● **Output signal connection**



IOR-44F Output Signal Connection Diagram



IOR-44F (PMOS) Input Signal Connection Diagram



IOR-44F (PMOS) Output Signal Connection Diagram

Description of Digital Input and Output Signal Interface

CN66				**Default PLC Address**		**CN67**				**Default PLC Address**	
Pin number						Pin number					
01	02	0V	+24V			01	02	0V	+24		
03	04	Xm+0.0	Xm+0.1	X9.0	X9.1	03	04	Xm+3.0	Xm+3.1	X12.0	X12.1
05	06	Xm+0.2	Xm+0.3	X9.2	X9.3	05	06	Xm+3.2	Xm+3.3	X12.2	X12.3
07	08	Xm+0.4	Xm+0.5	X9.4	X9.5	07	08	Xm+3.4	Xm+3.5	X12.4	X12.5
09	10	Xm+0.6	Xm+0.7	X9.6	X9.7	09	10	Xm+3.6	Xm+3.7	X12.6	X12.7
11	12	Xm+1.0	Xm+1.1	X10.0	X10.1	11	12	Xm+4.0	Xm+4.1	X13.0	X13.1
13	14	Xm+1.2	Xm+1.3	X10.2	X10.3	13	14	Xm+4.2	Xm+4.3	X13.2	X13.3
15	16	Xm+1.4	Xm+1.5	X10.4	X10.5	15	16	Xm+4.4	Xm+4.5	X13.4	X13.5
17	18	Xm+1.6	Xm+1.7	X10.6	X10.7	17	18	Xm+4.6	Xm+4.7	X13.6	X13.7
19	20	Xm+2.0	Xm+2.1	X11.0	X11.1	19	20	Xm+5.0	Xm+5.1	X14.0	X14.1
21	22	Xm+2.2	Xm+2.3	X11.2	X11.3	21	22	Xm+5.2	Xm+5.3	X14.2	X14.3
23	24	Xm+2.4	Xm+2.5	X11.4	X11.5	23	24	Xm+5.4	Xm+5.5	X14.4	X14.5
24	26	Xm+2.6	Xm+2.7	X11.6	X11.7	24	26	Xm+5.6	Xm+5.7	X14.6	X14.7
27	28					27	28				
29	30					29	30				
31	32	Yn+0.0	Yn+0.1	Y8.0	Y8.1	31	32	Yn+2.0	Yn+2.1	Y10.0	Y10.1
33	34	Yn+0.2	Yn+0.3	Y8.2	Y8.3	33	34	Yn+2.2	Yn+2.3	Y10.2	Y10.3
35	36	Yn+0.4	Yn+0.5	Y8.4	Y8.5	35	36	Yn+2.4	Yn+2.5	Y10.4	Y10.5
37	38	Yn+0.6	Yn+0.7	Y8.6	Y8.7	37	38	Yn+2.6	Yn+2.7	Y10.6	Y10.7
39	40	Yn+1.0	Yn+1.1	Y9.0	Y9.1	39	40	Yn+3.0	Yn+3.1	Y11.0	Y11.1
41	42	Yn+1.2	Yn+1.3	Y9.2	Y9.3	41	42	Yn+3.2	Yn+3.3	Y11.2	Y11.3
43	44	Yn+1.4	Yn+1.5	Y9.4	Y9.5	43	44	Yn+3.4	Yn+3.5	Y11.4	Y11.5
45	46	Yn+1.6	Yn+1.7	Y9.6	Y9.7	45	46	Yn+3.6	Yn+3.7	Y11.6	Y11.7
47	48	*DOCOM	*DOCOM			47	48	*DOCOM	*DOCOM		
49	50	*DOCOM	*DOCOM			49	50	*DOCOM	*DOCOM		

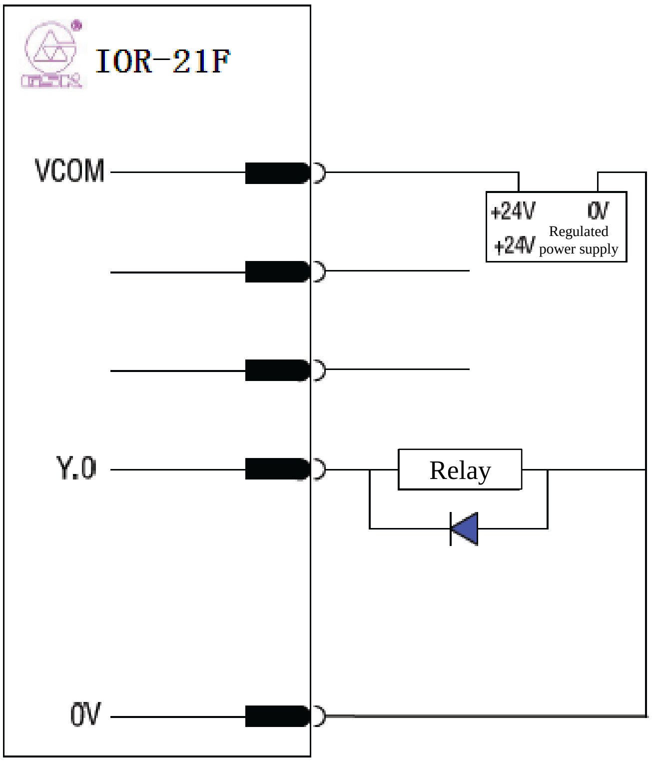
Note: 1. The address of the initial input signal can be set by parameter 2420, and defaulted as X9 in the system.

2. The address of the initial output signal can be set by parameter 2421, and defaulted as Y8 in the system.

3. The standard PLC is edited according to the default address of the system.

4. * represents the new I/O unit IOR-44F (PMOS) delivered since March 2021, and the 47-50 pins have been internally connected to 24V.

A wiring application for driven relay:

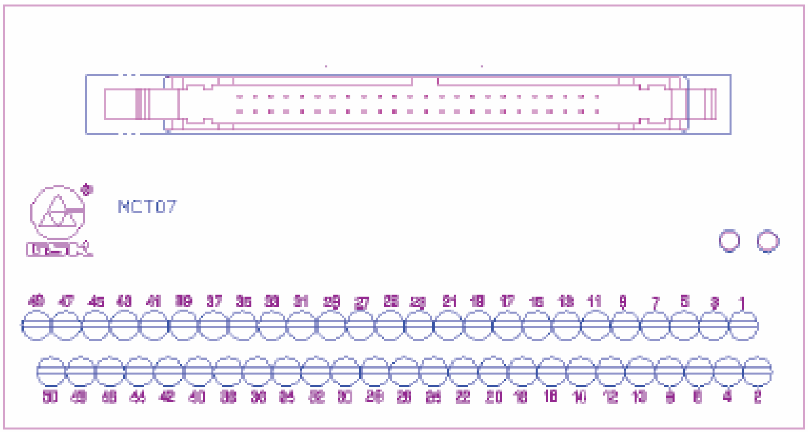


Output Signal Connection Diagram

Note: 1. Only when "VCOM" is connected to the 24V external power supply, and the 0V external power supply and the 0V I/O unit are connected together, there will be output from IOR-21F, IOR-44F; vice versa.

2. For the new I/O unit IOR-44F (PMOS) delivered since March 2021, no wiring is needed for 47-50.

In addition, IOL-21F and IOR-44F can be adapted to our company's I/O unit splitter "MCT-07" to connect with the horn socket for ease of wiring.



Note: 1. When the GSK-Link communication fails or the power supply of the I/O unit is disconnected, all output signals of the I/O unit are disconnected, so care should be taken when designing the machine tool circuit and PLC program.

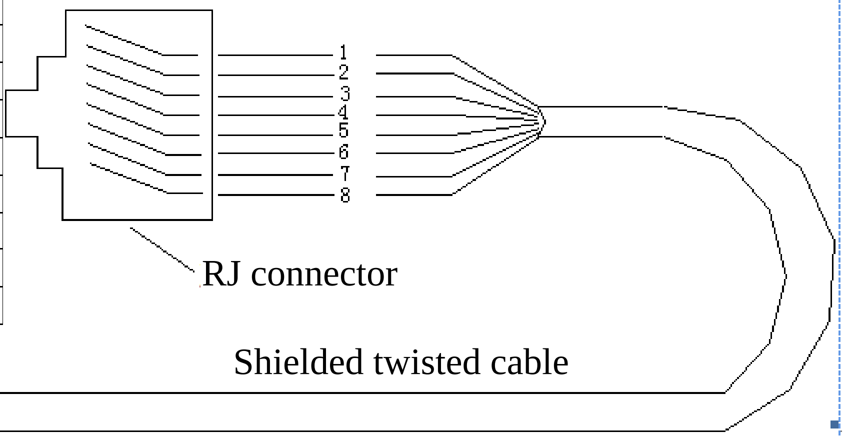
2. The state of unprocessed address outputs in the currently running PLC program will not be refreshed.

Chapter VI PC Communication Line

6.1 Communication connection between the system and the PC network port

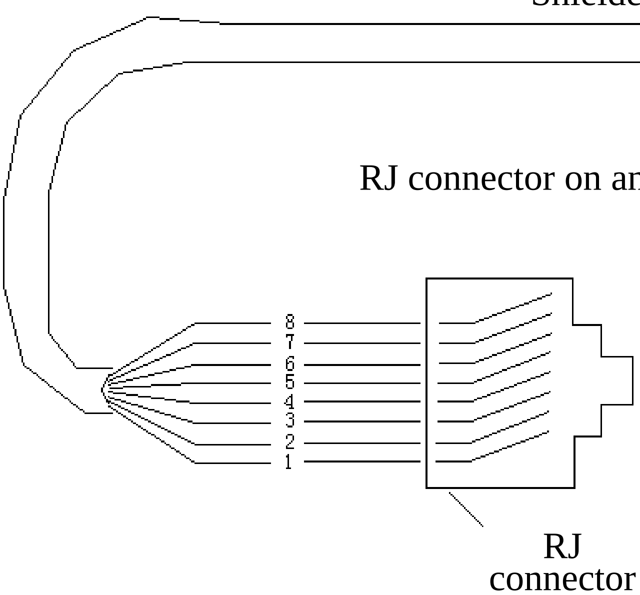
RJ connector on one end of Ethernet cable

Description of pin on one end of the RJ connector	
Pin No.	Pin description
1	TX1+, orange-white wire
2	TX1-, orange wire
3	RX1+, white-green wire
4	NC, blue wire
5	NC, blue-white wire
6	RX1-, green wire
7	NC, brown-white wire
8	NC, brown wire



RJ connector on another end of Ethernet cable

Pin description on another end of the RJ connector	
Pin No.	Pin description
1	TX1+, white-green wire
2	TX1-, green wire
3	RX1+, orange-white wire
4	NC, blue wire
5	NC, blue-white wire
6	RX1-, orange wire
7	NC, brown-white wire
8	NC, brown wire



System and PC Network Port Communication Connection Diagram

Chapter VII MPG Connection Lines

7.1 Connecting the external MPG unit to the host chassis

Host chassis

CN22 MPG interface

1	+5V	11	P_24V
2		12	
3	STP	13	
4	LED	14	PB−
5	HX	15	PB+
6	HY	16	PA+
7	HZ	17	PA−
8	H4	18	X100
9	H5	19	X1
10	P_0V	20	X10

Connection Diagram of External MPG Unit and Host Chassis

7.2 External MPG signal line connection

MPG CN22 (MDR20) — Hand wheel

	Signal	Pin	S/N	Signal
5V power output	+5V	1	1	+5V
Emergency stop signal input	STP	3	16	CN+
A phase differential signal	PA+	16	3	A+
A phase differential signal	PA−	17	3*	A−
B phase differential signal	PB+	15	4	B+
B phase differential signal	PB−	14	4*	B−
24V power output	P_24V	11	5	LED+
LED control signal	LED	4	6	LED−
X-axis selection signal	HX	5	7	X
Y-axis selection signal	HY	6	8	Y
Z-axis selection signal	HZ	7	9	Z
A-axis selection signal	H4	8	10	4
B-axis selection signal	H5	9	9*	5
X1 override signal	X1	19	11	X1
X10 override signal	X10	20	12	X10
X100 override signal	X100	18	13	X100
5V and 24V power ground	P_0V	10	14	COM
			15	CN−
			2	0V

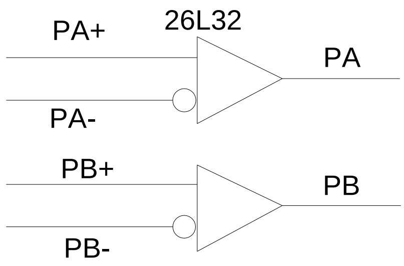
External

FG FG

MPG Signal Line Connection Diagram

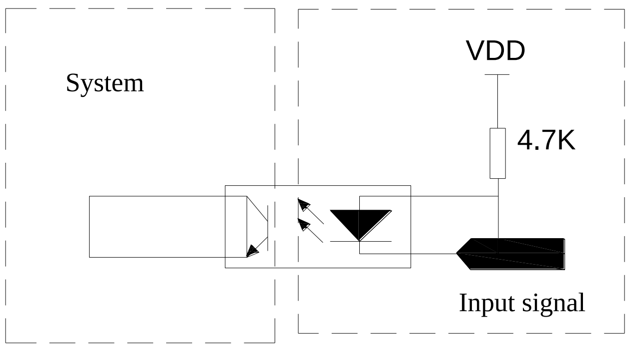
7.2.1 Input interface circuit

1. HA+, HA- and HB+, HB- are the A-phase and B-phase differential input signals of MPG, respectively:



MPG Signal Circuit

2. MPG input signals X1, X10, X100, HX, HY, HZ, H4, H5, STP. Its internal interface circuit is:



MPG Input Interface Circuit

7.2.2 Definition of MPG signal contact

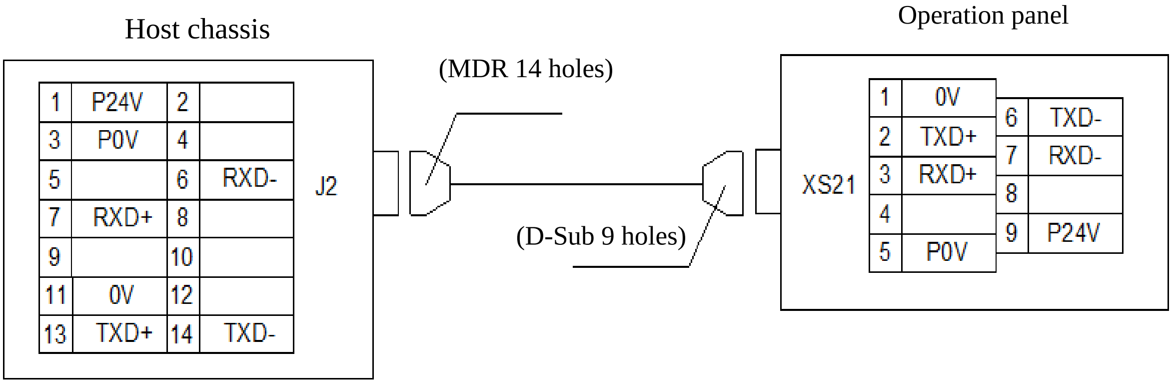
Definition of MPG signal contact

Signal Name	PLC Address	Signal Function	I/O
HX	X120.7	X-axis selection signal input	I
HY	X120.6	Y-axis selection signal input	I
HZ	X120.5	Z-axis selection signal input	I
H4	X120.4	4-axis selection signal input	I
H5	X120.3	5-axis selection signal input	I
X1	X120.2	X1 override signal input	I
X10	X120.1	X10 override signal input	I
X100	X120.0	X100 override signal input	I
STP	X121.0	Emergency stop signal input	I
LED	Y120.0	LED light output	O

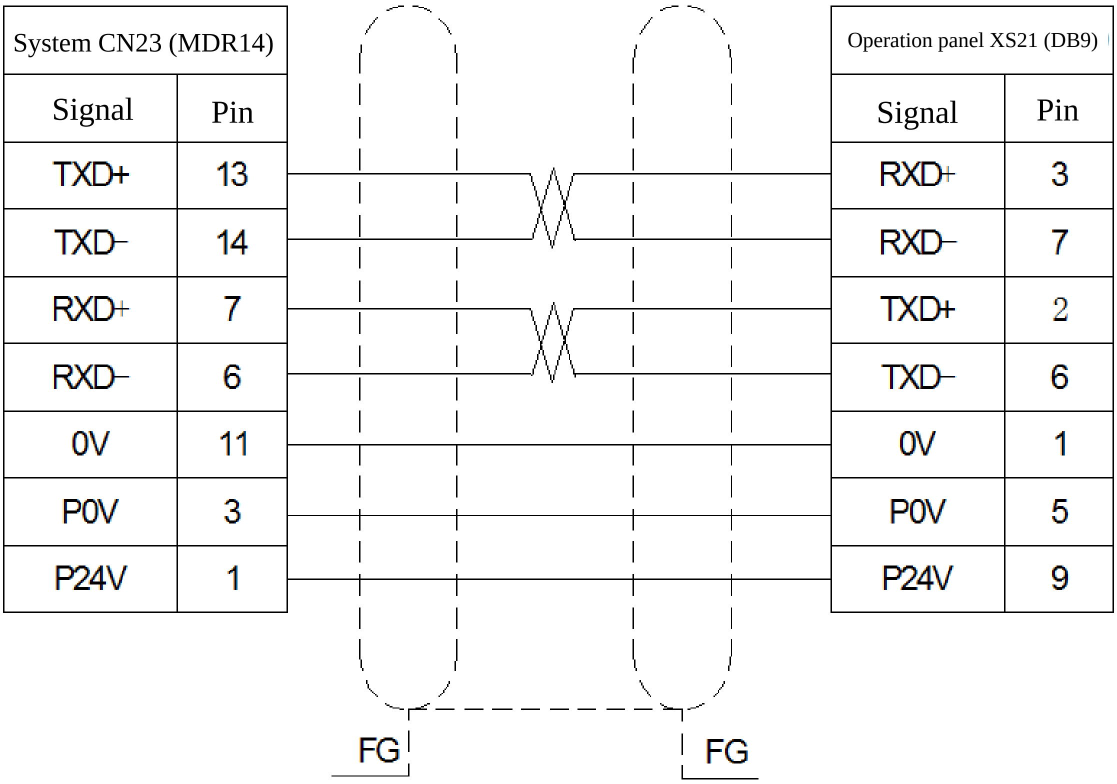
Chapter VIII Operation Panel Signal Lines

8.1 Connection of membrane structure operation panel

The host chassis of the GSK25iMc/GSK25iTc CNC system communicates with the operation panel through the RS485 serial interface.



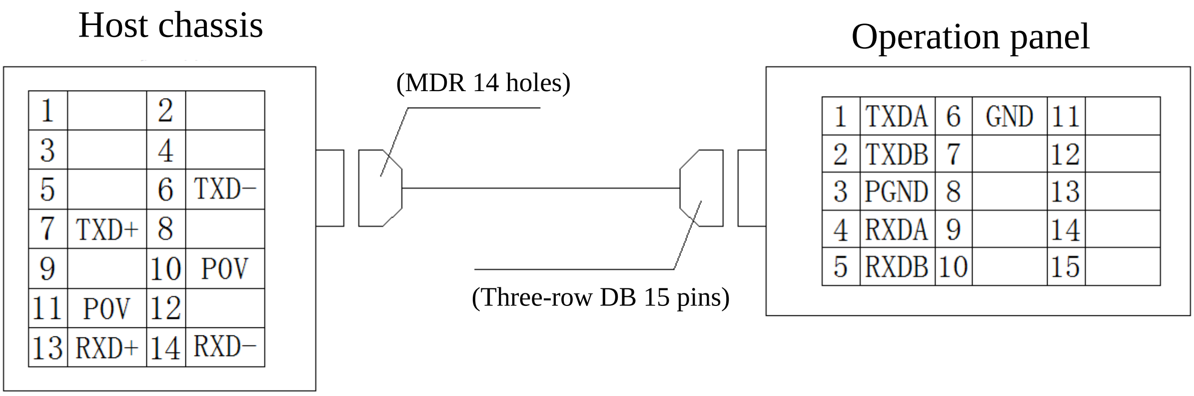
Host Chassis and Operation Panel Connection Diagram



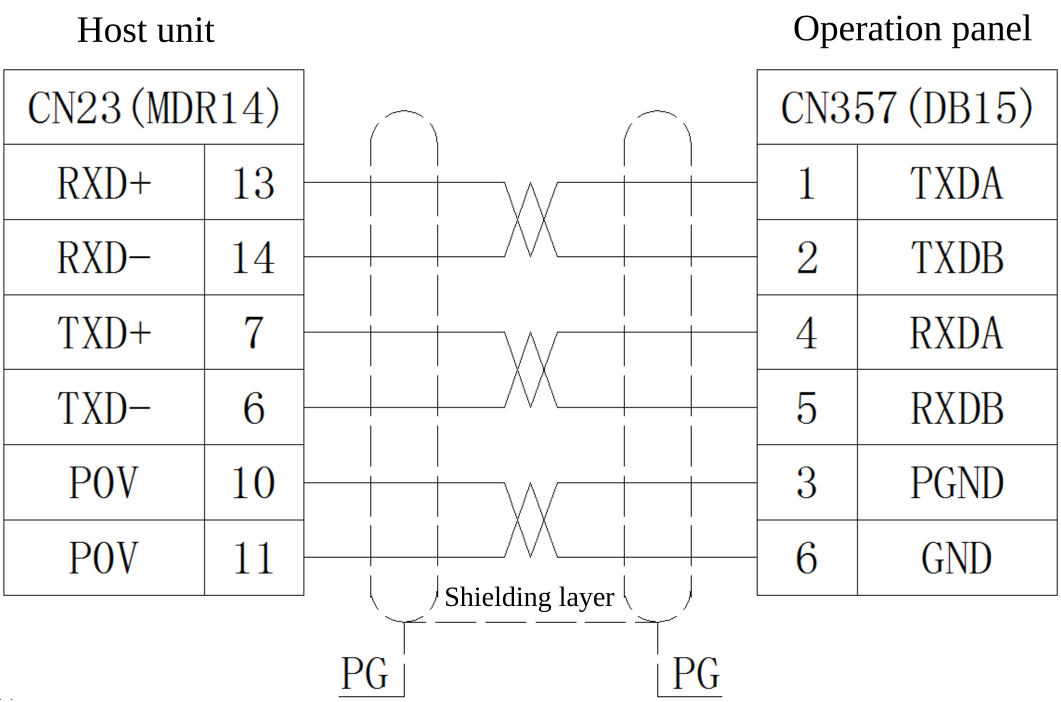
Operation Panel Cable Connection Diagram

8.2 Connection of independent key structure operation panel

The host chassis of the CNC system communicates with the operation panel through the RS485 serial interface.



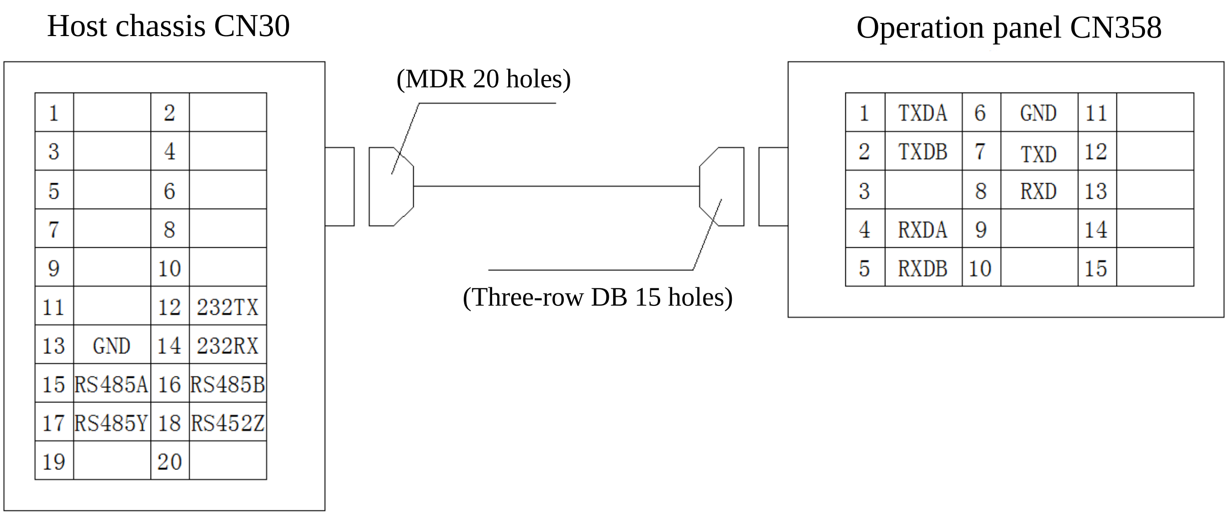
Host Chassis and Operation Panel Connection Diagram



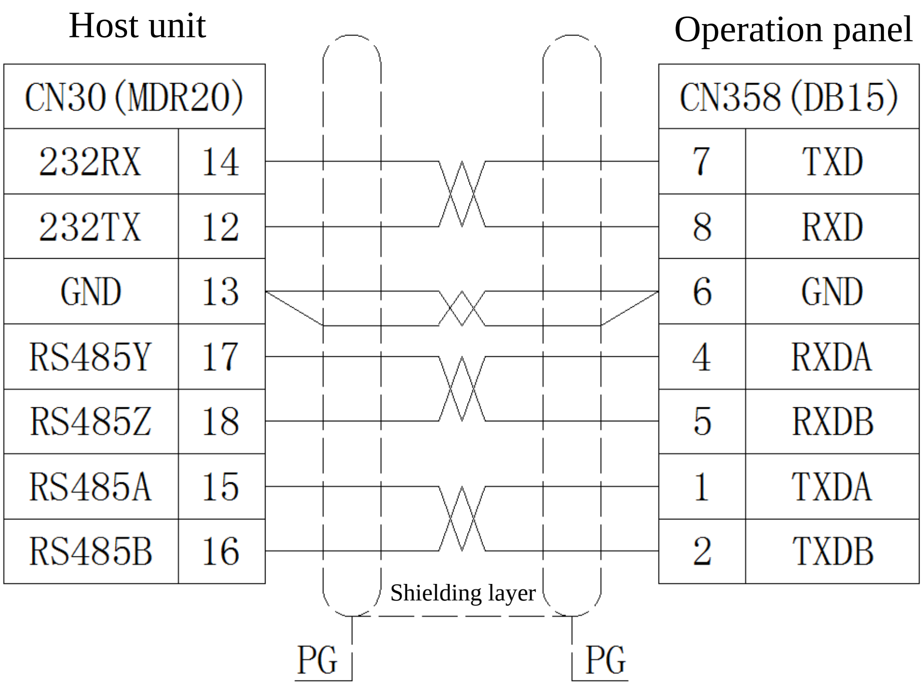
Operation Panel Cable Connection Diagram

8.3 Editing panel communication line (only for 15-inch independent key structure system)

The host chassis of the CNC system communicates with the operation panel through the RS485 and RS232 serial interfaces.



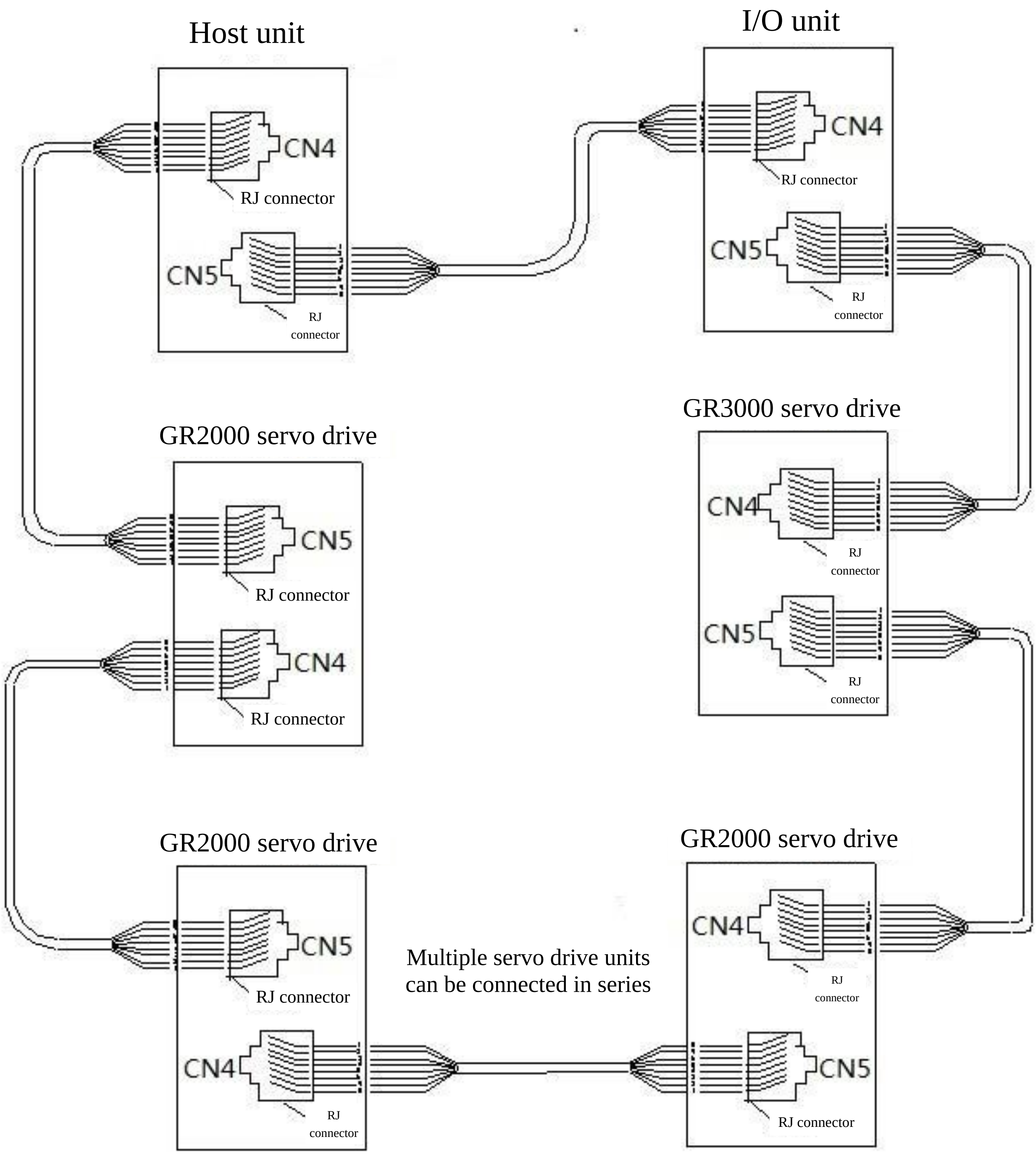
Host Chassis and Operation Panel Connection Diagram



Editing Panel Communication Cable Connection Diagram

Chapter IX Ethernet Communication Line Connection

9.1 Ethernet communication connection of GSK25iMc/GSK25iTc system



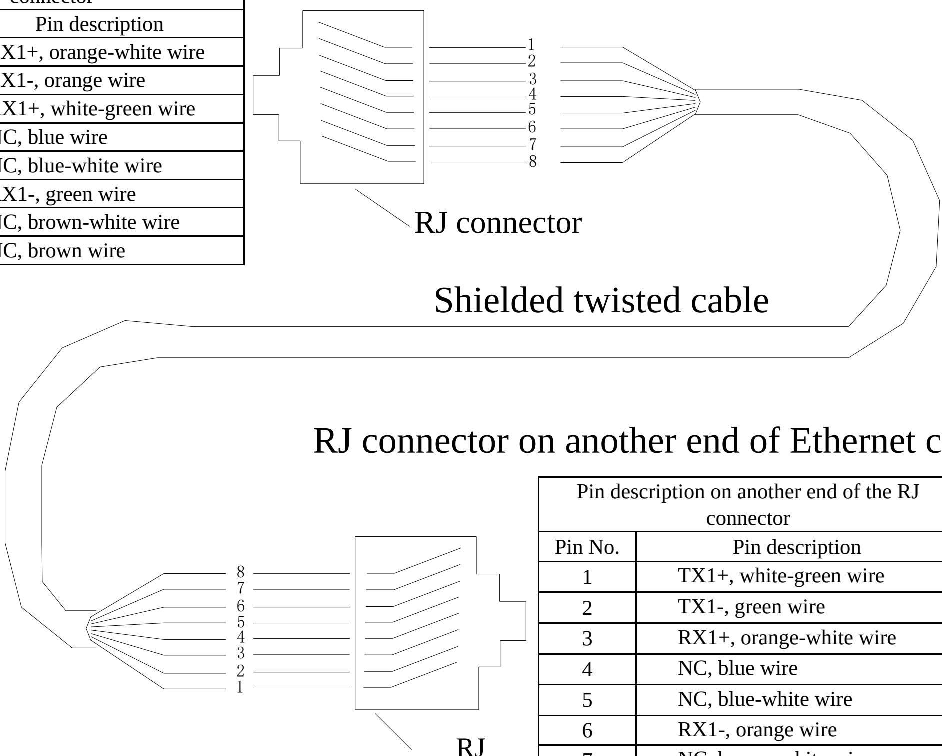
Ethernet Communication Line Connection Diagram

9.2 Ethernet cable connection

Connection mode 1:

RJ connector on one end of Ethernet cable

Description of pin on one end of the RJ connector	
Pin No.	Pin description
1	TX1+, orange-white wire
2	TX1-, orange wire
3	RX1+, white-green wire
4	NC, blue wire
5	NC, blue-white wire
6	RX1-, green wire
7	NC, brown-white wire
8	NC, brown wire

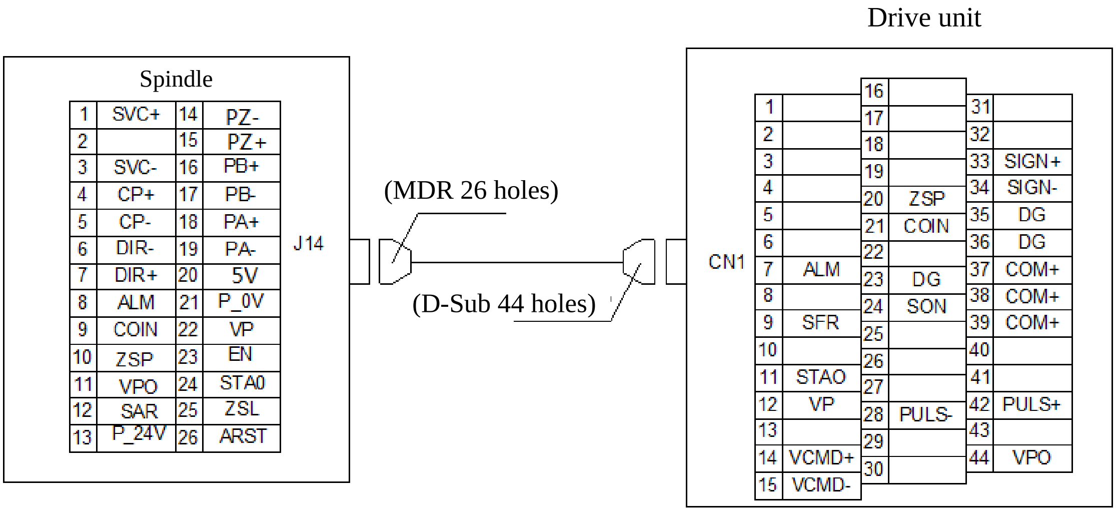


RJ connector on another end of Ethernet cable

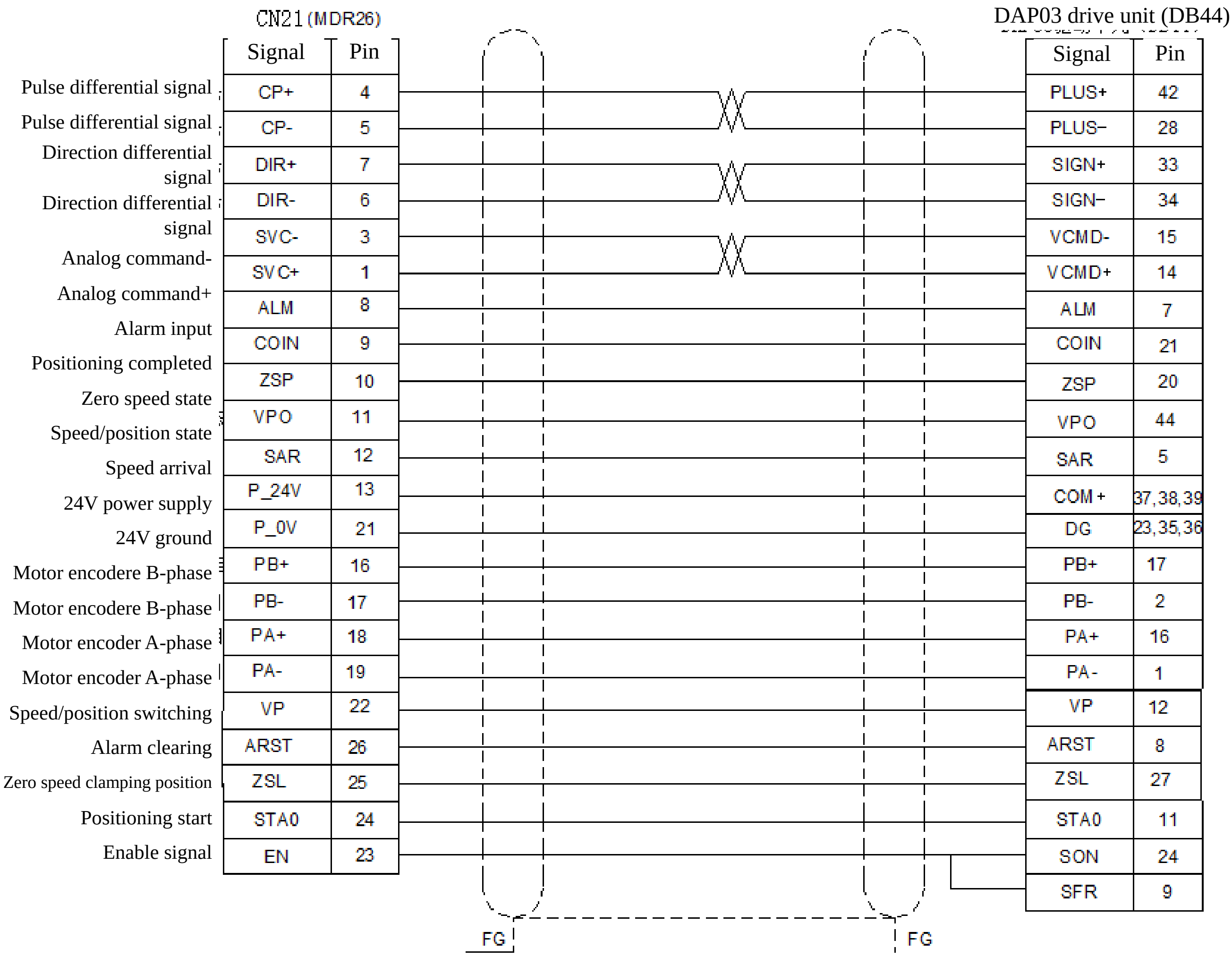
Pin description on another end of the RJ connector	
Pin No.	Pin description
1	TX1+, white-green wire
2	TX1-, green wire
3	RX1+, orange-white wire
4	NC, blue wire
5	NC, blue-white wire
6	RX1-, orange wire
7	NC, brown-white wire
8	NC, brown wire

Chapter X Spindle Servo Signal Line

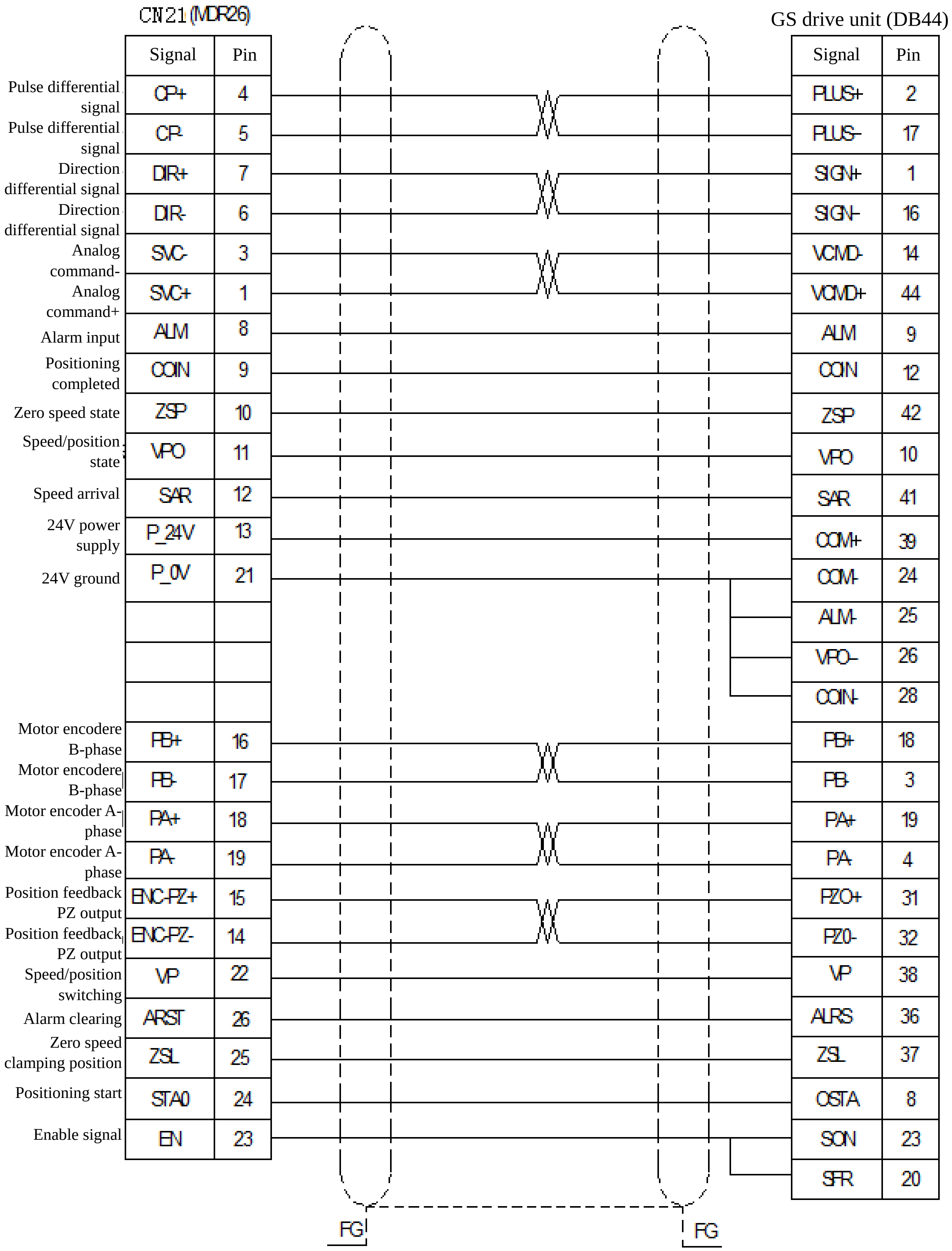
10.1 Spindle drive unit connection



10.1.1 Cable connection of DAP03 spindle drive unit

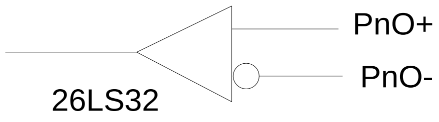


10.1.2 Cable connection of GS××××-NP2 spindle drive unit

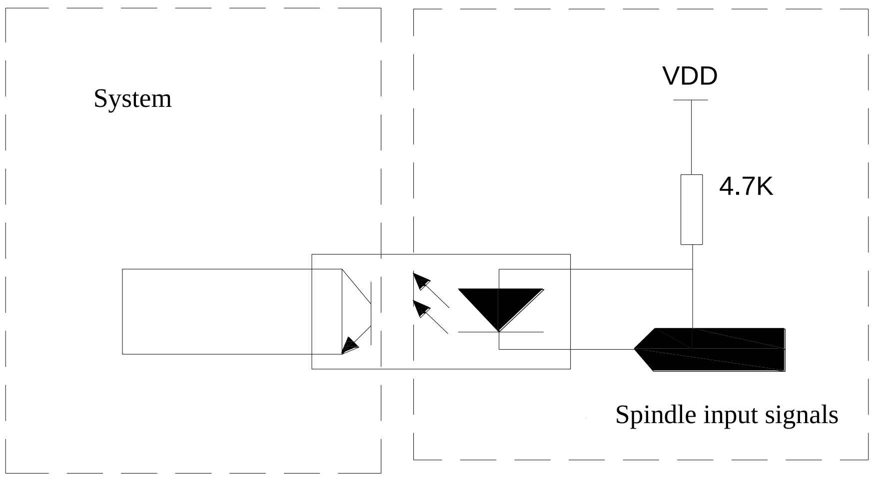


10.1.3 Signal interface circuit

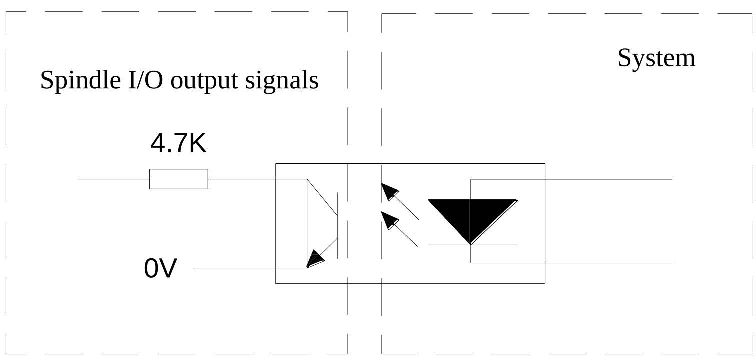
1. Encoder signal input: PA+/PA- and PB+/PB- are the differential input signals of the A-phase and B-phase of the encoder respectively. The interface circuit is shown in the figure below:



2. Spindle I/O input signals: ALM, COIN, ZSP, VPO, SAR; the interface circuit is shown in the figure below:

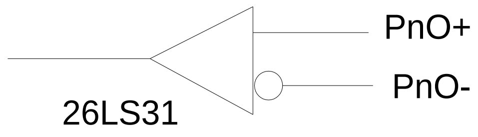


3. Spindle I/O output signals: ARST, ZSL, EN, STA0, VP; the interface circuit is shown in the following figure:

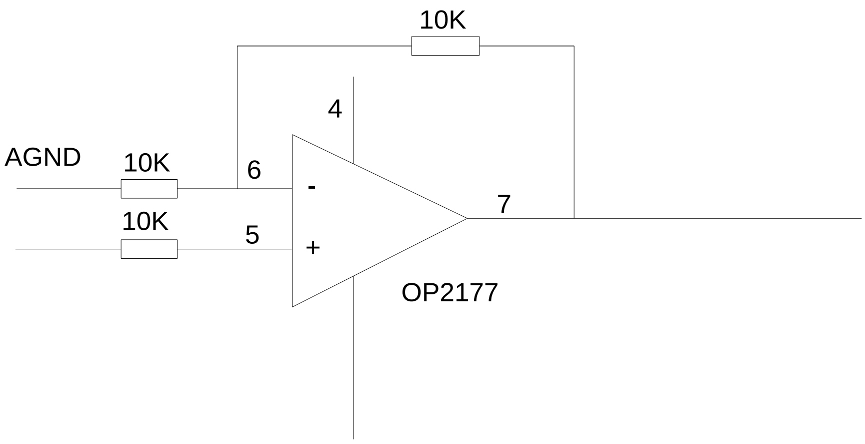


4. Position and direction pulse output signals: CO+/CP-, DIR+/DIR-; the interface circuit is shown in the figure below:

Part I Installation and Connection



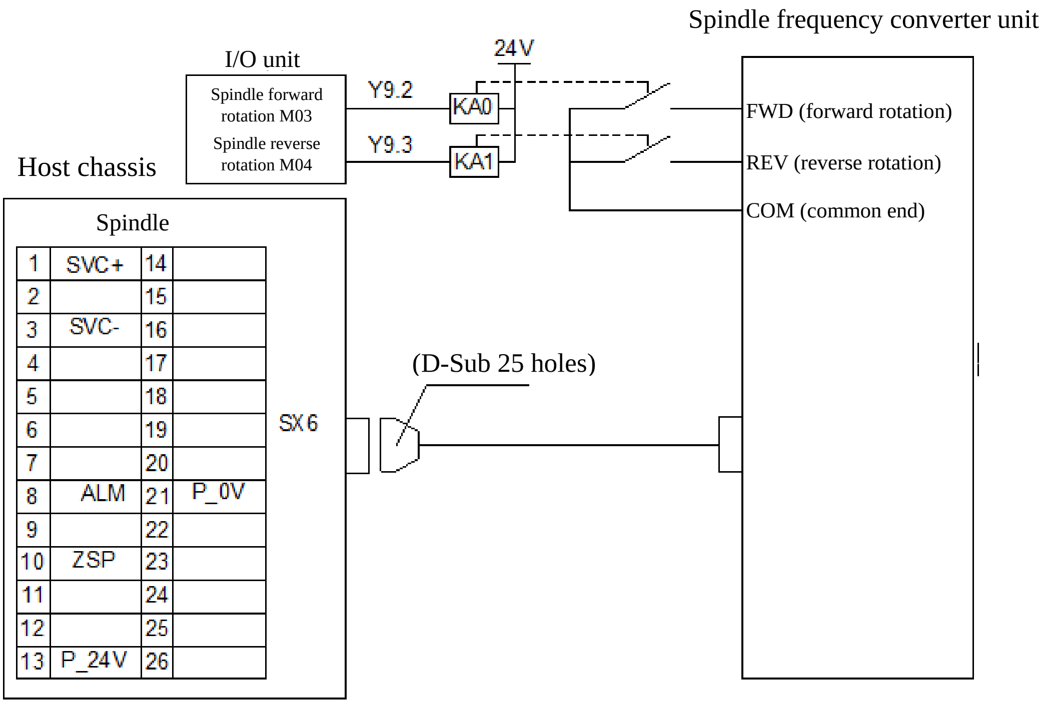
5. Analog command signals: SVC-/SVC+; the interface circuit is shown in the figure below:



SVC Signal Circuit

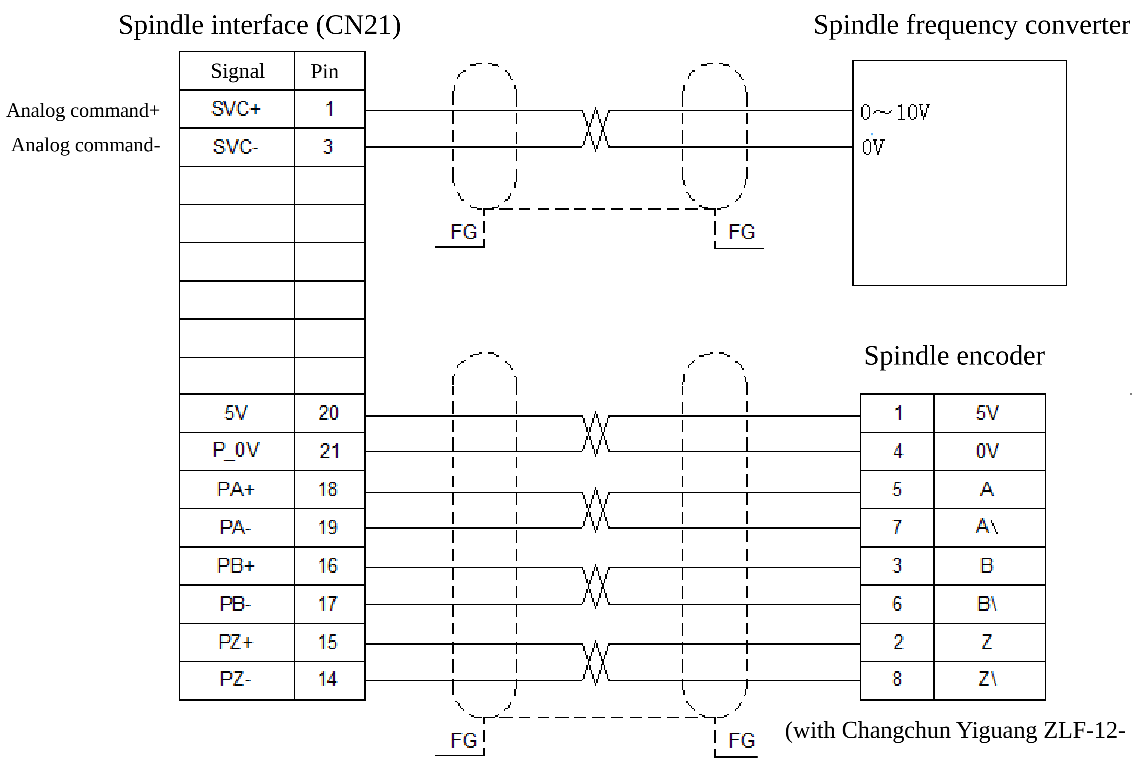
Chapter XI Spindle Frequency Converter Connection Line

11.1 Spindle frequency converter connection



11.2 Spindle frequency converter cable connection

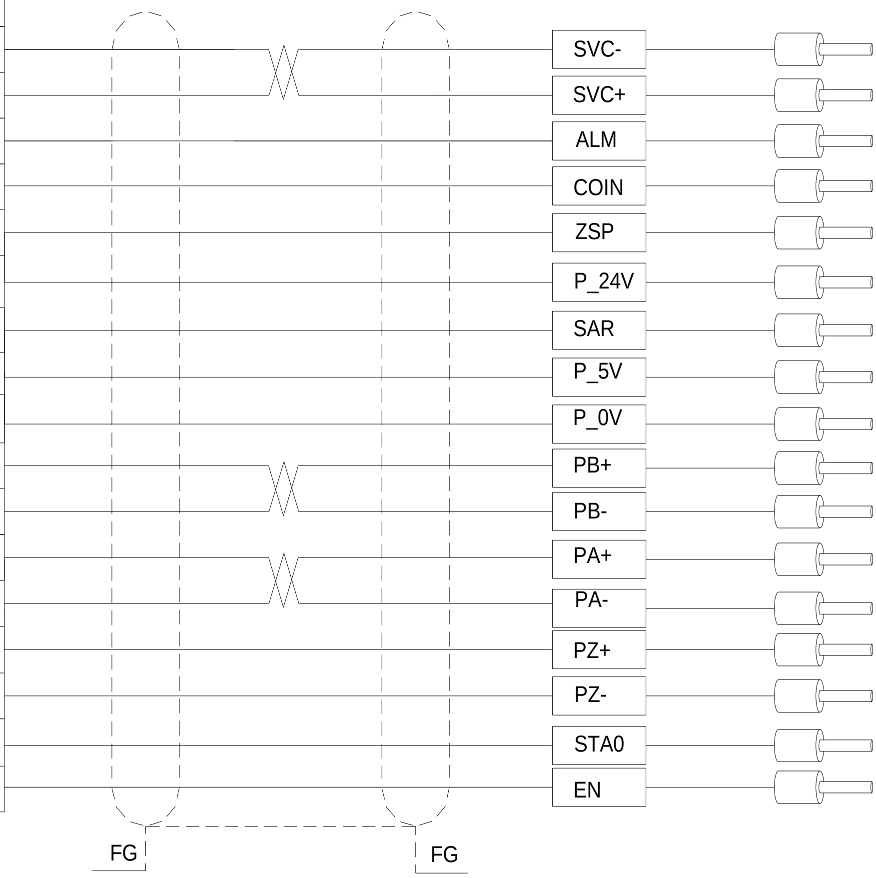
Method 1:



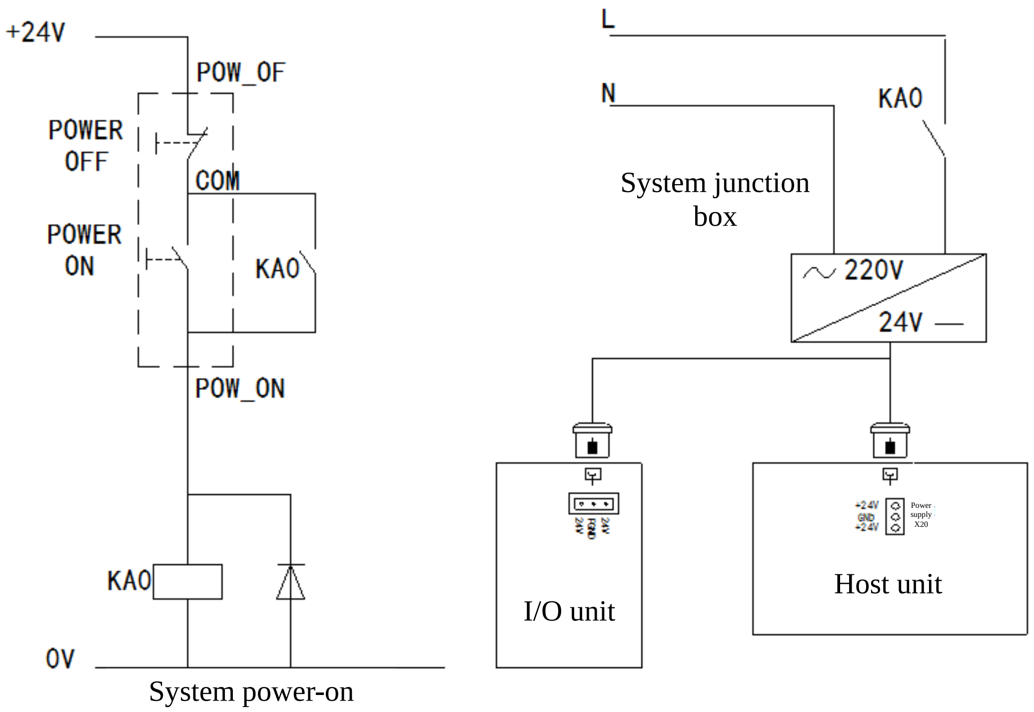
(with Changchun Yiguang ZLF-12-102.4BM-C05D as an example)

Method 2:

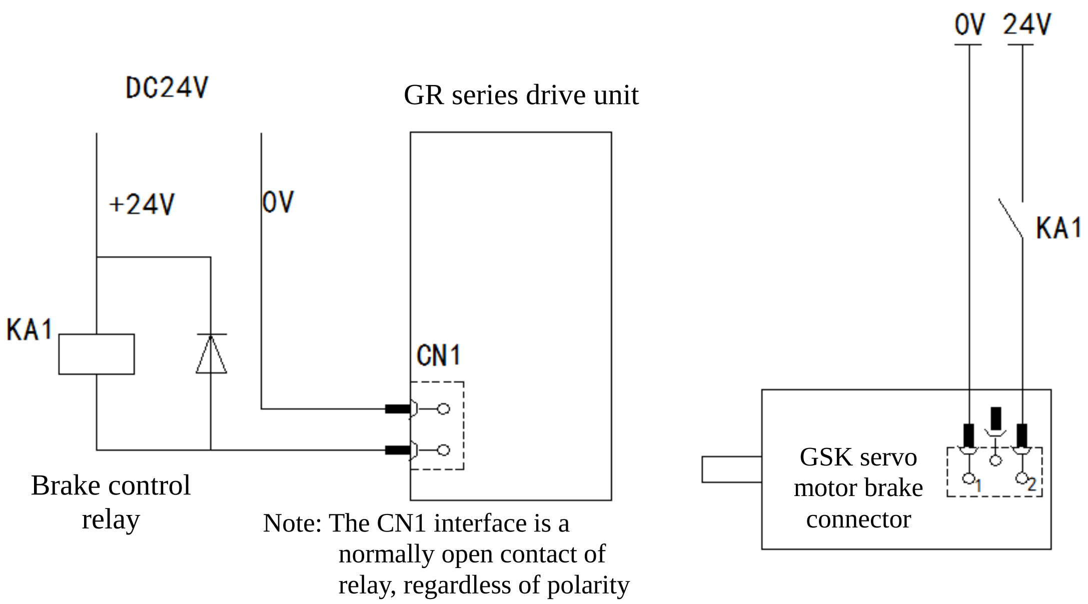
	Signal	Pin
Analog command-	SVC-	3
Analog command+	SVC+	1
Alarm input	ALM	8
Positioning completed	COIN	9
Zero speed state	ZSP	10
24V power supply	P_24V	13
Speed arrival	SAR	12
5V power supply	P_5V	20
24V power and 5V power ground	P_0V	21
Motor encodere B-phase	PB+	16
Motor encodere B-phase	PB-	17
Motor encoder A-phase	PA+	18
Motor encoder A-phase	PA-	19
Motor encoder Z-phase	PZ+	15
Motor encoder Z-phase	PZ-	14
Positioning start	STA0	24
Enable signal	EN	23



Chapter XII System Power-on, Vertical Axis Brake Control Connection Method



System Power-on Control



Vertical Axis Brake Control

Part II Debugging

Chapter I Parameter Configuration

1.1 Precautions for CNC parameter settings

1. The system has set up passwords to protect the data security, so the set parameters must be in the MDI mode and obtain the corresponding permissions.

2. The higher-level password can have all the permissions of the lower-level password.

3. The parameters are divided into three types: valid immediately, valid after reset, and valid after restart. There will be corresponding prompts after the parameters are modified.

1.2 Password permission operation

For more details, please refer to "3.5.1 [Login] interface operation description" in Chapter 3 of Part II in the "CNC System Programming Operation Manual of GSK25iMc/GSK25iTc Series Bus Milling/Turning Machining Center".

Protection Level	Initial Password	Permission Description	Remark
0: System vendor's advanced password		The highest permissions are retained by the developer. Clear alarm/operation records, set installment payment, and support 1-7 level permissions	
1: System vendor's service password		It may be used by the system vendor to provide services, including modification of various data in the system and formatting.	
2: Machine manufacturer	111111	It allows for PLC program modification, editing of PLC annotation and pitch compensation; start/stop of PLC; transfer-in and out of PLC and pitch compensation files; modification/transfer-in and out of the user customization interface rights.	
3: Installation and debugging engineer	111111	It allows for modifying the system and PLC parameters.	
4: End user's administrator	111111	It allows for modifying the program and tool offset value, setting various function set values on interface, workpiece coordinate system values, macro variable values, and modifying the programmer password.	
5: Operator 1		The end user's administrator grants the operation permissions to the corresponding personnel through the bit	
6: Operator 2			

7: Operator 3		parameters. Level 7 is the lowest level in the system by default, without the need of entering passwords.	

Note: To modify the login password of the interface, first enter the original password to log in to the corresponding user, and then enter the password to be modified at the corresponding place (entered twice). The passwords of lower-level users can also be modified through advanced users, but users at the same level cannot modify passwords to each other.

Definition of the bit parameter authorized by the end user's administrator:

Bit	Meaning	Notes
0	G-code modification right	1 permitted
1	Tool offset modification permission	1 permitted
2	Wear modification permission	1 permitted
3	Setting modification permission	1 permitted
4	Coordinate system modification permission	1 permitted
5	Macro modification permission	1 permitted
6	Permission to copy G-code to USB flash disk	1 permitted
7	Retained	

1.2.1 Permission login and settings

Entry into the interface:

Press the  key and go to the information display interface. There are four sub-interfaces: [Login], [User Permissions], Period Setting, and Setting. Press the [Login] soft key to enter the password input interface.

Enter the password to obtain the corresponding permissions.

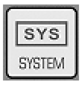
The permissions of operators 1, 2, and 3 are managed and granted by the end user's administrator.

Note: After the parameters are modified or the PLC operation ends, press [Logout] promptly or restart the system to clear the login status to prevent misoperation.

1.3 Parameter setting operation

1.3.1 CNC display and setting steps

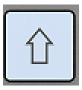
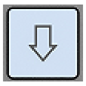
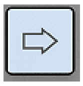
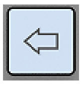
1) First press the  button on the editing panel, go to the [Login] setting interface and enter the corresponding password.

2) Press the function key  and go to the system interface.

3) Press the soft key [System Parameters] to display the parameter interface.

4) Move the cursor by the following method to the parameter number to be written in or displayed. The specific method is detailed as follows:

a) Enter the parameter number and press [Search];

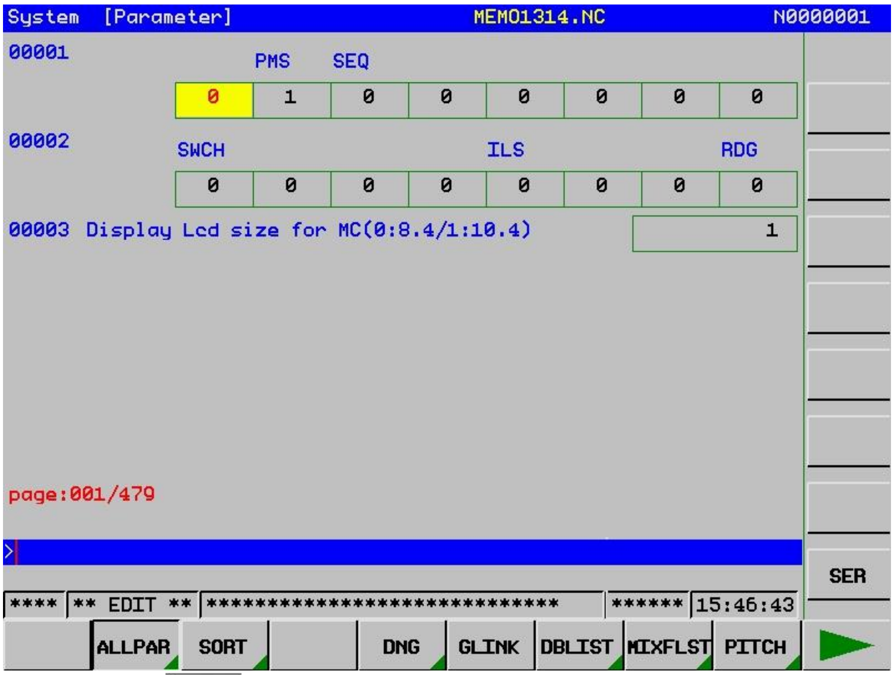
b) Use the page  and  keys, and the direction keys  ,  ,  ,  , to move the cursor to the parameter number.

5) Use the number keys and [Enter] to input a value.

6) After the parameter value is input, perform operations such as reset or restart according to the validity prompt to make the parameters valid.

1.3.2 PLC display and setting steps

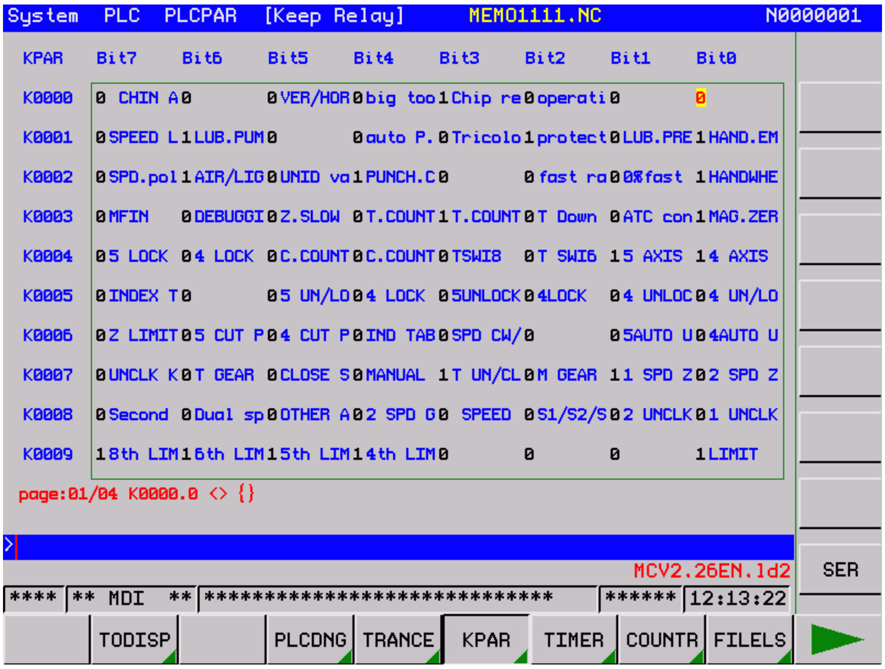
1) First press the  button on the editing panel, go to the [Login] setting interface and enter the corresponding password.



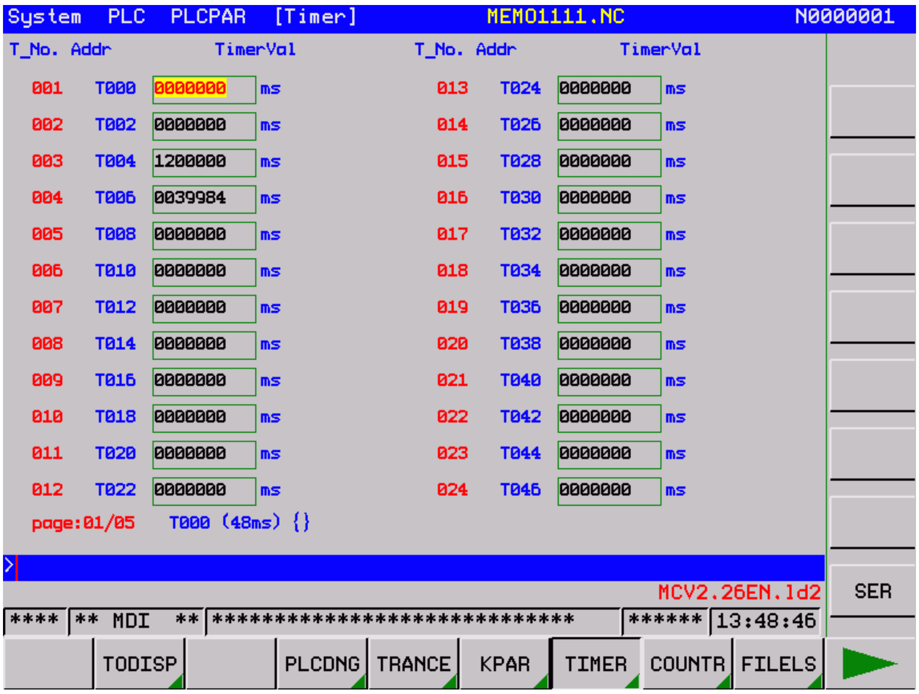
2) Press the function key  and go to the system interface.

3) Press the sub-interface keys, go to each parameter setting  interface, and press page down to turn the page.

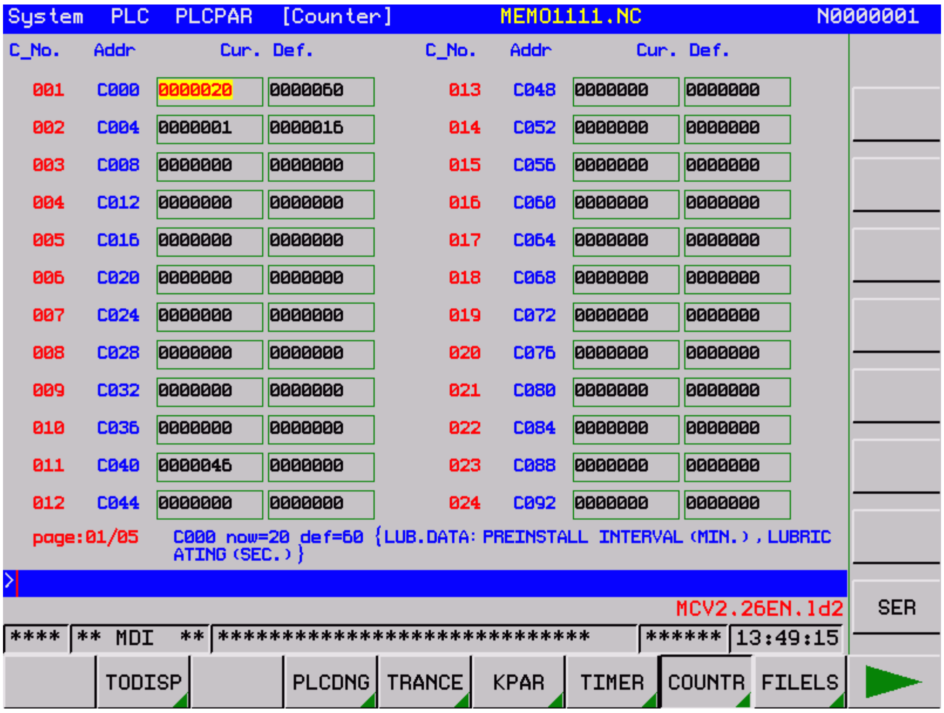
K parameter:



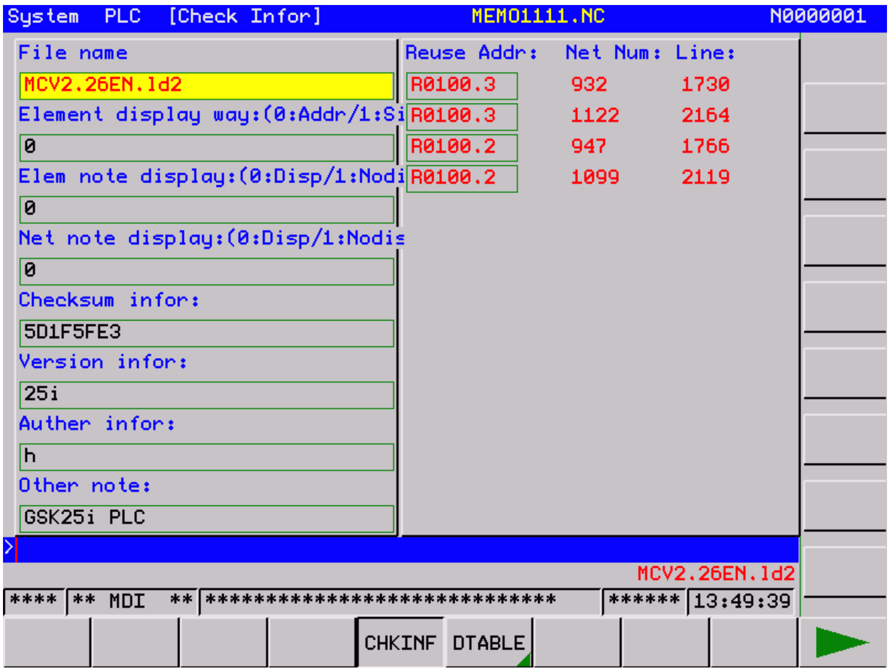
Timer T parameter:



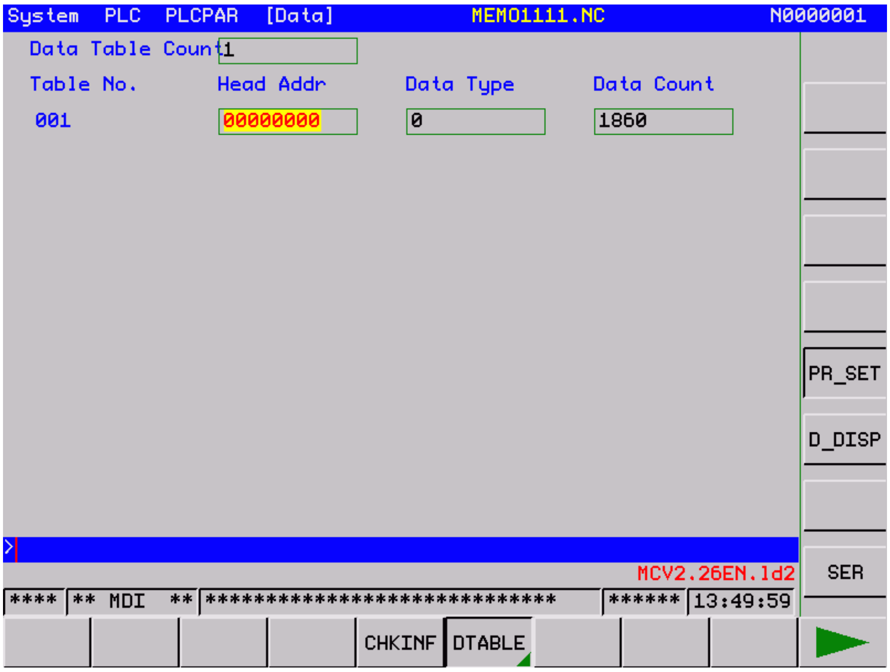
Counter C parameter:



PLC display setting:



Data D parameter:



1. Property settings

Start address: Set the start address of each data table.

Data type: Set to 0 when the data is 1 byte, set to 1 when the data is 2 bytes, set to 2 when the data is 4 bytes.

Number of data: Set the number of data for each data table.

2. Data display

It can display the data content for each data table.

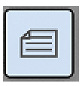
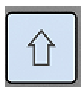
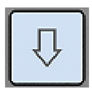
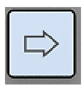
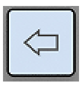
3. Setting the number of tables

Move the cursor to the number of data tables, input the value you want to set, and press the 

key to complete the setting.

4) Move the cursor by the following method to the parameter number to be written in or displayed. The specific method is detailed as follows:

a) Enter the parameter number and press [Search].

b) Use the page  and  keys, and the direction keys  ,  ,  ,  , to move the cursor to the parameter number.

5) Use the number keys and [Enter] key to input a value.

1.4 Ethernet communication debugging parameters

Ethernet is the signal and data path connecting the system and external devices. Only when the communication connection and parameter settings are correct can the drive and I/O of each axis be controlled. Ethernet communication is the basis for the normal operation of the system.

Related parameters:

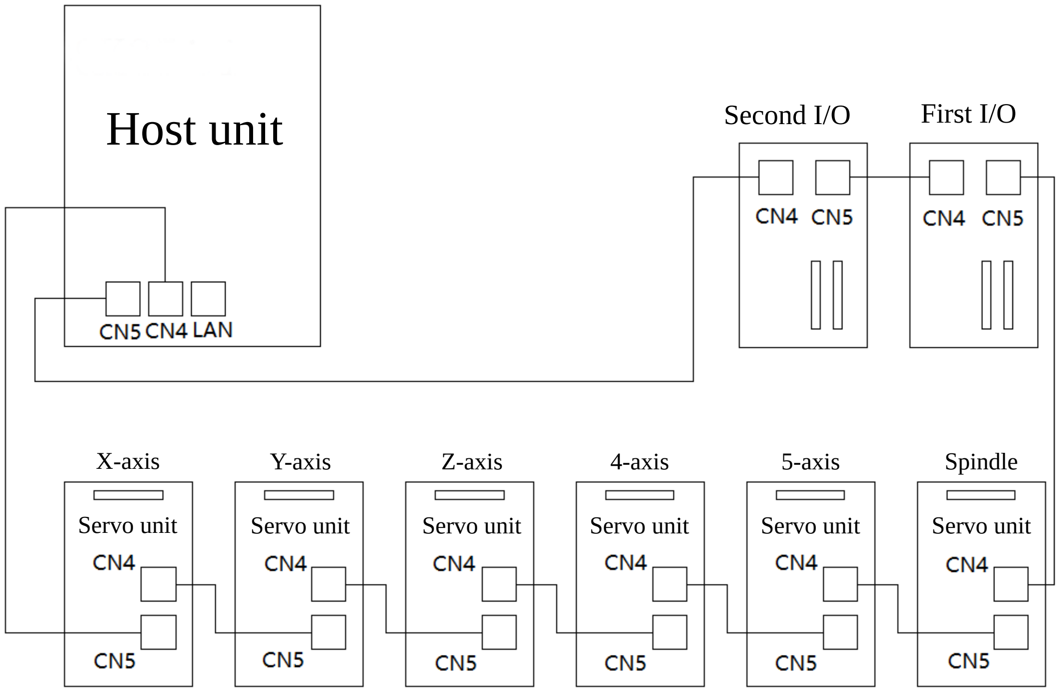
Parameter Number	Parameter Name	Function Description	Remark
205	Servo communication ignored	Used for shutting down communication and shielding communication alarm when the system is not connected to servo and I/O	Normally set to "0"
221	Total number of slave station devices	Used to set the total number of connected slave stations, including feed axis servo, spindle servo, I/O unit, etc.	
222	Number of I/O gateway devices	Used to set the number of connected I/O gateways	The minimum value of this parameter is set to 1, and even if one I/O gateway of the machine is not connected, it should be set to 1
225	Connection sequence number corresponding to the servo	Used to set the sequence number connected to the feed axis servo	CS axis: This parameter is set to -1~-4, but not 0
226	Connection sequence number corresponding to the spindle equipment	Used to set the sequence number connected to the spindle servo	Simulate the spindle or not set to 0
227	Connection sequence number corresponding to the I/O gateway devices	Used to set the sequence number to which the I/O gateway unit is connected	No connection being set to 0
228	I/O gateway selection	Setting I/O gateway properties	

Setting explanation:

Set the logical address of the servo driver connected to the system. The address of the first device connected to the CN4 port of the Ethernet connection interface in the system is "1", the second device connected in series is "2" and so on. The address corresponding to each slave station can be set to

#225~#227.

Setting example:



Note: 1. It is configured as 5-axis in the figure above; if it is not 5-axis, directly skip the missing one, and connect downward

2. When the I/O is connected, the address is allocated according to the connection sequence, detailed as follows:

The first I/O unit inputs X addresses X9-X14; outputs Y addresses Y8-Y12.

The second 1/O unit inputs X addresses X15-X20; outputs Y addresses Y13-Y16.

In this example, parameters are set to follows:

Parameter Number	Parameter Name	Set Value		Remark
221	Total number of slave station devices	8		
222	Number of I/O devices	2		
225	Connection sequence number corresponding to the servo	X	1	
		Y	2	
		Z	3	
		A (4th axis)	4	
		C (5th axis)	5	
226	Connection sequence number corresponding to the spindle equipment	1	6	
		2		When there are multiple axes, automatically increase the sequence number setting box
227	Connection sequence	1	7	

	number corresponding to the I/O devices	2	8	

1.5 Bus servo related parameters

1.5.1 Initializing servo parameters

When the system has established the GSK-Link Ethernet communication, after the slave station device has been set up.

GR2000 parameter recovery steps

Method 1 (recovery on the system side, it must ensure normal operation under the servo communication):

a. Change the system parameter 5200 to 385, and enter the corresponding motor model code for the system parameter 5201.

b. In the emergency stop mode, modify the system parameter 4001.0 to 0 and then change to 1, the system will automatically recover the default motor code of the servo.

c. After it reminds that the recovery is completed, release the emergency stop to complete the parameter recovery.

Method 2 (recovery on the servo side):

a. Change parameter PA-0 to 385.

b. Input the corresponding motor model code in parameter PA-1 according to the motor code table.

c. Execute EE-DEF to recover default parameters.

d. After re-inserting the GSK-Link, the system - parameter - parameter difference - overwrite local, the system will read the servo parameters from the servo.

After executing the servo parameter initialization, the system parameter 4201 should correspond to the following motor codes:

Motor Code	Motor Model	Remark	Motor Code	Motor Model	Remark
101	60SJTR-MZ2003E(A4I)		146	130SJT-M075D(A4I)	
102	60SJTR-MZ2005E(A4I)		148	130SJT-M100B(A4I)	
104	80SJT-M024C(A4I)		150	130SJT-M100D(A4I)	
106	80SJT-M024E(A4I)		152	130SJT-M150B(A4I)	
108	80SJT-M032C(A4I)		154	130SJT-M150D(A4I)	
110	80SJTA-M032E(A4I)		156	130SJT-M050E(A4I)	
112	80SJTA-M024C(A4I)		158	130SJT-M060E(A4I)	
114	80SJTA-M024E(A4I)		160	130SJT-M075E(A4I)	
116	80SJTA-M032C(A4I)		162	130SJTE-M150D(A4I)	
118	80SJTA-M032E(A4I)		166	175SJT-M120E(A4I)	
120	110SJT-M020E(A4I)		168	175SJT-M150DA4I)	
122	110SJT-M040D(A4I)		170	175SJT-M180B(A4I)	

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Motor Code	Motor Model	Remark	Motor Code	Motor Model	Remark
124	110SJT-M040E(A4I)		172	175SJT-M180D(A4I)	
126	110SJT-M060D(A4I)		174	175SJT-M220B(A4I)	
128	110SJT-M060E(A4I)		176	175SJT-M220D(A4I)	
140	130SJT-M040D(A4I)		178	175SJT-M300B(A4I)	
142	130SJT-M050D(A4I)		180	175SJT-M300D(A4I)	
144	130SJT-M060D(A4I)		182	175SJT-M380B(A4I)	
1200	130SJTG-M040GH(A4I)		1216	175SJTG-M220EH(A4I)	
1202	130SJTG-M050GH(A4I)		1218	175SJTG-M300EH(A4I)	
1204	130SJTG-M060GH(A4I)		1220	175SJTG-M380EH(A4I)	
1206	130SJTG-M075GH(A4I)		1222	175SJTG-M380BH(A4I)	
1208	130SJTG-M100GH(A4I)		1224	175SJTG-M380DH(A4I)	
1210	175SJTG-M120EH(A4I)		1226	175SJTG-M500BH(A4I)	
1212	175SJTG-M150EH(A4I)		1228	175SJTG-M500DH(A4I)	
1214	175SJTG-M180EH(A4I)				

Note: 1. When configuring A4II encoder motor, +100 is added before the motor model code corresponding to A4I; when configuring A6 encoder, +3000 is based on the A4II motor code; when configuring A7 encoder, the A4II motor code is +3000. On the basis of +4000, when configuring A9II encoder; on the basis of A4II motor code +5000, for example: 130SJTE-M150D (A4I) motor code is 162, then 130SJTE-M150D (A4II) is 262, 130SJTE-M150D (A6) It is 3262, 130SJTE-M150D (A7) is 4262, and 130SJTE-M150D (A9II) is 5262. This method is suitable for most motors, and some new motor codes should refer to the relevant servo drive manuals.

2. This method is for reference only, and the final correct motor code should refer to the list in the GR series manual.

Caution**:**

When the communication of the system and the servo drive is abnormal, and the drivers Err-39 and Err-42 give an alarm, the initialization of parameters will not succeed. The drive must be powered on separately, and the default parameters must be recovered in the servo drive GR2000 first. The specific operations on the drive are detailed as follows:

Step 1: Change the password and modify PA-0 as 385;

Step 2: Modify the model, and change PA-1 to the corresponding motor model; please refer to the above table for model details;

Step 3: Enter EE-DEF and press the Enter key for about 3s, until "FINISH" appears, indicating that the parameters have been recovered successfully; then power off and restart.

1.5.2 Setting of servo motor direction

The rotation direction of the motor can be changed by parameters #4003.5 CDIR, #4003.6 FDIR:

<table>
<tr><th>Parameters</th><th>Name</th><th>Setting</th><th>Setting Method</th></tr>
<tr><td>#4003.5 CDIR</td><td>Servo command direction</td><td>0: Positive
1: Negative</td><td rowspan="2">1. When the motor rotation direction is required to be opposite, the two parameters are inverted at the same time
2. Changing a parameter alone may cause click movement and an out-of-tolerance alarm</td></tr>
<tr><td>#4003.6 FDIR</td><td>Servo feedback direction</td><td>0: Positive
1: Negative</td></tr>
</table>

1.5.3 Zero point setting at the absolute position

There are three setting methods below for setting the zero point at the absolute position, but the first one is generally opted for.

1. Direct parameter setting of zero point

Method:

Enter the installation and debugging password in the [Offset] ([Login] interface to obtain permission to modify parameters.

The system is set to the MDI mode, switch the interface to [System] ([Parameter], change parameter #4001.3 APZ from 0 to 1, the system sets the zero point during the change from 0 to 1, and reset after the setting so as to clear alarm.

Move the axis at a place near the position where the zero point is to be set, and then move a certain distance along the direction set by parameter 1004.5 ZMIn, set parameter #4001.3 APZ to 0 and then change it to 1 again, and set the current position as the zero point.

Caution:

By directly modifying the parameter setting, the zero point must be moved a certain distance along the direction set by parameter #1004.5 ZMIn to eliminate the backlash, otherwise the accuracy problem will be caused by the failure to eliminate the backlash.

2. Setting of reference point return without stop block

Method:

Enter the installation and debugging password in the [Offset] ([Login] interface to obtain permission to modify parameters.

The system is set to the MDI mode, switch to the [System] ([Parameter] interface, change parameter #1001.1 DLZ as 1 to enable the function of reference point return without stop block, select the direction of reference point return for #1004.5 ZMIn, set the movement amount of the motor per revolution for parameter #1060, and set the feed axis gear ratio correctly.

Change parameter #4001.3 APZ from 0 to 1, first clear the Err49 alarm of the drive and then change it to "0", move the axis to a place near the position where the zero point is to be set, press "emergency stop" and release it to destroy the absolute zero point in memory; otherwise, it will be directly positioned to the previously set zero point when the reference point return is executed.

Switch to "return to machine zero" mode, press the direction key of the corresponding axis, the axis will stop when it moves at a low speed and encounters the Z signal of the encoder, and the system will automatically set parameter #4001.3 APZ as 1 to complete the zero point setting.

Caution:

This function should be used to set the parameters related to reference point return.

3. Setting of manual reference point return

It is suitable for the machine equipped with a reference point return switch, and the machine without a reference point return switch cannot be used.

Method:

Enter the installation and debugging password in the [Offset] ([Login] interface to obtain permission to modify parameters.

The system is set to the MDI mode, switch to the [System] ([Parameter] interface, change parameter #1001.1 DLZ as 0 to disable the function of reference point return without stop block, select the direction of reference point return for #1004.5 ZMIn, set the movement amount of the motor per revolution for parameter #1060, and set the feed axis gear ratio correctly.

Change parameter #4001.3 APZ from 0 to 1. First clear the Err49 alarm of the driver and then change it to "0". Press "emergency stop" and release it to destroy the absolute zero point in memory, otherwise it will be positioned directly to the previously set zero point when the reference point return is executed.

Switch to the "return to reference point" mode, press the direction key of the corresponding axis to start the action of reference point return, the axis rapidly moves to the speed of reference point return when the deceleration switch is pressed, and stops after moving away from the switch to the Z signal of the encoder, the system automatically sets parameter #4001.3 APZ as 1 to complete the zero point setting.

Caution:

This function should be used to set the parameters related to reference point return.

1.5.4 Adjustment of servo parameters

Based on the default parameters, adjust the following parameters according to the operation status:

Parameters	Name	Value Range	Default Value	Function Description
4009	Position proportional gain	0~2000	245	① Set the proportional gain of the position loop regulator ② The larger the set value, the higher the gain, the greater the stiffness, and the smaller the position lag under the same frequency command pulse. However, if the value is too large, it may cause oscillation or overshoot ③ The parameter value is determined according to the specific model of the servo drive unit and the load conditions
4017	Electronic gear ratio numerator	—	8192	For translational axes: It should be set according to the screw pitch A of the machine screw (unit: mm), the number of lines C of the motor photoelectric encoder (unit: pulses/turn), and the pulse equivalent M of the system (unit: pulses/mm) 4017/4018=C/(M*A) For rotational axis: It should be set according to the transmission gear ratio P (driven gear/drive gear), the line number C of the motor photoelectric encoder (unit: pulses/turn), and the pulse equivalent M of the system (unit: pulses/degree) 4017/4018=C/(M*P*360)
4018	Electronic gear ratio denominator	—	5000	
4215	First proportional gain of the speed loop	10~3000	According to the motor specification	① Set the proportional gain of the speed loop regulator ② The larger the set value, the higher the gain and the greater the stiffness. The parameter values are determined according to the specific model of the servo drive unit and the load conditions. In general, the larger the load inertia, the larger the set value ③ Under the condition that the system does not oscillate, try to set it as large as possible.
4216	First integral time constant of the speed loop	1~3000	According to the motor specification	① Set the integral time constant of the speed loop regulator ② Increase the set value Advantages: Quicker response to the speed command and enhanced motor rigidity; Disadvantages: If the set value is too large, it is easy to cause vibration to the motor itself, resonance of the mechanical device, together with

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Parameters	Name	Value Range	Default Value	Function Description
				tremolo triggered by mechanical vibration. ③ Decrease the set value Advantages: When the load inertia is large, it is not easy to cause resonance and oscillation of the motor and mechanical devices; Disadvantages: It is slow in response to speed commands and easy to cause speed fluctuations when the load changes, and affects the surface finish of machined workpieces.
4218	Low pass filter coefficient for peed detection	10~5000	According to the motor specification	① Set the speed detection low-pass filter characteristics ② The smaller the value, the lower the cutoff frequency and the less noise the motor causes. If the load inertia is large, the set value may be appropriately reduced. If the value is too small, it may lead to slower response and trigger oscillations The larger the value, the higher the cutoff frequency and the faster the speed feedback response. If a higher speed response is required, it may be increased appropriately, because there will be howling if it is too large.

1.6 Spindle related parameter configuration

1.6.1 CNC system parameter setting

	Name	Notes
5000.2	Selection of the spindle alarm level	0: Low level 1: High level
5000.3	Inspection of analog rigid tapping speed and position switching signal of the spindle	0: Yes 1: No
5000.4	Selection of analog pulse output mode of the spindle	0: Pulse + direction 1: A/B phase
5000.5	Control output when simulating the spindle speed mode	0: Analog voltage 1: Pulse
5000.7	Selection of analog spindle position control mode	0: Open loop 1: Closed loop
5001.0	Inspection of spindle speed fluctuation	0: No 1: Yes (Note: When this parameter is set to 1,

	Name	Notes
		the system will give an alarm when the actual speed and command speed of the spindle exceed the set values in the system)
5001.1	Spindle speed arrival signal	0: No 1: Yes (Note: When this parameter is set to 1, the spindle does not rotate, and the cutting feed G01 command is not executed)
5001.3	Selection of spindle speed display	0: Command speed 1: Actual speed
5001.6	Spindle gear shift mode selection	0: M type, gear shifting through S-command speed feed 1: T-type, gear shifting through M-code command
5001.7	Recover default parameters of the spindle (valid for the change from 0 to 1)	Recovery steps: 1. System parameters 5300=385, 5301=motor model code 2. In the emergency stop mode, when this parameter is changed from 0 to 1, the system will automatically adjust the default parameters of the corresponding motor model code.
5002.0	Spindle positioning function	0: Invalid 1: Valid
5002.1	Cs axis function	0: Invalid 1: Valid
5002.3	Spindle ignored	0: No 1: Yes
5002.5	Spindle speed synchronization function	0: Off 1:On
5005	Selection of spindle number in the system	Used to set the number of spindles used
5006	Analog spindle selection	Used to set the number of analog spindles used
5008	Spindle name	Used to set the spindle name, such as S1, S2
5100	Analog spindle gain	Used to adjust the maximum analog voltage of the spindle
5101	Spindle speed offset compensation	Used for zero drift compensation of the spindle analog voltage
5103	Analog output direction of the spindle	0: normal/1: invert/2: command inversion/3: feedback inversion
5104	Acceleration and deceleration time of the S-type rigid tapping	Default 650

	Name	Notes
5105	Maximum acceleration during the spindle position control	Default value 700
5106	2nd encoder selection of the spindle (0: 1st encoder; 1: 2nd encoder)	0 by default
5108	Pulses per revolution of the position encoder (line number*4)	Used for speed feedback display and spindle closed-loop control
5110	Motor speed when the spindle gear is shifted	Motor speed after the PLC signal G29.5 is connected, when the spindle shifts gears
5111	Motor speed during the spindle orientation	
5113	Check the time of the spindle speed arrival signal	Set the time for checking the spindle speed arrival signal
5115	Maximum rotational speed of the spindle	Used to set the maximum rotational speed of the spindle motor when the analog voltage is 10V
5116	Upper limit of the spindle speed	Maximum speed limit of the spindle
5120	Maximum rotational speed of the spindle	Maximum rotational speed at each gear of the spindle
5121	Maximum rotational speed at the second gear of the spindle	
5122	Maximum rotational speed at the third gear of the spindle	
5123	Maximum rotational speed at the fourth gear of the spindle	
5130~5132	Speed at the gear shifting point of the spindle	Spindle speed for setting the gear shifting point
5160~5168	Gear ratio of each gear	Gear ratio for setting each gear

1.6.2 Drive unit parameter setting of GR bus spindle

1. NC parameter setting

Parameter Number	Notes	Set Value	Remark
5006	0: Digital spindle 1: Analog spindle	0	Use of the GR series bus servo unit to control the spindle

2. Initializing drive parameters

Parameter recovery steps of the servo spindle motor:

Method 1 (The default parameters corresponding to the motor are called through the system, and executed when the communication connection is normal)

a. Enter 385 in the system parameter 5300, and the motor model code in 5301

b. In the emergency stop mode, change the system parameter 5001.7 from 0 to 1, and the system will call the default parameters of the motor

c. Release the emergency stop after it reminds that the recovery is over

Method 2 (The default parameters of the corresponding motor are called through the servo drive)

a. Change parameter PA-0 to 385

b. Enter the corresponding motor model code in parameter PA-1 according to the motor code table

c. Execute EE-DEF to recover the default parameters

After re-inserting the GSK-Link, the system - parameter - parameter difference - overwrite local, the system will read the servo parameters from the servo.

Spindle motor code table: (software version: V1.10)

Motor Model Code	Spindle Motor Model	Rated Current	Voltage Level	Standard Servo Unit
501	CTc-5.5BL with Tenda 6144 line encoder	14.5A	380V	GR3050-LA2
502	CTc-5.5BL with IGS1024 line encoder	14.5A	380V	GR3050-LA2
610	ZJY182-2.2BH-L(A2)	13A	220V	GR2050-LA2
609	ZJY182-3.7BH-L(A2)	26A	220V	GR2100-LA2
613	ZJY208-3.7AM-L(A2)	17.5A	220V	GR2075-LA2
611	ZJY208-3.7BH-L(A2)	22A	220V	GR2075-LA2
614	ZJY208-5.5AM-L(A2)	28.2A	220V	GR2100-LA2
608	ZJY208-5.5BH-L(A2)	31.8A	220V	GR2100-LA2
612	ZJY208-7.5BM-L(A2)	29.4A	220V	GR2100-LA2
617	ZJY182-1.5BH(A2)	7.3A	380V	GR3048-LA2
618	ZJY182-2.2BH(A2)	7.5A	380V	GR3048-LA2
652	ZJY182-2.2CF(A2)	9A	380V	GR3048-LA2
651	ZJY182-3.7BL(A2)	10.4A	380V	GR3050-LA2
619	ZJY182-3.7BH(A2)	15.5A	380V	GR3050-LA2
654	ZJY182-3.7DF(A2)	13A	380V	GR3050-LA2
653	ZJY182-5.5CF(A2)	19A	380V	GR3075-LA2
641	ZJY182-5.5EH(A2)	17A	380V	GR3075-LA2
642	ZJY182-7.5EH(A2)	21A	380V	GR3100-LA2
643	ZJY208A-2.2AM(A2)	6.7A	380V	GR3048-LA2
620	ZJY208-2.2BH(A2)	6.3A	380V	GR3048-LA2
621	ZJY208A-2.2BH(A2) ZJY208-2.2BM(A2)	8.9A	380V	GR3048-LA2
640	ZJY208A-3.7WL(A2)	11.3A	380V	GR3050-LA2
644	ZJY208A-3.7AM(A2)	10.2A	380V	GR3050-LA2

Motor Model Code	Spindle Motor Model	Rated Current	Voltage Level	Standard Servo Unit
622	ZJY208A-3.7BM(A2) ZJY208-3.7BH(A2)	8.6A	380V	GR3050-LA2
634	ZJY208A-3.7BH(A2)	12.6A	380V	GR3050-LA2
615	ZJY208A-5.5AM(A2)	16.3A	380V	GR3075-LA2
623	ZJY208A-5.5BM(A2) ZJY208-5.5BH(A2)	13.2A	380V	GR3075-LA2
635	ZJY208A-5.5BH(A2)	18.4A	380V	GR3075-LA2
624	ZJY208A-7.5BM(A2) ZJY208-7.5BH(A2)	17.3A	380V	GR3075-LA2
636	ZJY208A-7.5BH(A2)	22.4A	380V	GR3100-LA2
645	ZJY208A-11EH(A2)	25.2A	380V	GR3100-LA2
638	ZJY265A-5.5WL(A2)	16.3A	380V	GR3075-LA2
639	ZJY265A-7.5WL(A2)	21.4A	380V	GR3100-LA2
616	ZJY265A-7.5AM(A2)	21.5A	380V	GR3100-LA2
625	ZJY265A-7.5BM(A2)	18A	380V	GR3075-LA2
648	ZJY265A-7.5BH(A2)	21A	380V	GR3100-LA2
637	ZJY265A-11WL(A2)	30A	380V	GR3148-LA2
646	ZJY265A-11AM(A2)	30.9A	380V	GR3148-LA2
626	ZJY265A-11BM(A2)	26A	380V	GR3100-LA2
649	ZJY265A-11BH(A2)	30A	380V	GR3148-LA2
628	ZJY265A-15AM(A2)	48.3A	380V	GR3150-LA2
627	ZJY265A-15BM(A2)	35A	380V	GR3150-LA2
650	ZJY265A-15BH(A2)	40.7A	380V	GR3150-LA2
630	ZJY265A-18.5BM(A2)	48.7A	380V	GR3198-LA2
629	ZJY265A -22BM(A2)	58A	380V	GR3198-LA2
631	ZJY265A-30BL(A2)	69A	380V	GR3300-LA2
632	ZJY265A-37BL(A2)	87A	380V	GR3300-LA2

Note: The 5000-line encoder is the standard configuration for GSK CNC spindle motors as listed in the table. If a 1024-line encoder is configured, the first digit 6 for the same model code should be changed to 5; for example, the motor code of the model ZJY208A-7.5BM-LA2 is 624, but that of the model ZJY208A-7.5BM-L is 524. In case of change, the motor code listed in the corresponding servo manual shall prevail.

3. Speed control debugging:

Parameter Number	Notes	Set Value	Remark
5351	Speed inversion	0/1	Modify when the speed is running in the opposite direction
5354	Maximum speed limit	10000	It should be consistent with the maximum speed set by the

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			system
5357	Acceleration time	100	It can be adjusted appropriately, generally not less than 100
5358	Deceleration time	200	

4. Spindle orientation debugging:

Parameter Number	Notes	Set Value	Remark
5397	Position feedback input signal selection	1	0: Second code disc 1: Motor code disc 2: Reserved
5399	Positioning speed	100	It can be changed as 1000 to accelerate the positioning
5402	Position window when orienting	2	
5403	Located position		Go to the position to be oriented to view the system diagnosis 206 or the value of the drive DP-APO, and input the lower four digits into parameter 5403
5404	Located position		Go to the position to be oriented to view the system diagnosis 206 or the value of the drive DP-APO, and input the higher four digits into parameter 5403

5. Rigid tapping debugging:

Parameter Number	Notes	Default	Remark
2140	Maximum rotational speed of the spindle during rigid tapping (1st gear)	3000	It is recommended to set this parameter as 3000 when there is no gear shift
2141	Maximum rotational speed of the spindle during rigid tapping (2nd gear)		Set according to the speed of each gear when there is gear shift
2142	Maximum rotational speed of the spindle during rigid tapping (3rd gear)		
2143	Maximum rotational speed of the spindle during rigid tapping (4th gear)		
2170	Rigid tapping spindle and loop	280	Standard 5000-line spindle motor

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	gain at the tapping axis position (1st gear)		encoder
2180	Spindle loop gain coefficient during rigid tapping (1st gear)	65	Standard 5000-line spindle motor encoder
5104	Front acceleration/deceleration S-type time constant T2 during axis position control	650	The longer the time is set, the smoother the acceleration
5105	Maximum acceleration of the spindle during tapping	700	The smaller the value, the slower the acceleration; the larger the value, the faster the acceleration, but it will give an alarm when the motor response capacity is exceeded
5135	Speed of the shifting from the first gear to the second gear of the spindle during the tapping cycle (M type)	6000	During the tapping cycle, when the S-command is less than 5135, the first gear signal F34.0 will be set to 1; when it is greater than parameter 5135 and less than 5136, the second gear signal F34.1 will be set to 1;
5136	The speed of shifting from the second gear to the third gear of the spindle during the tapping cycle (M type)	6000	During the tapping cycle, when the S-command is greater than parameter 5136 and less than 5137, the 3rd gear signal F34.2 will be set to 1;
5137	Speed of the shifting from the third gear to the fourth gear of the spindle during the tapping cycle (M type)	6000	When S-command is greater than parameter 5137 during the tapping cycle, the fourth gear signal F34.3 will be set to 1;
5106	Closed loop spindle direction control	0~3	
5318	Speed detection low-pass filter coefficient	100	
5345	Second proportional gain of speed loop	200/400	
5346	Second integral time constant of speed loop	100	
5360	Current proportional gain	Default Value	Fine-tuning only
5361	Current integral coefficient	Default Value	Fine-tuning only

6. Common issues

- If the ERR-27 alarm arises during the initial running, please switch any two phases for the motor power lines U, V and W.

- If the rotational direction of the spindle is wrong, debugging: #5103.
- If the teeth are not good, the fitting of parameters #2170 and #2180 are debugged with reference to the diagnoses: #300 and #301; monitor the synchronization of the system diagnoses #300, #301; when the spindle is 1:1 transmission, adjust parameters #2170, #2180, view the diagnoses #300 and #301, and make the two diagnosis values equal.

  Parameter #2170 works for the diagnoses #300 and #301, but parameter #2180 works for the diagnosis #300 only.
- There is a "chirp, chirp" sound when the spindle starts, runs, and stops.

  Lower parameter #5460 of the spindle drive.
- There is a noise when the spindle stops.

  Decrease parameters #5345 or 5318 of the spindle drive.
- When the spindle is running at a general speed (rigid tapping S≈1000r/min), it shakes when being stopped.

  Increase parameter #5345 and decrease parameter #5346 of the drive.
- The spindle shakes when the high-speed tapping of the spindle stops.

  Decrease the values of parameters #2170, 2180 (gradually).

  When the spindle is oriented, if there is an overshoot or it swings when being stopped, decrease parameter #5348 appropriately.

1.6.3 Parameter setting of the analog drive unit of GS spindle

Servo parameter	Name	Notes
PA4	Control method selection	Set to 3 to allow the drive unit in the speed/position control mode
PA5	Position command mode	Set to 0, pulse + direction
PA6	Speed command mode selection	Set to 0, -10V~10V
PA15	First proportional gain of the speed loop	Set to 1100 Note: Standard tapping parameters of rigid tapping
PA16	First integral time constant of speed loop	Set to 4 Note: Standard tapping parameters of rigid tapping
PA19	First proportional gain of position loop	Set to 85 Note: Standard tapping parameters of rigid tapping
PA28	Position command direction	Set to 0, this setting is allowed when the rigid tapping direction is opposite to the command direction
PA51	Rotation direction inversion	Modify when the rotational direction of the spindle is opposite to the command
PA56	Zero drift compensation of user analog command	Mainly applicable when the spindle speed is 0, and the spindle still rotates at a small speed
PA60	Zero speed range of analog	Set to 0, mainly for the minimum speed range of the spindle

	command	

Setting method of the maximum speed parameter of the spindle motor (when the maximum speed of the motor exceeds the factory default value of 6000 rpm, it needs to be set):

<table>
<tr><td>a</td><td>Set the number of spindle drive units and change the password: PA0=1221</td></tr>
<tr><td>b</td><td>Set PA121 as the corresponding value:
<table>
<tr><th>PA121 set value</th><th>Maximum rotational speed of the motor rpm</th><th>P23, P42 may set the range rpm</th><th>Remark</th></tr>
<tr><td>1</td><td>3000</td><td>0~3100</td><td></td></tr>
<tr><td>2</td><td>6000</td><td>0~6200</td><td>Default Value</td></tr>
<tr><td>3</td><td>9000</td><td>0~9300</td><td></td></tr>
<tr><td>4</td><td>12000</td><td>0~12400</td><td></td></tr>
<tr><td>5</td><td>15000</td><td>0~15500</td><td></td></tr>
</table></td></tr>
<tr><td>c</td><td>Save parameters</td></tr>
<tr><td>d</td><td>The servo spindle drive unit is powered off, and then powered on again</td></tr>
<tr><td>e</td><td>Set the values of the new spindle drive unit parameters P52 and P54 (after modification, the system parameter #5115 should be changed to be consistent with them)</td></tr>
</table>

Setting of the orientation position of GS spindle:

a	After rotating the spindle motor for at least one turn, turn it to the place to be positioned
b	View the display value of the spindle drive dp-APO ¦- XXXX, and input the value into parameters PA103 and PA104
c	Save parameters
d	After commanding the spindle for more than one revolution, use the system command for positioning and confirm whether the position is correct

1.7 Speed parameter configuration

Regarding whether the machining process of the workpiece is stable, whether the machining efficiency is high, and what effect it has, the following speed parameters of the system needs to be adjusted:

Parameter Number	Name	Value Range	Default	Function Description	Remark
1224	Maximum cutting feed resultant speed (common to all axes)	0~1000000	10000	Maximum speed limit of multi-axis linkage	
1225	Maximum cutting feed speed for each axis in the	0~1000000	10000	Maximum speed of cutting feed in the automatic mode	

	automatic mode				
1226	Maximum rapid traverse speed in the automatic mode	0~1000000	10000	Maximum speed of G00 in the automatic mode	
1231	F0 speed of rapid traverse override	0~99999	100	Default speed of manual and automatic fast override F0	
1232	Manual feed speed	0~999999	1000		
1233	Manual rapid speed	0~999999	10000	Manual rapid traverse speed	
1239	Manual highest speed	0~999999	10000	Manual highest speed limit	
1240	Highest speed of single-step running		10000	Highest speed of single-step running	

1.8 Acceleration parameter configuration

1) Another factor that affects the machining process and effect is the system acceleration. The common acceleration parameters are as follows:

Parameter Number	Name	Value Range	Default	Function Description	Remark
1400.6	PACD	0/1	1	0: Linear type; 1: S-curve type The linear acceleration is much lower than the acceptable acceleration of the S-curve	It is recommended to set to 1
1403.7	HJF	0/1	0	0: Linear type; 1: S type Move each axis in the manual or MPG mode to reduce impact	It is recommended to set to 1
1440	Linear maximum acceleration	0~25000	0.5	The maximum acceleration control of each axis when the system adopts the linear acceleration and deceleration (1400.6=0); the larger the set value, the shorter the acceleration and deceleration time, and the greater the impact when starting and stopping	
1442	Highest acceleration of circular interpolation feed	0~25000	0.8	Highest acceleration of circular interpolation feed.	The recommended setting range is 0.1~0.8. The smaller the value is, the higher the surface quality is, and the larger

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Parameter Number	Name	Value Range	Default	Function Description	Remark
					the value is, the higher the machining efficiency is
1443	Centripetal acceleration of curve interpolation	0~25000	0.8	Centripetal acceleration of curve interpolation	
1445	Acceleration upon dwell or RESET during G5P0 running	0~25000	0.7	Feed hold or default acceleration of reset: The larger the value, the faster the feed hold and reset response, but if it is too large, vibration and abnormal noise will generate	It should be increased to about 1 for high-speed machine
1446	Linear acceleration	0~25000	0.6	Maximum acceleration of handwheel: When the machine does not vibrate, the larger the value, the better the real-time response of each axis	
1447	Linear acceleration	0~25000	0.6	Manual maximum acceleration: When the machine does not vibrate, the larger the value, the better the real-time response of each axis	
1410	S-curve acceleration/ deceleration time constant T1 of rapid feed	0~4000	64	L-type acceleration/deceleration time constant T or S-type T1 before rapid feed	
1411	S-curve acceleration/ deceleration time constant T2 of rapid feed	0~4000	128	S-type acceleration/deceleration time constant T2 of rapid feed	
1480	S-curve acceleration/ deceleration time constant T1 of cutting	0~4000	128	Linear acceleration/deceleration time constant T/or S-type T1 before cutting feed	

Parameter Number	Name	Value Range	Default	Function Description	Remark
	feed				
1481	S-curve acceleration/ deceleration time constant T2 of cutting feed	0~4000	64	S-type acceleration/deceleration time constant T2 before cutting feed	

2) Manual and MPG control of acceleration and deceleration

Parameter Number	Name	Default	Function Description	Remark
1447	Linear manual acceleration m/s^2	1	Manual control valid	
1450	S-type acceleration/deceleration time constant of manual feed	128	Adjustment valid in the manual mode	
1451	S-type acceleration/deceleration time constant of manual rapid	128	Adjustment valid in the manual mode	
1452	S-type acceleration/deceleration time constant of MPG feed	128	Adjustment valid in the MPG mode	

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1.9 System zero return configuration

When using an incremental encoder, the following parameters should be set correctly so that the machine can establish the reference point by manual zero return.

When an absolute value encoder is used, the absolute-position zero must be established for machine operation. You can set the machine zero by manual zero return when parameter #4001.3APZ is set to 0. When the machine is not installed with the zero return switch, you can manually modify parameter 4001#3APZ from 0 to 1 to set the zero point. The following parameters do not need to be set when setting the zero point manually.

The parameters to be set for the machine zero return are detailed as follows:

Parameter Number	Name	Value Range	Default	Definition Description	Remark
#1004.5	ZMIn	0/1	0	Set the reference point return direction of each movement axis of the machine: 1 positive direction - 0 negative direction	
#2401.4	DEC	0/1	0	Reference point return deceleration signal: 0: Decelerate if it is 0 1: Decelerate if it is 1	
#1060	Movement amount per	0~999999	10	Movement amount per revolution of the feed axis (unit:	Affects zero return

	revolution of the feed axis			mm or °)	accuracy
#1234	FL speed of each axis returning to the reference point	50~10000	300/75	During the reference point return process of each axis, after receiving the deceleration signal, the axis decelerates to this speed and continues to move until it encounters the z-direction pulse	The larger the value, the faster it returns to zero, but the accuracy will be reduced
#1235	Reference point return speed of each axis	1000~10000	4000/2000	Speed in the first stage in the reference point return process of each axis	
#1236	2nd FL speed reference point return of each axis	1~1000	7/2	In the reference point return process of each axis, find the speed used in the 2nd z-direction pulse process	
#1444	Default acceleration of machine zero return	0~25000	0.139/80	Acceleration used in the reference point return process of each axis	

1.10 Soft limit, second reference point, backlash parameters

Generally, the following parameters need to be set before machining with the system:

Parameter Number	Name	Value Range	Default	Definition Description	Remark
#1080	Positive soft limits	-99999.99 ~99999.99	99999.99	Positive soft limit of each axis	Set to maximum if without position limit
#1081	Negative soft limits	-99999.99 ~99999.99	-99999.99	Negative soft limits of each axis	Set to minimum if without position limit
#1051	Coordinate value of the 2nd reference point of each axis in the machine coordinate	-99999.99 ~99999.99	0	Second reference point of machine	According to the machine structure, set the tool change point without affecting machining.
#1403.5	Backlash compensation switch	0	0	Backlash compensation: 0: No compensation 1: Compensation	After setting this value, the compensation amount must be set according to the measurement
#4121	Backlash	0~999999	0	Cutting backlash	Set to the actual tested

	compensation amount			compensation amount	value Unit: mm

1.11 Screw pitch compensation parameters

Pitch error compensation:

Parameter Number	Name	Value Range	Default	Definition Description
#2800.0	SCRW	0/1	0	Whether to perform the pitch error compensation: 0: No 1: Yes
#2800.1	WDIR	0/1	0	Pitch error compensation mode: 0: Unidirectional 1: Bidirectional
2806	Pitch error compensation value for reference point return	32768~23767	0	In the case of bidirectional pitch compensation, enter the backlash into this parameter, which uses the same unit of pitch compensation
#2810	Reference point compensation number of each axis	0~1023	0	Set the compensation origin
#2811	Negative farthest end compensation number	0~1023	0	Pitch error compensation point number at the farthest end in the negative direction of each axis
#2812	Positive farthest end compensation number	0~1023	0	Pitch error compensation point number at the farthest end in the positive direction of each axis
#2813	Pitch compensation override	1~100	1	Override of pitch compensation value
#2814	Pitch compensation interval	0~9999.9999	0	Spacing between two adjacent points when calculating the pitch compensation

Position switch:

Parameter Number	Name	Value Range	Default	Definition Description	Remark
#2401.3	SWI	0/1	0	Whether the position switch is valid: 0: Invalid 1: Valid	
#2500~2531		0~5	0	Servo axis number corresponding to the position switch	

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#2532~2563		0~999999	0	Positive max range of position switch	
#2564~2595		0~999999	0	Negative max range of position switch	

1.12 Synchronous axis debugging

The synchronous axis function is used for two motors driving the same feed axis. Due to the mechanical hard connection, the two drives must be strictly synchronized. A synchronization group consists of a master axis and a maximum of 2 slave axes. Taking the X master axis and the U slave axis as an example, the steps are detailed as follows:

1) First, determine the mechanical installation structure, and the motor rotation direction of the XU axis also needs to be determined.
2) In the case of no load, when the XU axis is running normally, ensure that the XU acceleration and deceleration parameters and gear ratio are consistent, and after the motor rotation direction is correct, enable the synchronous axis function.
3) After the synchronous axis function is enabled, set the zero point of the master and slave axes at the same time, and the slave axes will no longer be able to exercise the program and manual control.
4) For the tightening machine running with load, view the system diagnosis 105, check the current value of the XU axis, usually the deviation between the two axes is not too large, and they can run normally.
5) Move to the machine zero and reset the origin.

Parameters	Name	Value Range	Default	Definition Description	Remark
#4020.0	SNY	0/1	0	Tag indicating valid feed axis synchronization 0: Invalid 1: Valid	Set to 1 when there is synchronous axis
#4020.1	ADJ	0/1	0	Synchronous correction mode of the feed axis 0: Invalid 1: Valid	It is used to manually correct the synchronization error. When set to 1, the synchronization is canceled, and one axis can be adjusted separately
#4020.3	SPW	0/1	0	Start position check of feed axis synchronization (0: Yes/1: No)	Set to 1 if there is a deviation between the starting positions of the two axes
#4021	Main control axis number	0~Number of maximum	0	Set the axis number of master axis to the slave axis	For example: when the V axis is the slave axis of Y axis, the V axis

Parameters	Name	Value Range	Default	Definition Description	Remark
		control axes			parameter is set to 2
#4022	Allowable synchronization error of the coordinates of the machine	0~99999	1000	Set the machine coordinate deviation allowable between the master and slave axes	Only set the slave axis
#4023	Allowable synchronization error of position deviation	0~99999	2000	Set the detection position deviation allowable between the master and slave axes	Only set the slave axis
#4025	Allowable error amount of synchronous torque	0~99999	0	Set the torque deviation allowable between master and slave axes	Only set the slave axis

Note: 1. The servo parameters of the master and slave axes should be set consistently; particularly, the position loop gain must be consistent.

2. When setting the zero point of the synchronous axis, the emergency stop should be pressed to avoid the ensuing adjustment of the other axis.

3. After adjusting the parameters, you should observe the current and synchronization errors between the two synchronized axes. If the difference between the two axes is too large, it is incorrect or there is a mechanical problem.

1.13 Debugging of the fourth axis

1.13.1 Debugging of CNC rotation axis

The setting steps of installing the fourth axis are detailed as follows:

1) Restart after setting parameters #800 and #801 as 4, and the system will turn on and display the fourth axis.

2) Connect the servo drive correctly and recover the default parameters.

3) Correctly set the logical address of #225 slave station.

4) Correctly set #4017 and #4018 according to the gear ratio.

5) After the system clears the alarm, please refer to 3.21 of this part for details about the clamp/release control of the fourth axis.

Parameter Number	Name	Value Range	Default	Definition Description	Remark
#800	Select the number of system control axes	1~8	3	Set the number of system control feed axes	
#801	Select the number of system linkage axes	1~8	3	Set the number of system control linkage axes	
#1020	Programming axis name of each axis	A65, B66, C67, U85, V86, W87, X88, Y89, Z90	X88 Y89 Z90	Set the name of each axis	A-axis 65, B-axis 66, C-axis 67
#1023.1	ROT	0/1	1	Whether each axis is a rotation axis or a translation axis 0: Translation 1: Rotation	
#1023.2	Rotation axis coordinate axis type	0/1	0	Rotation axis coordinate axis type 0: Rotation axis type 1: Linear axis type	
1023.3	Rotation axis interpolation mode	0/1	0	0: Nearby; 1: Not nearby;	
#1023.5	Relative coordinate display	0/1	0	Relative coordinate display: 0: Command value 1: Within 360 degrees	
#1023.6	Absolute coordinate display	0/1	0	Absolute coordinate display: 0: Command value 1: Within 360 degrees	

1.13.2 Debugging of indexing worktable

Parameter Number	Name	Value Range	Default	Definition Description	Remark
#1030.7	ITI	0/1	0	Validity of the indexing worktable function: 0: Invalid 1: Valid	Axis for which the indexing worktable function is set to be enabled cannot be moved manually
#1030.6	IDX	0/1	0	Indexing sequence of indexing worktable: 0: Type A	

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				1: Type B	
#1931	Minimum indexing angle of indexing worktable	0~360.000	0	Set the commanded minimum exact divisor	After setting the minimum angle parameter, the programmed command value of the axis can only be an integral multiple of the minimum angle, otherwise it will give an alarm
#1932	Indexing axis setting of indexing worktable	0~8	0	Set the axis number of the index worktable function axis	For example, if the fourth axis is set to the indexing axis, then the parameter is set to 4

Note: For details about the PLC parameter setting, please refer to 3.21 of this part.

Chapter II Precision Compensation

2.1 Backlash compensation

1. Ordinary backlash compensation:

When #1403.4 is set to 0, set the compensation value in parameter #4121, and the compensation value range of each axis is 0mm~±9999.9999mm.

2. Separate compensation for rapid traverse and cutting feed backlash:

When #1403.4 is set to "1", the high-precision machining can be achieved by compensating the clearance value with the backlash between different opposite directions according to the change of the feed speed, during rapid traverse or cutting feed.

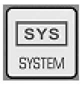
The backlash measured by the cutting feed is set in #4121; and the backlash measured during rapid traverse is set in parameter #4122.

3. Backlash compensation step size: Set the backlash compensation amount allocated by the system to each interpolation cycle compensation.

2.2 Unidirectional pitch error compensation

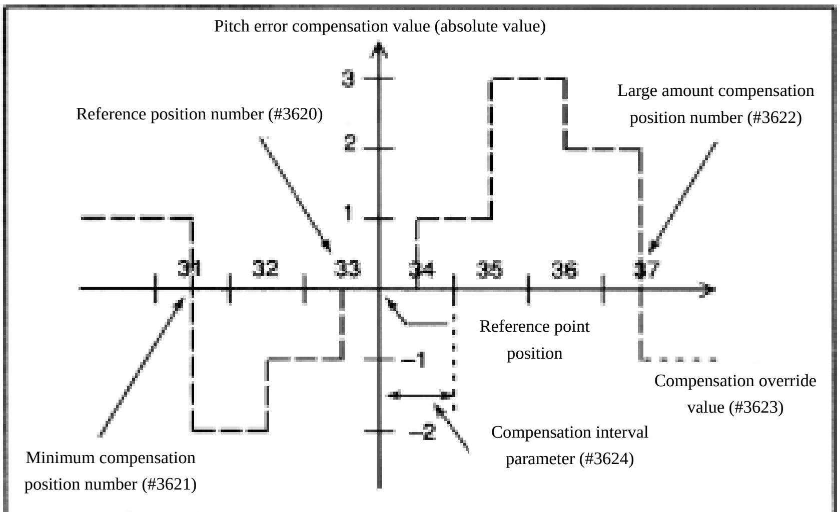
Function and purpose

If the pitch error compensation data is specified, the pitch error of each axis can be compensated by the detection unit. The compensation position of each axis compensation data is set at fixed interval. The compensation origin is the reference point for each axis of the machine. The compensation data is set according to the measurement error.

The pitch error compensation data can be set on the "Pitch Compensation" interface under the 

key menu. To set or modify the pitch compensation value, you need to obtain the permission of the machine manufacturer or higher in "Login".

When performing the pitch error compensation, the following parameters must be set. According to these parameters, the pitch error of each compensation point should be set (each point is numbered by position).



Compensation position number	31	32	33	34	35	36	37
Compensation value to be set	−3	+1	+1	+1	+2	−1	−3

In the following example, the reference point is used as the datum point for compensation, and the compensation number is set to 33.

Whether to perform the pitch compensation: parameter #2800.0.

Unidirectional and bidirectional selection of pitch compensation: parameter #2800.1.

Pitch error compensation value of reference point return (bidirectional pitch compensation backlash): parameter #2806.

Position number of pitch error compensation of reference point (each axis): parameter #2810.

Minimum position number for pitch error compensation (each axis): parameter #2811.

Maximum position number of pitch error compensation (each axis): parameter #2812.

Override of pitch error compensation (each axis): parameter #2813.

Compensation point spacing of pitch error compensation (each axis): parameter #2814.

Detailed description

Definition of compensation position: In order to specify the compensation position for each axis, the positive and negative movement directions of compensation should be specified based on the reference point. If the machine stroke exceeds the specified range in the positive or negative direction, the pitch error compensation will not work when the specified range is exceeded.

Compensation position point number: On the setting screen of pitch error, a total of 1024 points can be compensated from 0 to 1023. The available parameters can arbitrarily assign compensation points to each axis. The compensation position number of the reference point (parameter 2810), minimum compensation position number (parameter 2811) and maximum compensation position number (parameter 2812) must be set for each axis.

Compensation point interval: Compensation positions (points) are placed at an equal interval, which is set by parameter #2814, and may be set separately for each axis.

The minimum compensation interval is limited and can be calculated by the following equation:

Minimum interval of compensation points = maximum feed speed (rapid traverse speed) * (interpolation cycle/60000) * compensation override

Unit:

Minimum spacing of compensation: mm, inch, deg

Maximum feed speed: mm/min, inch/min, deg/min

[Example] When the maximum rapid traverse speed is 15000 mm/min, the minimum interval between compensation points is 2 mm.

Setting example

For linear axes:

Machine stroke:-400mm~800mm

Interval of pitch error compensation points: 50mm

Compensation position number of reference point: 40

After the above value is specified, the farthest compensation position number in the negative direction is given as follows:

Farthest compensation position number in the negative direction = compensation position number of the reference point - (machine stroke in the negative direction/compensation position interval) +1

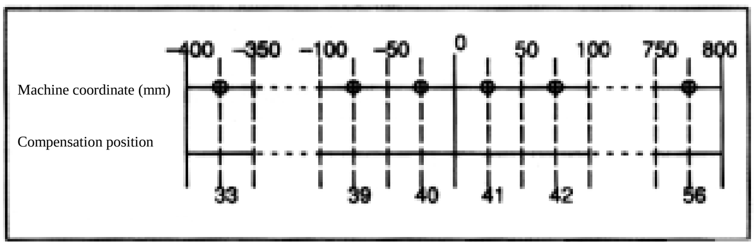
= 40 - 400/50 +1=33

The farthest compensation position number in the positive direction is given as follows:

Farthest compensation position number in the positive direction = compensation position number of the reference point + (machine stroke in the positive direction/compensation position interval)

= 40+800/50 = 56

The corresponding relationship between the machine coordinate value and the compensation position number is given as follows:



In the figure above, the compensation value is output at the position where the tag is 0.

Therefore, the set parameters are given as follows:

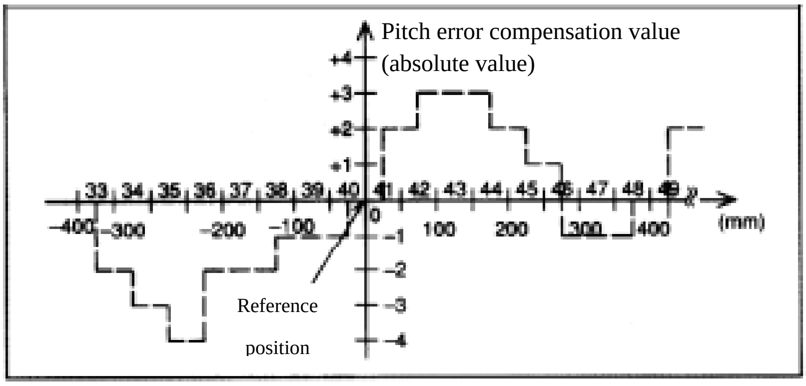
Parameter	Set Value
2810: Compensation position number of reference point	40

2811: Minimum compensation position number	33
2812: Maximum compensation position number	56
2813: Compensation override	1
2814: Interval of pitch error compensation points	50

The compensation value is output between the two coordinate values corresponding to the compensation position number.

An example of compensation amount is given below:

Point number	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	…	56
Compensation	-2	-1	-1	+2	0	+1	0	+1	+2	+1	0	-1	-1	-2	0	+1	+2	…	+1



For gyration axis:

Movement amount per revolution: 360 °

Interval of pitch error compensation points: 45 °

Compensation position number of reference point: 60

After specifying the above parameters, the farthest compensation position number in the negative direction of the rotation axis = the compensation position number of the reference point.

The farthest compensation position number in the positive direction is given as follows:

The farthest compensation position number in the positive direction = the compensation position number of the reference point + (movement per revolution/compensation interval)

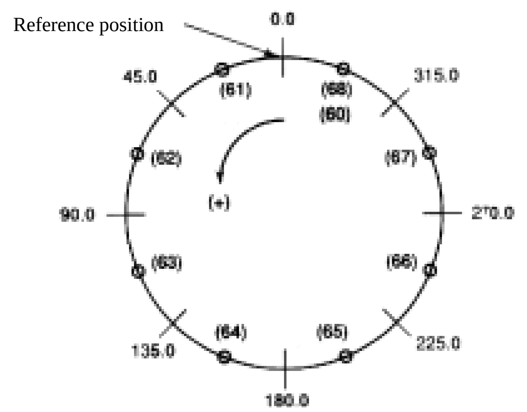
= 60 + 360/45 = 68

> Note: The compensation data of the gyration axis must be set within the range of one-revolution movement in the positive direction during design. If it is actually running within the range of the one-revolution movement in the negative direction, the one-revolution movement must be added to switch to the range of the one-revolution movement in the positive direction.

For example:

When setting the compensation value at -45° position, you should first set -45° + 360° = 315°, and then set the compensation value at -45° position at the compensation serial number corresponding to 315°.

Therefore, the corresponding relationship between the machine coordinate value and the compensation position number is given as follows:



The compensation value is output at the position marked with 0

Therefore, the set parameters are given as follows:

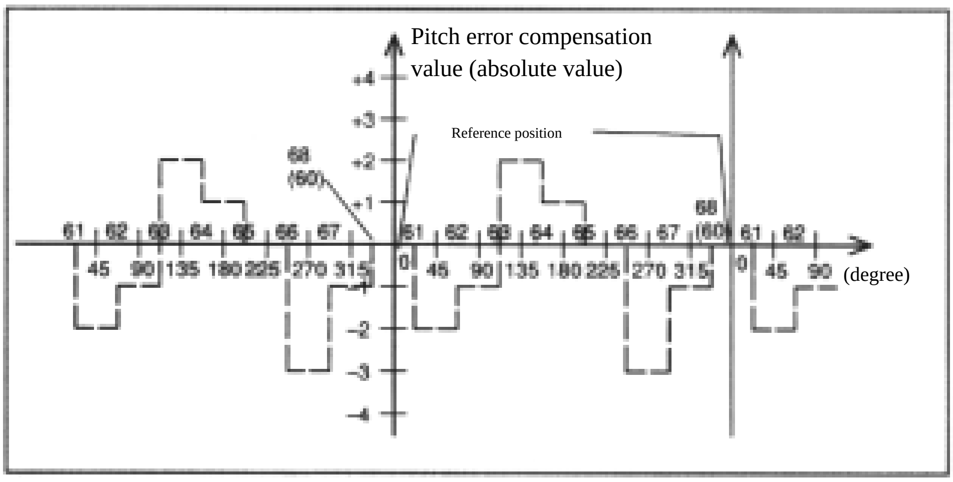
Parameter	Set Value
2810: Compensation position number of reference point	60
2811: Minimum compensation position number	60
2812: Maximum compensation position number	68
2813: Compensation override	1
2814: Interval of pitch error compensation points	45
1068: Movement amount of per revolution	360

If the sum of the compensation values from positions 61 to 68 is not 0, the compensation values per revolution will be accumulated, resulting in a position deviation.

At the compensation positions 60 and 68, the same value must be set.

An example of compensation amount is given below:

Point number	60	61	62	63	64	65	66	67	68
Compensation	+1	-2	+1	+3	-1	-1	-3	+2	+1

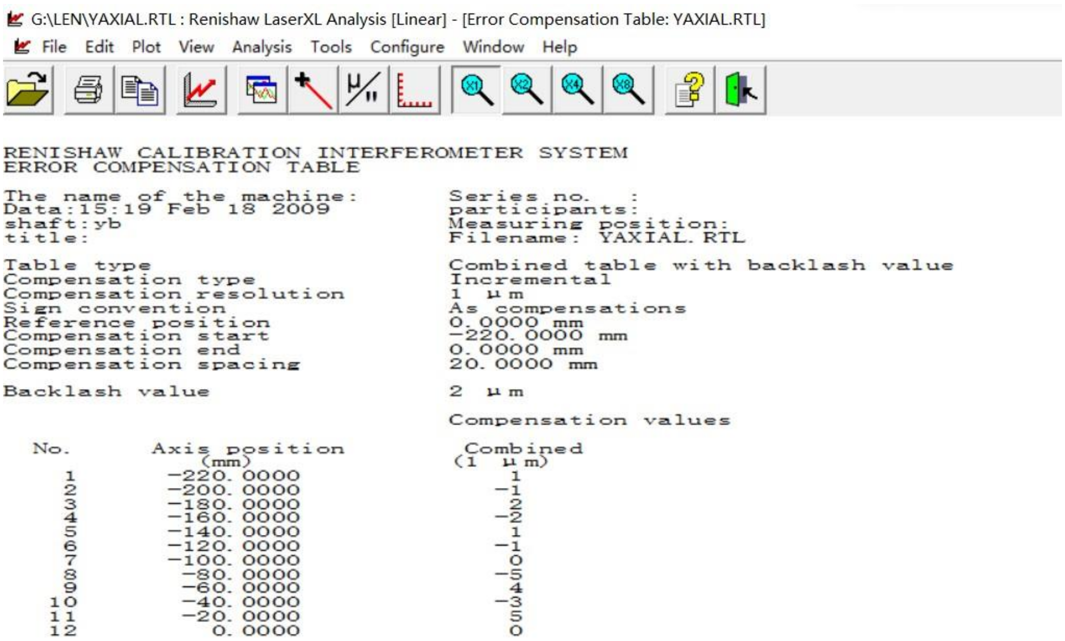


Example of compensation operation

In the above example, after returning to the reference point manually, the movement of the machine:

0, -20, -40, -60, -80, -100, -120, -140, -160, -180, -200, -220, -220, -200, -180, -160, -140, -120, -100, -80, -60, -40, -20, 0.

The measurement data of the laser interferometer is given as follows:


G:\LEN\YAXIAL.RTL : Renishaw LaserXL Analysis [Linear] - [Error Compensation Table: YAXIAL.RTL]

File Edit Plot View Analysis Tools Configure Window Help

RENISHAW CALIBRATION INTERFEROMETER SYSTEM
ERROR COMPENSATION TABLE

The name of the machine:	Series no. :
Data:15:19 Feb 18 2009	participants:
shaft:yb	Measuring position:
title:	Filename: YAXIAL. RTL
Table type	Combined table with backlash value
Compensation type	Incremental
Compensation resolution	1 μm
Sign convention	As compensations
Reference position	0. 0000 mm
Compensation start	−220. 0000 mm
Compensation end	0. 0000 mm
Compensation spacing	20. 0000 mm
Backlash value	2 μm

Compensation values

No.	Axis position (mm)	Combined (1 μm)
1	−220. 0000	1
2	−200. 0000	−1
3	−180. 0000	2
4	−160. 0000	−2
5	−140. 0000	1
6	−120. 0000	−1
7	−100. 0000	0
8	−80. 0000	−5
9	−60. 0000	4
10	−40. 0000	−3
11	−20. 0000	5
12	0. 0000	0

The error compensation values are presented as follows:

Parameter Number	Setting	Notes
2800.1	0	Bidirectional pitch error compensation: 1: Valid/0: Invalid
2810	11	Pitch error compensation point number corresponding to the machine reference position
2811	1	Farthest pitch error compensation point number on the reverse side when moving in the forward direction
2812	11	Farthest pitch error compensation point number on the forward side when moving in the forward direction
2813	1	Ratio of compensation values
2814	20	Interval of compensation points
1068	-	Gyration amount per revolution of gyration axis

For unidirectional compensation, take the data of the positive compensation point:

Positive point number	12	11	10	9	8	7	6	5	4	3	2	1
Compensation	0	+5	-3	+4	-5	0	-1	1	-2	+2	-1	1

Parameters:

	7#	6#	5#	4#	3#	2#	1#	0#
2800							WDIR	SCRW

[Data type] Bit type

[Data range] 0 or 1

SCRW: Screw pitch compensation

0: No

1: Yes

WDIR: Pitch compensation option

0: Unidirectional

1: Bidirectional

2806	Pitch error compensation value for reference point return	0

[Data type] character type

[Data range] -32768~32767

Note: The pitch error compensation value (absolute value) of reference point return when moving to the reference point

Part II Debugging

from the direction opposite to that of reference point return.

2810	Pitch error compensation number of reference points for each axis	0

[Data type]　　character type

[Data range]　　0~1023

2811	The number of the farthest pitch error compensation point in the negative direction of each axis	0

[Data type]　　character type

[Data range]　　0~1023

2812	The number of the farthest pitch error compensation point in the positive direction of each axis	0

[Data type]　　character type

[Data range]　　0~1023

Note: The set value of this parameter is larger than that of #2810 (pitch compensation number of reference point).

2813	Pitch error compensation override of each axis	0

[Data type]　　byte type

[Data unit]　　%

[Data range]　　1~100

2814	Spacing between the pitch error compensation points of each axis	0

[Data type]　　double-character type

[Data unit]　　mm

[Data range]　　0~9999.9999

Note: The pitch error compensation points are distributed at an equal spacing, and the minimum spacing = maximum feed speed* (interpolation cycle/60000) * compensation override.

1068	Amount of rotation angle per revolution of rotation axis	0

[Data type] double-character type

[Data unit] deg

[Data range] 0.001~9999.9999

0811	System interpolation cycle	0

[Data type] Real number type

[Data unit] %

[Data range] 0~16

Note: After this parameter is set, the power must be cut off once to take effect.

Precautions

1. Compensation value range

The setting range of compensation value is: -1024×compensation override (detection unit) ~ +1024×compensation override (detection unit). The compensation override of each axis can be set separately in parameter #2813, within the value range: 0~100.

2. Pitch error compensation of gyration axis

For a gyration axis, the interval of pitch error compensation points must be set to an integral multiple of one part of the movement per revolution (usually 360°). The sum of all pitch error compensation values per revolution must be 0. In addition, the same compensation value must be set at the same position for each revolution.

The compensation data of the gyration axis must be set within the range of one-revolution movement in the positive direction during design. If it is actually running within the range of the one-revolution movement in the negative direction, the one-revolution movement must be added to switch to the range of the one-revolution movement in the positive direction.

For example:

When setting the compensation value of -45° position, you should first set -45°+ 360°= 315°, and then set the compensation value of -45° position as the compensation serial number corresponding to 315°.

3. When the pitch error compensation is not executed

Caution: The pitch error compensation is not executed in the following cases:

After power-on, the machine does not return to the reference point. But excluding the use of absolute position detectors.

When the interval between the pitch error compensation points is 0.

When the positive or negative compensation position number is not within the range of 0~1023.

When the compensation position number does not conform to the following relationship: negative point number ≤ reference point number < positive point number.

2.3 Bidirectional pitch error compensation

Function and purpose

The bidirectional pitch error compensation function is to set the compensation amount in the positive and negative directions of the machine, so that the compensation can be made separately during positive and negative movements, and the compensation precision can be improved. Moreover, when the stroke movement is reversed, the compensation amount can be automatically calculated according to the compensation data, and the compensation can be made in the same way as the usual storage-type pitch error compensation method. The bidirectional pitch error compensation can reduce the position error of machine movements in the positive and negative directions.

Setting data:

1. Parameter setting

The following parameters should be set for each axis:

Table 2-1

Parameter Number	Notes
2800.1	Bidirectional pitch error compensation: 1: Valid/0: Invalid
2806	Pitch error compensation value for reference point return
2810	Pitch error compensation point number corresponding to the machine reference position
2811	Farthest pitch error compensation point number on the reverse side when moving in the forward direction
2812	Farthest pitch error compensation point number on the forward side when moving in the forward direction
2813	Ratio of compensation values
2814	Interval of compensation points
1068	Gyration amount per revolution of gyration axis

2. Pitch error compensation data

The number of pitch error compensation points corresponds to 0~1023 in the positive direction and 0~1023 in the negative direction.

Data setting example: Assume that the manual reference point return direction is the positive direction (linear axis), and the pitch error is illustrated in Figure 2-1. The setting data are presented in Table 2-2.

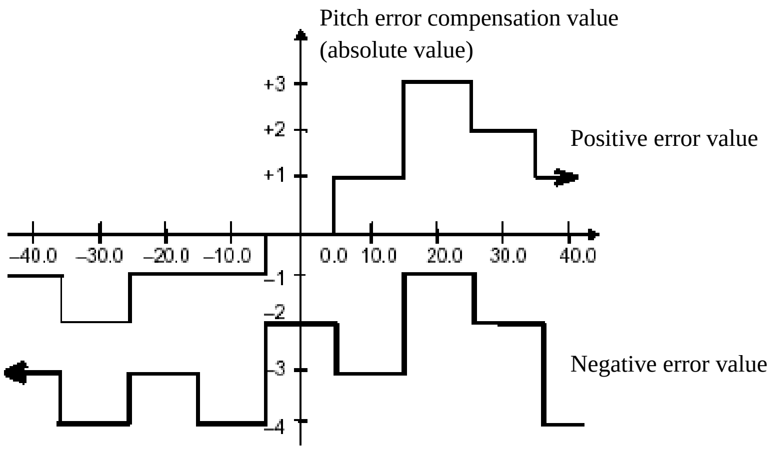


Figure 2-1

Table 2-2 Positive Error Compensation Data

Compensation point number	20	21	22	23	24	25	26	27
Set compensation value	-1	+1	0	+1	+1	+2	-1	-1

The pitch error data is always set to an incremental value as seen from the negative direction (the direction towards the left in Figure 2-2).

Table 2-3 Negative Error Compensation Data

Compensation point number	30	31	32	33	34	35	36	37
Set compensation value	-1	+1	-1	+2	-1	+2	-1	-2

After the positive compensation data is set, set the pitch error compensation data of each point in the negative direction.

The negative pitch error data is always set to an incremental value, as seen from the negative direction.

Table 2-4

Parameter Number	**Setting**	**Notes**
2800.1	1	Bidirectional pitch error compensation: 1: Valid/0: Invalid
2806	-2	Pitch error compensation value for reference point return
2810	23	Pitch error compensation point number corresponding to the machine reference position
2811	20	Farthest pitch error compensation point number on the reverse side when moving in the forward direction
2812	27	Farthest pitch error compensation point number on the forward side when

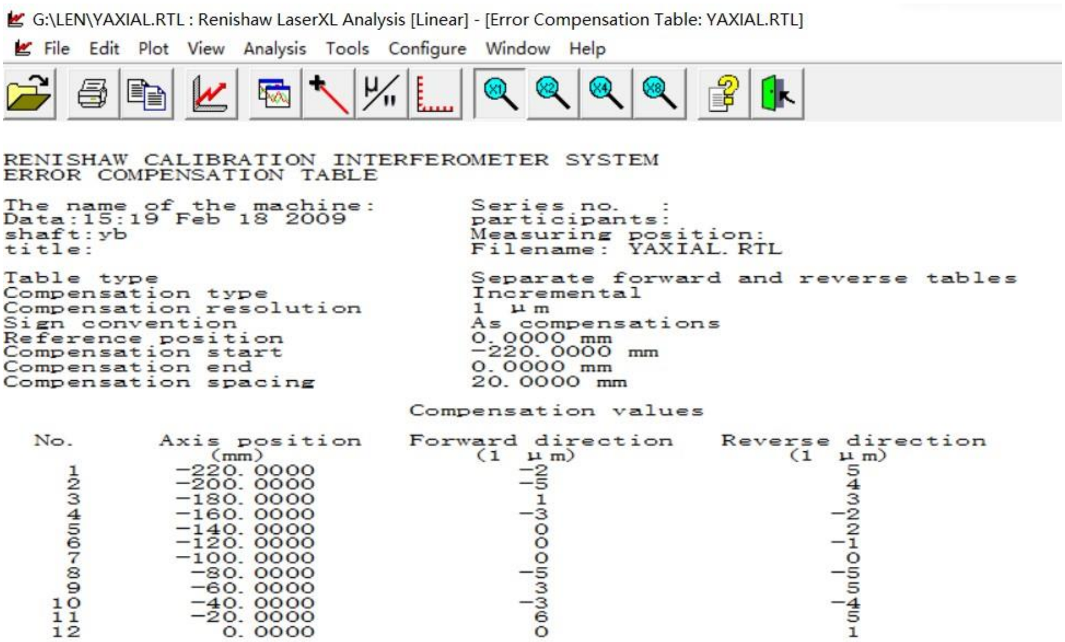
		moving in the forward direction
2813	1	Ratio of compensation values
2814	10	Interval of compensation points
1068	360	Gyration amount per revolution of gyration axis

3. Example of compensation operation

In the above example, after returning to the reference point manually, the movement of the machine: 0, -20, -40, -60, -80, -100, -120, -140, -160, -180, -200, -220, -220, -200, -180, -160, -140, -120, -100, -80, -60, -40, -20, 0

For bidirectional compensation:

The measurement data of the laser interferometer is given as follows:



RENISHAW CALIBRATION INTERFEROMETER SYSTEM
ERROR COMPENSATION TABLE

The name of the machine:
Data:15:19 Feb 18 2009
shaft:yb
title:

Series no. :
participants:
Measuring position:
Filename: YAXIAL.RTL

Table type	Separate forward and reverse tables
Compensation type	Incremental
Compensation resolution	1 μm
Sign convention	As compensations
Reference position	0.0000 mm
Compensation start	-220.0000 mm
Compensation end	0.0000 mm
Compensation spacing	20.0000 mm

Compensation values

No.	Axis position (mm)	Forward direction (1 μm)	Reverse direction (1 μm)
1	-220.0000	-2	5
2	-200.0000	-5	4
3	-180.0000	1	3
4	-160.0000	-3	-2
5	-140.0000	0	2
6	-120.0000	0	-1
7	-100.0000	0	0
8	-80.0000	-5	-5
9	-60.0000	3	5
10	-40.0000	-3	-4
11	-20.0000	6	5
12	0.0000	0	1

The output of its error compensation value is presented as follows:

Parameter Number	Setting	Notes
2800.1	1	Bidirectional pitch error compensation: 1: Valid/0: Invalid
2806	1	Pitch error compensation value for reference point return
2810	11	Pitch error compensation point number corresponding to the machine reference position
2811	1	Farthest pitch error compensation point number on the reverse side when moving in the forward direction

2812	11	Farthest pitch error compensation point number on the forward side when moving in the forward direction
2813	1	Ratio of compensation values
2814	20	Interval of compensation points
1068	360	Gyration amount per revolution of gyration axis

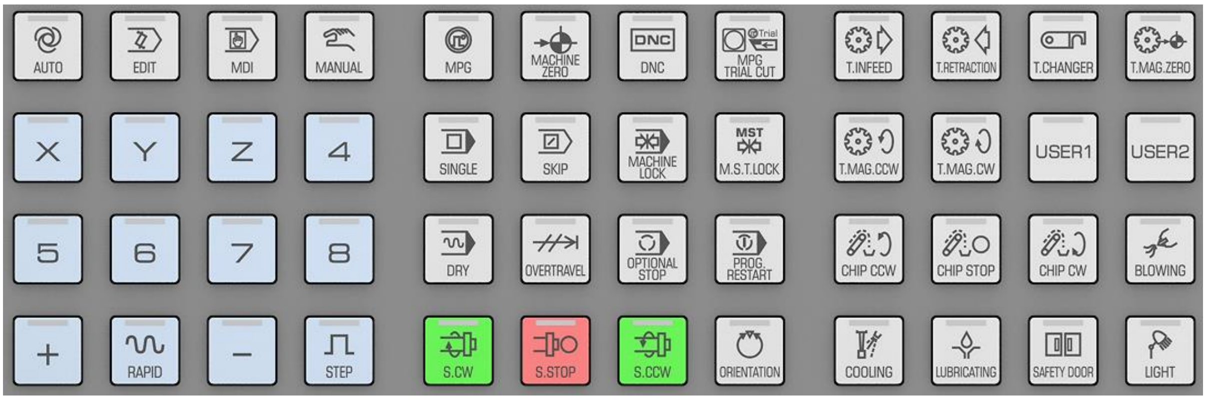
Negative point number	12	11	10	9	8	7	6	5	4	3	2	1
Compensation	1	+5	-4	+5	-5	0	-1	+2	-2	+3	+4	+5

Positive point number	12	11	10	9	8	7	6	5	4	3	2	1
Compensation	0	+6	-3	3	-5	0	0	0	-3	+1	-5	-2

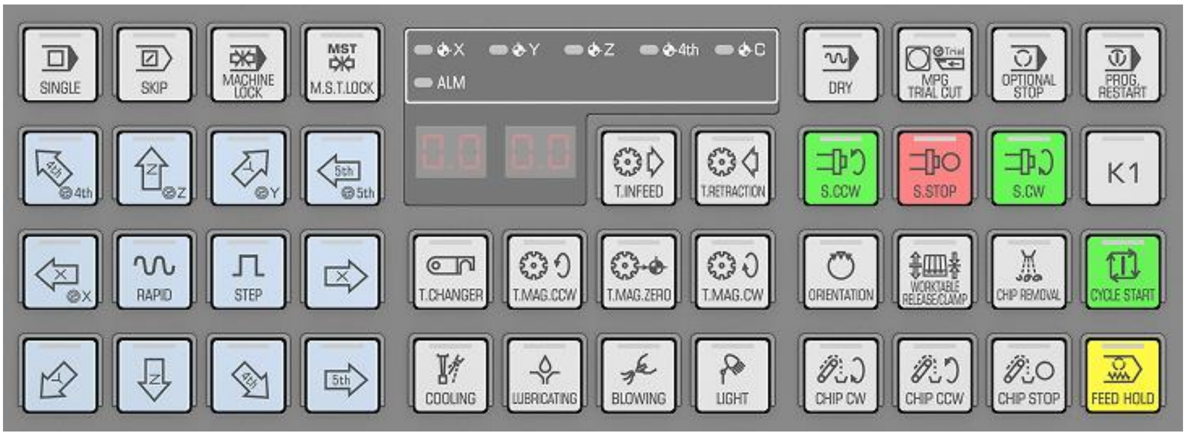
Chapter III Description and Debugging of Standard PLC Function

The description in this chapter aims only for the built-in standard PLC of the system, with the version number of MV2.18ABCS.LD2, which is applicable for all models of GSK25iMc. The PLC can be fit for 3- to 8-axis CNC boring and milling machines and carousel, disc, and clamping arm type tool magazine machining centers. If the machine manufacturer does not use this ladder diagram, please refer to the instructions for use provided by the machine manufacturer. The machine operation panel keys of the independent-key 8.4-inch, 15-inch color screen system are illustrated below.

1) Independent key 8-axis machine operation panel (selecting the 8-axis panel to set K0#2=1)



2) Independent key 5-axis machine operation panel (selecting the 5-axis panel to set K0#2=0)



Note: The mode selection and rapid override in the independent key panel are controlled by the knob switch.

The mode selection and rapid override selection in the membrane key panel are still controlled by separate keys, and there is no digital tube display.

3.1 Definition of input and output addresses

3.1.1 Input X address of standard machine operation panel

Table 3-1

Operation Panel Key Input	PLC Address	Operation Panel Key Input	PLC Address
Auto mode	X0.0	-4(8#"-")*3	X3.6
Editing mode	X0.1	-5 (8#single step)*3	X3.7
Enter mode	X0.2	Spindle CCW	X4.0
Manual mode	X0.3	Spindle stop	X4.1
MPG mode	X0.4	Spindle CW	X4.2
Zeroing mode	X0.5	Spindle orientation	X4.3
DNC mode	X0.6	F0/0.001	X4.4
MPG trial cutting	X0.7	25%/0.01	X4.5
Single block	X1.0	50%/0.1	X4.6
Skip	X1.1	100%/1	X4.7
Machine lock	X1.2	Chip removal forward	X5.0
Auxiliary lock	X1.3	Chip removal reverse	X5.1
+4 (8#X-axis)*3	X1.4	Chip removal stop	X5.2
+Z (8#Y-axis)*3	X1.5	Tool magazine forward	X5.3
-Y (8#Z-axis)*3	X1.6	Tool magazine back	X5.4
+5 (8#4-axis)*3	X1.7	Tool changer	X5.5
Dry run	X2.0	Tool magazine counter-clockwise	X5.6
Over-travel release	X2.1	Tool magazine return to zero	X5.7
Optional stop	X2.2	Worktable loose/tight	X6.0
Program restart	X2.3	K1(USER2)*2	X6.1
+X (8#5-axis)*3	X2.4	Chip flushing (USER3)*2	X6.2
Fast (8#6-axis)*3	X2.5	Air blowing (USER4)*2	X6.3
Single step (8#7-axis)*3	X2.6	Feed Hold	X6.4
-X (8#8-axis)*3	X2.7	Cycle Start	X6.5
Cooling	X3.0	Tool magazine clockwise	X6.6
Lubricating	X3.1	USER1*1*2	X6.7
Safety door	X3.2	Feed override, at most 24 gears (without output light)	X7.0-X7.4
Work light	X3.3	Spindle override, presenting the 16th gear at maximum (no output light)	X8.0-X8.3
+Y(8#"+")*3	X3.4	Emergency stop	X8.4

Operation Panel Key Input	PLC Address	Operation Panel Key Input	PLC Address
-Z (8#fast)*3	X3.5		
Note: *1 represents that the key is not available in the independent key structure. *2 The name in parentheses is the mask-type structure identification. *3 The 8-axis panel annotation definition is in parentheses.			

3.1.2 Output Y address of standard machine operation panel

Table 3-2

Operation Panel Output	PLC Address	Operation Panel Output	PLC Address
Auto key indicator	Y0.0	-5 (8# single step)*3 key indicator	Y3.7
Edit key indicator	Y0.1	Spindle counter-clockwise key indicator	Y4.0
Enter key indicator	Y0.2	Spindle stop key indicator	Y4.1
Manual key indicator	Y0.3	Spindle clockwise key indicator	Y4.2
MPG key indicator	Y0.4	Spindle orientation key indicator	Y4.3
Back-to-zero key indicator	Y0.5	F0/0.001 key indicator	Y4.4
DNC key indicator	Y0.6	25%/0.01 key indicator	Y4.5
MPG trial cut key indicator *1	Y0.7	50%/0.1 key indicator	Y4.6
Single block key indicator	Y1.0	100%/1 key indicator	Y4.7
Skip key indicator	Y1.1	Chip removal forward indicator	X5.0
Machine lock key indicator	Y1.2	Chip removal reverse indicator	X5.1
Auxiliary lock key indicator	Y1.3	Chip removal stop indicator	X5.2
+4 (8#X-axis)*3 key indicator	Y1.4	Tool magazine forward key indicator	Y5.3
+Z (8#Y-axis)*3 key indicator	Y1.5	Tool magazine back key indicator	Y5.4
-Y (8#Z-axis)*3 key indicator	Y1.6	Tool changer key indicator	Y5.5
+5 (8#4-axis)*3 key indicator	Y1.7	Tool magazine counter-clockwise key indicator	Y5.6
Dry run key indicator	Y2.0	Tool magazine back-to-zero key indicator	Y5.7
Over-travel release key indicator	Y2.1	Workbench loose/tight key indicator	Y6.0

Operation Panel Output	PLC Address	Operation Panel Output	PLC Address
Optional stop key indicator	Y2.2	K1 (USER2) key indicator	Y6.1
Program restart key indicator	Y2.3	Chip flushing (USER3) key indicator*2	Y6.2
+X (8#8-axis)*3 key indicator	Y2.4	Blow key indicator*2	Y6.3
Quick key indicator	Y2.5	Feed hold key indicator	Y6.4
Single step key indicator	Y2.6	Cyclic Start key indicator	Y6.5
-X key indicator	Y2.7	Tool magazine clockwise key indicator	Y6.6
Cooling key indicator	Y3.0	USER1 key indicator*2	Y6.7
Lubricating key indicator	Y3.1	X-axis reference point indicator	Y7.0
Safety door indicator	Y3.2	Y-axis reference point indicator	Y7.1
Work light key indicator	Y3.3	Z-axis reference point indicator	Y7.2
+Y (8#"+")*3 key indicator	Y3.4	Axis 4 reference point indicator	Y7.3
-Z (8# fast)*3 key indicator	Y3.5	5-axis reference point indicator light	Y7.4
-4 (8#"-")*3 key indicator	Y3.6	System alarming	Y7.6
Note: *1 represents that the key is not available in the independent key structure. *2 The name in parentheses is the mask-type structure identification. *3 The 8-axis panel annotation definition is in parentheses.			

3.1.3 MPG signal input X address

Table 3-3

MPG Signal Input	PLC Address
STP (MPG emergency stop signal)	X121.0
X100 (MPG feed override)	X120.0
X10 (MPG feed override)	X120.1
X1 (MPG: Feed override)	X120.2
H5 (5-axis option)	X120.3
H4 (4-axis option)	X120.4
HZ (Z-axis option)	X120.5
HY (Y-axis option)	X120.6
HX (X-axis option)	X120.7

3.1.4 Input Y address of MPG signal

Table 3-4

MPG signal light output	Y120.0

3.1.5 Input X address of I/O unit

PLC Address	Signal Name	Signal Function	A	B	C	I/O
X9.0	*DECX (fixed)	Reference point return deceleration signal of X-axis	●	●	●	I
X9.1	*DECY (fixed)	Reference point return deceleration signal of Y-axis	●	●	●	I
X9.2	*DECZ (fixed)	Reference point return deceleration signal of Z-axis	●	●	●	I
X9.3	*DEC4 (fixed)	Reference point return deceleration signal of 4-axis	●	●	●	I
X9.4	*DEC5 (fixed)	Reference point return deceleration signal of 5-axis	●	●	●	I
X9.5	—	—				I
X9.6	—	—				I
X9.7	—	—				I
X10.0	—	—				I
X10.1	Condit.OVL	Air conditioning overload	●	●	●	I
X10.2	SP.Fan.OVL	Spindle fan alarm	●	●	●	I
X10.3	Lub.OVL	Lubrication overload	●	●	●	I
X10.4	—	—				I
X10.5	—	—				I
X10.6	—	—				I
X10.7	—	—				I
X11.0	LUB.ALM	Lubrication pump alarm input signal	●	●	●	I
X11.1	DOOR.ALM	Protective door alarm input signal	●	●	●	I
X11.2	HYPUP.ALM	Hydraulic pump overload input signal	●	●	●	I
X11.3	AIRPRE.ALM	Air pressure detection alarm input signal	●	●	●	I
X11.4	CLNM.ALM	Cooling pump motor overload alarm input	●	●	●	I

PLC Address	Signal Name	Signal Function	A	B	C	I/O
X11.5	CHIPM.ALM	Chip remover motor overload input signal	●	●	●	I
X11.6	MGPLA.ALM	Tool carrier motor overload input signal	●	●	●	I
X11.7	ARM.ALM	Mechanical arm motor overload input signal		●		I
X12.0	GR1.M	Spindle first gear (in-position detection)	●	●	●	I
X12.1	GR2.M	Spindle second gear (in-position detection)	●	●	●	I
X12.2	GR3.M	Spindle third gear (in-position detection)	●	●	●	I
X12.3	GR4.M	Spindle fourth gear (in-position detection)	●	●	●	I
X12.4	LUBPRE.I	Lubrication pump pressure detection	●	●	●	I
X12.5	TRLCK.I	Tool release (in-position detection)	●	●		I
X12.6	TCLCK.I	Tool clamp (in-position detection)	●	●		I
X12.7	CKST	Tool clamp/release button	●	●		I
X13.0	4UCLP.I	Fourth axis release in-position detection	●	●	●	I
X13.1	4CLP.I	Fourth axis clamping in-position detection	●	●	●	I
X13.2	Rinse.lad	Chip flushing overload	●	●	●	I
X13.3	SCOVL.I	Spindle cooling system overload input signal	●	●	●	I
X13.4	5UCLP.I	Fifth axis release in-position detection	●	●	●	I
X13.5	5CLP.I	Fifth axis clamping in-position detection	●	●	●	I
X13.6	—	—				I
X13.7	SP.Lub.OVL	Spindle oil cooling overload	●	●	●	I
X14.0	T-BARE	Tool carrier in position	●		●	I
X14.1	TZER.I	Tool magazine zero-return signal	●	●		I
X14.2	TCN.I	Tool count signal	●	●	●	I
X14.3	TFN.I	Tool magazine advance in position/tool case vertical	●	●		I

PLC Address	Signal Name	Signal Function	A	B	C	I/O
X14.4	TcK.I	Tool magazine back in position/tool case horizontal	●	●		I
X14.5	ATCZERO.I	ATC origin/C-type magazine tool change area signal		●	●	I
X14.6	ATCHOLD.I	ATC tool hold		●		I
X14.7	ATCSTOP.I	ATC stop/C-type magazine tool change enable signal		●	●	I
Note: A: tool magazine of carousel type, B: disc mechanical arm tool magazine, C: turret tool magazine, ● symbol indicates that there are functions marked in the table text. I represents input signal, and O represents output signal.						

3.1.6 Output Y address of I/O unit

PLC Address	Signal Name	Signal Function	A	B	C	I/O
Y8.0	CLN.O	Cooling pump (coolant)	●	●	●	O
Y8.1	MGFR.O	Tool magazine advancing / tool case vertical	●	●		O
Y8.2	MGBK.O	Tool magazine back / tool case horizontal	●	●		O
Y8.3	AOFF.O	Automatic power off	●	●	●	O
Y8.4	TRL.M	Tool release	●	●		O
Y8.5	MGCW.O	Forward rotation of tool magazine	●	●	●	O
Y8.6	MGCCW.O	Backward rotation of tool magazine	●	●	●	O
Y8.7	ARM.O	Mechanical arm motor		●		O
Y9.0	LUB.O	Lubrication pump output	●	●	●	O
Y9.1	OR.T	Over-travel release	●	●	●	O
Y9.2	M03	Spindle forward	●	●	●	O
Y9.3	M04	Spindle reverse	●	●	●	O
Y9.4	RED.L	Lighthouse red light	●	●	●	O
Y9.5	YEL. L	Lighthouse yellow light	●	●	●	O
Y9.6	GRE. L	Lighthouse green light	●	●	●	O
Y9.7	HYPR.O	Hydraulic oil pump	●	●	●	O
Y10.0	GR1.O	Spindle 1st gear	●	●	●	O
Y10.1	GR2.O	Spindle 2nd gear	●	●	●	O
Y10.2	GR3.O	Spindle 3rd gear	●	●	●	O
Y10.3	GR4.O	Spindle 4th gear	●	●	●	O
Y10.4	4UCLPO	4-axis release	●	●	●	O
Y10.5	4-CLPO	4-axis clamping	●	●	●	O
Y10.6	5UCLPO	5-axis release	●	●	●	O
Y10.7	5-CLPO	5-axis clamping	●	●	●	O

Part II Debugging

PLC Address	Signal Name	Signal Function	A	B	C	I/O
Y11.0	LAMP.O	Machine work light	●	●	●	O
Y11.1	WASH.O	Chip flushing valve	●	●	●	O
Y11.2	SPAIRT.O	Spindle air seal	●	●	●	O
Y11.3	CLN-2.O	Air blow of workpieces	●	●	●	O
Y11.4	CHIP1.CW	Forward rotation of chip conveyor	●	●	●	O
Y11.5	CHIP1.CCW	Reverse rotation of chip conveyor	●	●	●	O
Y11.6	C.MAG.BRAKE	C-type tool carrier brake			●	O
Y11.7	Lock	Door interlock open	●	●	●	O
Note: A: tool magazine of carousel type, B: disc mechanical arm tool magazine, C: turret tool magazine, ● symbol indicates that there are functions marked in the table text. I represents input signal, and O represents output signal.						

3.2 Emergency stop function

When the G8.4 signal is disconnected to 0, the standard factory PLC address X8.4 is 0 and the system enters the emergency stop state.

Emergency stop state conditions: The system panel communication is abnormal; the emergency stop switch is pressed.

After the automatic power-off function of the system is enabled, the system must be emergently stopped before starting the automatic power-off.

When the MPG function is enabled, the disconnection of the X121.0 signal will cause an emergency stop, which can be shielded and enabled through K1.0.

3.3 Hard limit overtravel

K9.0=1 when the hard overtravel detection of all axes is shielded, and K9.0=0 when it is not shielded.

When K9.0=0:

Set K9.4=1 for shielding the hard overtravel of the fourth axis, and set K9.5=1 for shielding the hard overtravel of the fifth axis.

Set K9.4=0 if the hard overtravel of the fourth axis is not shielded, and set K9.5=0 if the hard overtravel of the fifth axis is not shielded.

Note: 1. In order to ensure the safety of the machine, please keep the hard overtravel on the machine valid.

2. The current system configuration is an absolute encoder motor, which can use the soft limit function for protection. The hard limit input signal has been deleted in the standard ladder diagram.

3.4 Overtravel release

Press the 

key, the I/O unit Y9.1 outputs, and the user can connect an external relay to close the emergency stop chain disconnected due to overtravel.

Note: This key remains only on the membrane structure panel, but not on the independent structure panel.

3.5 Single step function

When the machine is not installed with an MPG, you can operate the feed axis like MPG by selecting the single-step feed mode.

The single-step processing of the power-on system lies at the "0.1" gear by default.

3.6 Tricolor lamp control

Control signals:

Address	Function Description	Remark
Y9.4	Red light output	The system is in an alarm state
Y9.5	Yellow light output	The system is ready for running
Y9.6	Green light output	The system is running automatically

3.7 Lubrication pump control

3.7.1 Automatic lubrication

Counter C000: [Preset Value]   Set the stop interval time of the automatic lubrication pump, unit: min.

Counter C000: [Current Value]   Set the oil supply time of the automatic lubrication pump, unit: s.

Counter C040: [Current Value]   Display the executed lubrication pump stop interval, unit: min.

When C000 [Current Value] and [Preset Value] are not set to 0, the lubrication pump starts to work after the interval set by C000 [preset value].

When the lubrication pump works automatically:

1. If K1.1=0, (there is no lubricating pressure detection switch), the pump work counter C000 [Current Value] will stop after the set time;
2. If K1.1=1, (there is a lubricating pressure detection switch), the pump will stop with a delay of 5s after the X12.4 pressure switch is actuated; (PLC diagnosis address X12.4=1 when reaching the pressure, if the PLC diagnosis address X12.4=0 when reaching the pressure, it is necessary to modify the ladder diagram X12.4 to invert the trigger logic);
3. If the pressure is not reached within the set time of the counter C000 [Current Value], the alarm #2032 will be issued.

3.7.2 Manual lubrication

If K1.1=1, (there is a lubricating pressure detection switch), the pump will stop with a delay of 2.5s after the X12.4 pressure switch is actuated;

If K1.1=0, when the set value of C000 [Current Value] is not 0, the pump will stop working after the set time of [Current Value], and when the set value of the counter C1 [Current Value] is 0, then release the lubrication button, and the lubrication pump stops.

3.7.3 Accumulation of lubricating intermittent time and alarm

The working interval time of lubrication pump can be memorized, the current stop time will be saved after the system is powered off, and the time counting will accumulate after it is powered on again; when the emergency stop or [Preset Value] and [Current Value] are set to 0, the accumulated timing will stop.

1. The lubrication pump does not output during emergency stop, reset and lubrication alarm, and the manual lubrication does not affect the time counting of automatic lubrication.
2. When the current value of C040 is greater than the preset value of C000, the system issues an alarm PL2043: PLC parameter setting error.
3. K11.0 is the alarm logic selection signal of the lubrication alarm input signal X11.0 (i.e., whether to give an alarm at 1 or 0). When an alarm arises, the lubrication pump does not output.

Control signals:

Address	Function Description	Remark
X3.1	Lubrication keys	
Y3.1	Lubrication indicators	
Y9.0	Lubrication pump output	
X11.0	Lubrication alarm input signal	
X12.4	Lubricating pressure detection signal	
K1.1	Whether to detect lubrication pressure	0: No 1: Yes
K11.0	Lubrication alarm signal selection	0: Normally open 1: Normally closed

3.8 Cooling pump control

In any operation mode, each time the 

key on the operation panel is pressed, the output state of the cooling pump will be reversed once. Command in automatic mode: M8 cooling pump on, M9 cooling pump off. The output of the cooling pump is disabled upon overload alarm, emergency stop and reset.

When the output of the cooling pump is enabled during autorun, if the protective door gives an alarm, the cooling pump output is disabled, and the cooling pump is automatically turned on after the protective door is closed. When there is no protective door alarm, the cooling pump can be manually operated.

Relevant input and output signals and K parameters:

Address	Function Description	Remark
X3.0	Cooling key	

Address	Function Description	Remark
Y3.0	Cooling key indicators	
Y8.0	Cooling pump control output	
X11.4	Cooling pump overload	
K11.4	Cooling alarm signal selection	0: Normally open 1: Normally closed

3.9 Hydraulic pump control

1. When the system is powered on and the emergency stop is released, the output of the hydraulic pump becomes the working state.

2. When the emergency stop button is pressed or the hydraulic pump gives an alarm, the output of the hydraulic pump is turned off, and the output will be resumed after the alarm and the emergency stop are cleared.

Relevant input and output signals and K parameters:

Address	Function Description	Remark
Y9.7	Hydraulic pump control output	
X11.2	Hydraulic pump overload	
K11.2	Hydraulic alarm signal selection	0: Normally open 1: Normally closed

3.10 Air blowing control of workpieces

In any operation mode, each time the 

key on the operation panel is pressed, the workpiece air blowing output status is reversed once.

In the automatic mode, the command M7 means workpiece air-cooling on, and M9 means workpiece air-cooling off. The output is turned off during emergency stop and reset.

Relevant input and output signals:

Address	Function Description	Remark
X6.3	Workpiece air blowing key	Air blow (USER2) key
Y6.3	Workpiece air blowing indicator	Air blow (USER2) key
Y11.3	Workpiece air blowing control output	

3.11 Chip remover control

3.11.1 Manual operation of chip removal

In any working mode, the output state of the chip remover can be controlled through the 

,

, and


keys on the operation panel.

3.11.2 Two options for automatic chip removal

1. M-code commands for chip removal

   When K0.7=0 (the automatic start and stop of chip removal is invalid), M35 means the forward rotation is on, M34 means the reverse rotation is on, and M36 means the forward rotation is off. The output is turned off during overload alarm and emergency stop of the chip remover.

2. Time-controlled automatic start and stop of chip removal

   When K0.7=1 (the automatic start and stop of chip removal is valid), T006 must be set to the forward rotation time, and T004 is the stop time. When the system operates in the automatic mode, MDI mode or DNC mode, after the startup program runs, the chip remover can be automatically started and stopped according to the start and stop time set by the timer.

When K0.7=1 (the automatic start and stop of chip removal is valid), the chip removal key on the panel is only used for reverse jogging during maintenance, that is, in the manual mode, press the chip removal key, the chip remover will be reversed, and release the key, the chip remover will stop.

Relevant signals of chip remover:

Address	Function Description	Remark
X5.0	Chip removal forward	
X5.1	Chip removal reverse	
X5.2	Chip removal stop	
Y5.1	Chip remover forward indicator	
Y5.2	Chip remover reverse indicator	
Y5.3	Chip remover stop indicator	
Y11.4	Chip remover forward output	Command M35
Y11.5	Chip remover reverse output	Command M34
X11.5	Chip remover overload	Command M36 (stop)
K11.5	Chip remover alarm signal selection	0: Normally open 1: Normally closed
K0.3	Chip remover function	1: On 0: Off
K0.7	Automatic start-stop of chip removal	1: Valid 0: Invalid

3.12 Work light control

When K2.6=1, in any operation mode, each time the


key on the operation panel is pressed, the work light output status is reversed once.

Relevant signals:

Address	Function Description	Remark
X3.3	Work light key	
Y3.3	Work light key indicator	
Y11.0	Work light control output	

3.13 Automatic power off function of the system

1. The K parameter that must be set (K1.4=1)
2. Operation method of automatic power off

   Press the  key, the indicator light will shine, and it enters the preparation state for automatic power-off.
3. Description of the control flow of automatic power-off

   When the automatic machining program of the machine ends, after executing the M30 program command, the system signal F9.4=1 is output; after a delay of 2 seconds, the system emergency stop is triggered, and after a delay of 60 seconds, the system I/O unit Y8.3 is output, triggering power-off of the machine and closing of the relay, then the system is powered off.

Note: 1. This function is valid for the membrane structure operation panel.

2. This key is not available on the independent structure operation panel, but the PLC has this function.

3.14 Protective door and door lock control function

1. Setting K1.2=1 for the protective door function

   After the protective door function is enabled, in the automatic mode or DNC mode, when the system runs the machining program, the protective door is opened, the spindle rotates normally (the K parameter can select whether to dwell the spindle when the door is opened), the feed axis enters a dwell state, and the cooling pump will be turned off immediately, and a PL1001 alarm will be issued (you can choose the K parameter to open the door without issuing an alarm, but limiting the speed of spindle and feed axis only). When the protective door is closed, the alarm is automatically cleared, and the output of the cooling pump is restored immediately. Press the Cycle Start key to continue the machining program.
2. Selection of opening the door to stop the spindle (K7.5)

   After opening the protective door function, if K7.5=1 is set, when the program is automatically running, the protective door is opened, the spindle dwells immediately, the feed axis enters a dwell state, the cooling pump is turned off, and the alarm PL1001 is given. After the door is closed, the pump restarts immediately; however, the spindle will not automatically resume rotation, but needs to be restarted.
3. Selection of opening the door to limit the speed (K1.7)

   After the protective door function is enabled, if K1.7=1 (opening the door to limit the speed), K7.5=0 (opening the door without stopping the spindle) and the program runs automatically, when the protective door is opened, the system will not give an alarm except the cooling pump stops, but the spindle speed and the feed speed of the feed axis are limited. The spindle safety speed is set by parameter #5118, and the safety speed of the feed axis is set by parameter #1260.

Control signals:

Address	Function Description	Remark
X11.1	Protective door alarm input signal	
Y11.7	Door interlock open	
K1.2	Protective door function	0: On 1: Off
K7.5	Whether the protective door alarm turns off the spindle	0: No 1: Yes
K11.1	Protective door alarm signal inversion	0: Normally open 1: Normally closed
K1.7	Whether to limit the speed by opening the door?	0: No / 1: Yes

3.15 Function of external MPG box

When using an external MPG according to the connection diagram, the external MPG function will be automatically enabled. You can also set parameter K2.0 to "1" to open the external MPG, and set K2.0 as "0" to close it.

When the external MPG axis selection signal is connected, the work indicator on the MPG is on, and the positive and negative direction key indicators of the corresponding axis on the machine operation panel are on, indicating that the axis has been controlled by the MPG; when the override signal on the external MPG box is connected, there is also a corresponding movement amount indication on the machine operation panel.

MPG box override key	×1	×10	×100	×1
Operation panel indication	F0 0.001	25% 0.01	50% 0.1	100% 1
Corresponding movement amount	0.001	0.01	0.1	1

Note: 1. The emergency stop button on the MPG is invalid when the external MPG function is not enabled.

2. There is no such indicator on the independent key structure panel.

Control signals:

Address	Function Description	Remark
X121.0	MPG stop	
X120.0	X100 (MPG feed override)	
X120.1	X10 (MPG feed override)	
X120.2	X1 (MPG feed override)	
X120.3	5-axis selection	
X120.4	4-axis selection	
X120.5	Z-axis selection	
X120.6	Y-axis selection	
X120.7	X-axis selection	
Y120.7	MPG signal light output	
K2.0	External MPG function	0: Off 1: On

3.16 Selection of two control modes for rapid override

3.16.1 Panel override key control

When the parameter K2.2 is set to "0", the panel key control is valid.

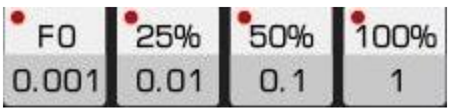
The override of manual rapid and G00 is controlled by F0, 25%, 50%, and 100% keys on the machine operation panel, and the initial value of the override is 50% after power-on.

3.16.2 Feed override knob control

When the parameter K2.2 is set to "1", the feed override knob control is valid.

The override of manual rapid and G00 is controlled by the cutting feed override switch on the panel. This switch controls the overrides of cutting feed and rapid traverse at the same time. Now, for the rapid traverse override, the adjustment range is 0%~100%, and the adjustment increment is 10%; when the override exceeds 100%, the rapid override is treated as 100%, and the cutting feed override should be the actual selection number.

When K2.2=0, set K2.1=1 to stop the rapid traverse when the feed override is adjusted to 0.



K2.2=0

K2.2=1

3.17 Spindle related functions

3.17.1 Polarity selection of spindle analog voltage

Bipolarity: When K2.7=0, the spindle control analog voltage output is ±10V.

Unipolarity: When K2.7=1, the spindle control analog voltage output is 0V~10V.

Analog output interface selection:

K18.0=1 When selecting IOR-44T or IOR-44F, the 1st channel analog interface is used;

K18.0=0 Select the system host CN21 spindle interface signal.

3.17.2 Selection of K parameters related to the spindle tool clamp/release

1. With/without the spindle tool clamp/release detection switch

   When there is a detection switch, set K7.3=0;

   When there is no detection switch, set K7.3=1;

   K7.3=1 is invalid when a tool magazine is selected.

2. Selection of whether the tool release detects the spindle zero speed signal

   Do not detect the spindle zero speed signal, K7.1=1;

   Detect the spindle zero speed signal, K7.1=0.

3. Selection of whether the manual tool clamp/release button of the spindle is self-locking

   If the tool clamp/release button of the spindle is self-locking, set K7.4=1;

   If the tool clamp/release button of the spindle is not self-locking, set K7.4=0.

3.17.3 Dual-spindle function

The standard PLC has the dual-spindle control function, which can realize the dual-spindle control through a series of system parameters and PLC parameter settings.

1. When the system parameter #5005=2, the dual spindle is enabled. If there is an analog spindle, set #5006 as 1. The digital spindle will be surely the first spindle, and the analog spindle will be the second spindle. In the corresponding spindle parameters, set the relevant motor parameters.
2. If the single and double spindles K8.7=1, the dual-spindle control is enabled.
3. Execute the M-code control switching in the system. After the switching is completed, it can be used with the same method as that of a single spindle. After switching, the spindle maintains the current state.

   M77 switches the first spindle.

   M78 switches the second spindle.

3.17.4 CS spindle control function

The standard PLC supports the CS spindle control function, which can be controlled by the CS axis of the spindle through a series of system parameters and PLC parameter settings.

1. When the system parameter #5002.1=2, the CS axis function is enabled.
2. Parameter #225 can select a control axis for the CS axis and sets it as -1.
3. Parameter #1023.1=1.
4. When the PLC parameter K14.2=1, the PLC will enable the CS axis control.
5. Execute the M-code control switching in the system. After the switching is completed, it can be used with the same method as that of a single spindle. After switching, the spindle maintains the current state.
   M126 can enter the CS axis.
   M127 can exit from the CS axis.
6. The position loop gain of the CS axis may be adjusted through parameter 5200.

3.18 Spindle orientation function

When the machine is equipped with a servo spindle drive, press the 

key on the operation panel if in the manual mode, or command in the automatic or input mode and run M19, the system will output an orientation start signal to the servo drive. After the drive receives the orientation start signal and servo enable signal sent by the system, it will execute the orientation action of the spindle servo motor according to the orientation speed and orientation position information pre-set on the drive. And it will stop the rotation and send the orientation completion signal to the control system after the spindle rotates the set position. After CNC receives the orientation completion signal, the M19 command ends.

Conditions of spindle orientation start:

1. In the spindle tool clamping confirmation state.
2. When using a tool magazine of carousel type, the tool magazine is in the rear position.
3. Mechanical arm magazine, the mechanical arm is in a zero state.
4. Turret tool magazine, the machine is outside the tool change area.

3.19 Spindle rigid tapping function

Command in the automatic or input mode and run M29, then the CNC will immediately output the rigid tapping start signal. After entering the rigid tapping state, the system will execute the displacement and linkage tapping according to the G84 fixed cycle command program written by the user. Execute G80 or M39 to exit the rigid tapping state.

Rigid tapping enable conditions:

1. In the spindle tool clamping confirmation state.
2. When using a tool magazine of carousel type, the tool magazine is in the rear position.
3. Mechanical arm magazine, the mechanical arm is in a zero state.
4. Turret tool magazine, the machine is outside the tool change area.

The GSK25iMc system is equipped with a GR3000 or GS3000 spindle drive, of which GR3000 is a digital spindle and GS3000 is an analog spindle. The debugging methods of rigid tapping of GR3000 and GS3000 spindle drives are briefed below respectively.

- Rigid tapping of GR3000 spindle

Parameter Number	Parameter Description	Factory Default Value
NO.2170	Position loop gain of rigid tapping spindle and tapping axis	350
NO.2180	Spindle loop gain coefficient during rigid tapping	320
NO.5105	Maximum acceleration during the spindle position control	139

Note: The rigid tapping parameters should be paired properly before factory delivery. If the rigid tapping effect is not good, parameters should be modified as the case may be.

Common problem-solving:

1) First, match parameters 2170 and 2180 correctly. According to the selected spindle encoder line number and the measured parameter values, make fine-tunning based on the following.

Parameter Number	2170	2180	Remark
1024 line encoder	280	320	
5000 line encoder	280	65	
21-bit encoder	280	0.625	Use as absolute value encoder

2) If the rigid tapping shakes during operation, you can increase NO.5345 by 100 each time, and decrease 5346 by about 50 each time. After modification, run the rigid tapping to see if there is any improvement.
3) If the rigid tapping effect is not ideal: You can modify NO.2180 (the spindle loop gain coefficient during rigid tapping), increase by 5 (or decrease by 5) each time, and run the rigid tapping after modification to see if there is any improvement.
4) If there is no improvement after adjusting the above parameters, and the spindle inertia is relatively large, the closed-loop acceleration NO.5105 may be decreased by 10 each time, but not exceeding 139.

How to assess the rigid tapping performance:

The rigid tapping effect is assessed by the value in [Diagnosis] NO.304 (the difference between the spindle conversion position deviation in rigid tapping), the value of NO.304 reflects the synchronization error in the process of rigid tapping, and if the less the displayed value is, it means that the synchronization is good. The range value is within 50, and try to adjust it to within 30.

- Rigid tapping of GS3000 spindle:

Parameter Number	Parameter Description	Factory Default Value
NO.5000#7	The analog spindle position control mode selects closed loop	1
NO. 5006	Analog spindle selection	1
PA-19	First proportional gain of position loop	40

Note: The rigid tapping parameters should be paired properly before factory delivery. If the rigid tapping effect is not good, parameters should be modified as the case may be.
PA-19 debugging method: The larger the proportional gain of the position loop, the faster the response to the position command, and the greater the stiffness. If the set value is too large, the motor start and stop can trigger position overshoot and cause vibration; the smaller the set value, the slower the response, and the larger the following error. When the user makes adjustment, this parameter is set to 75, and then increased by 2 (or decreased by 2) for fine-tunning until the motor runs smoothly. Note: When an analog spindle is used, the open-loop rigid tapping is adopted, and the synchronization cannot be checked through diagnosis. It needs to be verified by actual cutting.

3.20 Spindle gearshift (M/T gearshift selection of the digital/analog spindle)

3.20.1 M-type gearshift (S*** speed value automatically determines the gear)

1. M-type automatic gearshift function

   The M-type spindle gearshift can handle the automatic and manual switching control of 4 mechanical gears at most. When the gearshift is abnormal, the gear control can be restored by pressing [Spindle Stop] and [Feed Hold] simultaneously in the manual mode.

   When M3S**** (or M4S****) is commanded, the CNC will automatically determine which gear the S*** command speed belongs to, and whether the spindle gear signal needs to be changed according to the spindle gear speed parameters #5120, #5121, #5122, #5123, #5130, #5131, #5132 set by the user.

   For example:

   When the speed of the S*** command is consistent with the current gear position of the machine detected by the X signal of the I/O unit, the system starts directly according to the speed commanded by S*** and keeps the previous gear output Y signal unchanged.

   When the speed of the S*** command is inconsistent with the current spindle gear of the machine detected by the X signal of the I/O unit, the system will first output the spindle stop signal, and cut off the original gear output signal; until the zero speed signal of the spindle is detected, the low-speed swing signal of the spindle's forward and reverse rotation and the new gear output signal will be output, and the solenoid valve installed on the machine side can drive the gearshift mechanism to switch the speed change gear. After detecting the gear switch in-position signal, the CNC stops the spindle forward and reverse swing output, and automatically starts the spindle according to the newly commanded spindle speed.

   Once the gear position Y signal is output, it has a memory function after power off. After powering on again, it can continue the output at the gear before power off.

2. K parameters related to M-type automatic gearshift:

   K7.2=1(The S-code gearshift is valid)

K7.4=0(The manual gearshift is invalid)

K8.2=0(The asynchronous motor gearshift is invalid)

3. Related NC parameters of M-type automatic gearshift:

#5001.6=0(M-type gearshift valid)

#5110 Motor speed during the gearshift of spindle gears

#5120 Maximum spindle speed of gear 1

#5121 Maximum spindle speed of gear 2

#5122 Maximum spindle speed of gear 3

#5122 Maximum spindle speed of gear 4

#5130 Spindle speed at gear 1 - gear 2 switching point

#5131 Spindle speed at gear 2 - gear 3 switching point

#5132 Spindle speed at gear 3 - gear 4 switching point

#5160 1st gear, number of gear teeth on the spindle side

#5161 2nd gear, number of gear teeth on the spindle side

#5162 3rd gear, number of gear teeth on the spindle side

#5162 4th gear, number of gear teeth on the spindle side

#5165 1st gear, number of gear teeth of spindle motor

#5166 2nd gear, number of gear teeth of spindle motor

#5167 3rd gear, number of gear teeth of spindle motor

#5167 4th gear, number of gear teeth of spindle motor

4. Description of M-type manual gearshift function and K parameter setting

K parameters related to M-type manual gearshift:

K7.2=1(The S-code gearshift is valid)

K7.4=1(S-code manual gearshift valid)

K8.2=0(The asynchronous motor gearshift is invalid)

When M3 S**** (or M4 S****) is commanded, the CNC determines which gear the S*** command speed belongs to according to the spindle gear speed parameters #5120, #5121, #5122, #5130, #5131 set by the user, and then compare it with the current spindle gear (X signal) detected by the I/O unit to determine whether the command gear is consistent with the current spindle gear. If the S*** command gear is consistent with the detected gear, the spindle will be started at the new S*** speed. If the S*** command gear is inconsistent with the detected gear, the spindle enters the forward and reverse rotation low-speed swing state, waiting for manual operation to switch the shifting gears. When the system detects that the gear is shifted in place, it exits from the spindle low-speed swing state and stops the spindle. Press the Cycle Start button again to start the spindle at the new command speed.

3.20.2 T-type gearshift (M-code specifies the gear)

1. Description of T-type gearshift function

   The spindle T-type gearshift can handle the automatic and manual switching control of 4 spindle gears (this system).

   This type of spindle gear is specified by the operator using M-code or by manual operation. Four M-codes correspond to four groups (or multiple groups) of Y signal outputs, which drive the external solenoid valve and push the shifting gear to realize the switching of the spindle mechanical gear. For example:

   M41 (First gear of spindle)

   M3 S*** (Forward rotation S*** speed of spindle)

   M42 (Second gear of spindle)

   M4 S*** (Reverse rotation S*** speed of spindle)

2. Parameters to be set for T-type gearshift

   #5001.6=1(T-type gearshift valid)

   #5110 Motor speed during the gearshift of spindle gears

   #5120 Maximum spindle speed of gear 1

   #5121 Maximum spindle speed of gear 2

   #5122 Maximum spindle speed of gear 3

   #5123 Maximum spindle speed of gear 4

   #5160 1st gear, number of gear teeth on the spindle side

   #5161 2nd gear, number of gear teeth on the spindle side

   #5162 3rd gear, number of gear teeth on the spindle side

   #5163 4th gear, number of gear teeth on the spindle side

   #5165 1st gear, number of gear teeth of spindle motor

   #5166 2nd gear, number of gear teeth of spindle motor

   #5167 3rd gear, number of gear teeth of spindle motor

   #5168 4th gear, number of gear teeth of spindle motor

3.20.3 Speed change of three-phase asynchronous motor of the spindle (two-speed/three-speed winding switching)

1. Description of three-phase asynchronous gearshift function

   This type of spindle gearshift is realized by the Y signal output from the system I/O unit, driving the relay or AC contactor on the machine side, and switching the coil windings of the three-phase asynchronous motor of the spindle to realize the spindle gearshift.

   The command mode is as follows:

M3 S1 (Spindle forward first gear)

M4 S2 (Spindle reverse second gear)

M5 (or S0) (Spindle stop)

……..

When S1 is commanded, the Y first gear signal corresponding to the I/O unit is output

When S2 is commanded, the Y second gear signal corresponding to the I/O unit is output

When S3 is commanded, the Y third gear signal corresponding to the I/O unit is output

When S0 is commanded, the spindle gear signal of the I/O unit is not output

2. Parameters to be set for gearshift of the three-phase asynchronous motor

K7.2=0 (The S-code gearshift of the analog and digital spindle is invalid)

K8.2=1 The gearshift of the asynchronous motor is valid)

K7.4=0 (The manual gearshift is invalid)

#5000.6=0

3.20.4 Gearless digital/analog spindle control

When the spindle is a servo motor or a variable frequency motor, and there is no mechanical gearshift control, after setting the system parameters:

Command: M3 S***; (command speed) can realize the forward rotation of servo motor or variable frequency motor

Command: M4 S***; (command speed) can realize the reverse rotation of servo motor or variable frequency motor

Command: M5 or S0 can stop the spindle rotation

3.20.5 Check of spindle speed arrival signal during cutting (disabled, currently implemented by the system speed arrival function)

The PLC parameter K0.1 sets whether to check the spindle speed arrival signal during cutting (check if K0.1=0, not check if K0.1=1). After being set to check, when the CNC command changes from G0 to G01 state, if the CNC does not receive the spindle speed arrival signal, it will stop feeding and wait for the spindle speed arrival signal to prevent the variable frequency spindle from accidentally stopping during the machining process and the feed axis running from damaging the tools and machine.

3.21 Selection of indexing worktable and CNC rotary worktable (only for the 4^{th} axis)

3.21.1 Indexing worktable

1. Features of indexing worktable

   In the indexing worktable mode, the rotation of the fourth axis by the manual and handwheel mode is invalid (except for manual zero return). It can only command to rotate in the automatic/MDI mode, and the rotation angle of the command must be integer multiples of the set value of parameter #1931, otherwise the system will give a command error alarm.

2. Parameters to be set when selecting an indexing worktable

   #1030.7=1(The indexing worktable function is valid)

   #1030.6It can be set to 0 or 1 according to the needs of locking the front/rear motor cut-off enable

   #1931Set the minimum movement angle of the indexing worktable each time

   #1932=4(Currently only the 4^{th} axis is supported to be set to indexing worktable)

   K5.7=1(The indexing worktable function is valid)

   K4.0=1(Enable the fourth axis control)

   K5.0Choose whether to have a clamp/release mechanism. (K5.0=0 means yes by default)

   K5.1Select whether the 4^{th} axis has the release in-position detection signal (K5.1=0 by default, indicating that there is no in-position detection)

   K5.2Select whether the 4^{th} axis has clamped in-position detection signal (K5.2=0 by default, indicating that there is no in-position detection)

   When the in-position detection signal is set, the clamp/release in-position signal is not detected, and the 4^{th} axis is locked.

3. The release/clamp of the indexing worktable and the on-off of the motor enable

   The release/clamp of the indexing worktable is completed automatically. When there is a motion command, the system automatically outputs a release signal. When there is no motion command, the system automatically outputs a clamping signal, and the motor enable signal is disconnected according to the sequence set by parameter #1030.6, to make the motor in a free state.

3.21.2 CNC rotary table

1. Features of CNC rotary table

   When the 4^{th} axis of the system is selected as the CNC rotary table mode, the rotation of the 4^{th} axis can be freely operated in the manual and handwheel modes, and the arbitrary rotation angle of the 4^{th} axis can be commanded by the automatic mode. Whether the rotary table adopts automatic or M-code release/clamp can be set by the K parameter. For the specific meaning, please refer to the "Control and debugging of CNC rotary table" section.

2. Parameters to be set for the CNC rotary table

#1030.7=0 The indexing worktable function is invalid

K5.7=0 The indexing worktable function is invalid

K4.0=1 Enable the fourth axis

K4.1=1 Enable the fifth axis

3. Control and debugging of CNC rotary table

In order to adapt to the CNC rotary table control requirements of different manufacturers, the following K parameters must be set reasonably according to the different requirements of the release/clamp mechanism related to the rotary table control.

(1) With a release/clamp device

When the 4th axis rotary table has a release/clamp device, set K5.0=0.

When the 5th axis rotary table has a release/clamp device, set K5.5=0

(2) Without a release/clamp device

When the 4th axis rotary table has no release/clamp device, set K5.0=1.

When the 5th axis rotary table has no release/clamp device, set K5.5=1.

(3) With/without release in-position detection

When the 4th axis rotary table has the release in-position detection, set K5.1=1 and K5.1=0 without detection.

When the 5th axis rotary table has the release in-position detection, set K5.3=1 and K5.3=0 without detection.

(4) With/without clamp in-position detection

When the 4th axis rotary table has the clamp in-position detection, set K5.2=1 and K5.2=0 without detection.

When the 5th axis rotary table has the clamp in-position detection, set K5.4=1 and K5.4=0 without detection.

(5) Selection of release/clamp using the M-code or axis movement command

1) Release the 4th axis movement command or M11 command

When K6.0=0, when there is a 4th axis movement command in the program, the PLC can automatically output the rotary table release signal by using the 4th axis movement signal.

When K6.0=1, when there is a 4th axis movement command in the program, the PLC will not output the CNC rotary table release signal, and M11 can be used to release the 4th axis CNC rotary table.

2) Automatic clamp of the 4th axis or M10 command clamp

When K4.6=1, the automatic clamp function of the 4th axis is valid. When there is no

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movement command of the 4th axis, the PLC automatically outputs the rotary table clamp signal.

In practical applications, because the user may need to frequently start and stop the 4th axis when machining products, in order to avoid frequent movements of the 4th axis rotary table release/clamp mechanism, the user can also set K4.6=0 (the automatic clamp function of the 4th axis is invalid). When the rotary table needs to be clamped, M10 is used to clamp the 4th axis CNC rotary table.

3) Release by the 5th axis movement command or the M21 command

If setting K6.1=0, when there is a 5th axis movement command in the program, the PLC can automatically output the rotary table release signal by using the 5th axis movement signal.

If setting K4.5=0 and K6.1=1, when there is a 5th axis moving command in the program, the PLC will not output the CNC rotary table release signal, and M21 can be used to release the 5th axis CNC rotary table.

4) Automatic clamp of the 5th axis or M20 command clamp

When setting K4.7=1, the automatic clamp function of the 5th axis is valid. When there is no movement command of the 5th axis, the PLC automatically outputs the rotary table clamp signal.

In practical applications, because the user may need to start and stop the 5th axis frequently when machining products, in order to avoid frequent movements of the 5th axis rotary table release/clamp mechanism, the user can also set K4.7=0 (the automatic clamp function of the 5th axis is invalid). When the rotary table needs to be clamped, M20 is used to clamp the 5th axis CNC rotary table.

(6) Whether the CNC rotary table clamp disables the motor

K6.5=0: The 4th axis is released and enabled; K6.5=1: The 4th axis is clamped and disabled.

K6.6=0: The 5th axis is released and enabled; K6.6=1: The 5th axis is clamped and disabled.

Note: The automatic release/clamp control function is prohibited when the clamp and disconnection of the 4th and 5th axes are enabled. Release/clamp can only be released using the M-code control.

3.22 MPG trial cut function

Through K14.7=1, the handwheel simulation control is set to be valid. During autorun, press the key or the MPG trial cut key, press once to light up and make it valid, and press the light again to cancel it. After lighting, it can run through the MPG control program.

Note: The X0.7 signal is not available on the independent key operation panel, so this key doesn't exist. But PLC has this function.

1400.7: MPG simulation function (0: Unidirectional / 1: Bidirectional (only valid for G1G2G3G0)).

3.23 Continuous operation of air pressure alarm

For a machine equipped with tool magazine, when an air pressure alarm arises during machining, the system will automatically lock the Z axis. When the air pressure recovers to normal, press the Cycle Start button to continue running, or press the Reset button to clear the air pressure alarm.

3.24 Parameter settings

3.24.1 K parameter setting

Address	Function	Set Value: 0	Set Value: 1	Remark
K0.1	Whether to check the spindle speed arrival signal during cutting	Yes	No	Using a tool magazine of carousel type
K0.2	Mask selection	5-axis panel	8-axis panel	
K0.4	Large tool function	Off	On	Mechanical arm tool magazine
K0.5	Vertical or horizontal selection	Vertical	Horizontal	Mechanical arm tool magazine
K0.6	Tool magazine function	Off	On	
K0.7	Automatic chip removal function	Off	On	
K1.1	Lubrication pressure detection function	Off	On	
K1.2	Protective door alarm function	Off	On	
K1.4	Automatic power off function	Off	On	
K1.6	Lubrication pump function	Invalid	Valid	
K1.7	Open the door to limit the spindle and feed axis speeds	No	Yes	
K2.0	External MPG function	Off	On	
K2.1	Cutting feed override 0%, rapid traverse	Non-stop	Stop	
K2.2	Simultaneous control of rapid and feed override	Off	On	
K2.4	Chip flushing function	Off	On	
K2.5	Tool magazine forward and backward valve selection	Using double valves	Using a single valve	Using a tool magazine of carousel type
K2.6	Workpiece air blowing control/work	Off	On	

Address	Function	Set Value: 0	Set Value: 1	Remark
	light function			
K2.7	Spindle control analog voltage selection	±10V	0~10V	
K3.0	Tool magazine zero return function	Yes	No	For mechanical arm tool magazine
K3.1	Mechanical arm jog mode selection	Continuous action	Single-step jog	For mechanical arm tool magazine
K3.2	Advance tool reverse function	Close	Open	For mechanical arm tool magazine
K3.3	Tool magazine count signal selection	Fetch in-position signal	Fetch count signal	For mechanical arm tool magazine
K3.4	Position limit function in the Z-negative direction during tool change	Off	On	Using a tool magazine of carousel type
K3.5	Z-axis clamping speed function of high-speed machine	Off	On	Using a tool magazine of carousel type
K3.6	Tool magazine debugging status	Exit	Enter	
K3.7	M special reply	Off	On	
K4.0	Does the machine have the 4th axis	No	Yes	
K4.1	Does the machine have the 5th axis	No	Yes	
K4.2	Is there a switch in the tool change area	No	Yes	Clamp-arm tool magazine
K4.3	Tool change enable switch	No	Yes	Clamp-arm tool magazine
K4.4	C in-position inversion	Normal	Invert	Clamp-arm tool magazine
K5.5	C select count / in position	Normal	Invert	Clamp-arm tool magazine
K4.6	Fourth-axis automatic clamping function	Off	On	If selected as on, it will release when there is a movement command, and automatically clamp after the movement is
K4.7	Fifth-axis automatic clamping function	Off	On	

Address	Function	Set Value: 0	Set Value: 1	Remark
				completed
K5.0	4th axis with release/clamp device	Yes	No	
K5.1	Detect the release in-position signal of the 4th axis	No	Yes	
K5.2	Detect the clamp in-position signal of the 4th axis	No	Yes	
K5.3	Detect the release in-position signal of the 5th axis	No	Yes	
K5.4	Detect the clamp in-position signal of the 5th axis	No	Yes	
K5.5	The 5th axis has a release/clamp device	Yes	No	
K5.7	The four-axis is selected for CNC worktablerotary worktable/indexing worktable	CNC rotary table	Indexing worktable	
K6.0	The 4-axis rotary table automatically releases	Yes	No	
K6.1	The 5-axis rotary table automatically releases	Yes	No	
K6.5	The 4th axis (rotary table) clam disconnecting motor enable	Yes	No	The automatic release/clamp function cannot be used after being turned on
K6.6	The 5th axis clamp disconnecting motor enable	Yes	No	The automatic release/clamp function cannot be used after being turned on
K7.0	The 2nd spindle has no zero speed	Yes	No	
K7.1	Whether the spindle zero speed signal is detected when the tool is released	Yes	No	
K7.2	Spindle two-speed M-type gearshift function	No	Yes	
K7.3	Whether the spindle tool release	Yes	No	

Address	Function	Set Value: 0	Set Value: 1	Remark
	signal is detected			
K7.4	S-code manual gearshift of analog spindle	Invalid	Valid	
K7.5	Whether to close the spindle when the protective door gives an alarm	No	Yes	
K7.7	Tool release button on the panel	Invalid	Valid	
K8.0	Whether the manual release/clamp button operation is self-locking	No	Yes	
K8.1	Whether the 2nd spindle tool release is self-locking	No	Yes	
K8.2	S-code gearshift of asynchronous spindle motor	Invalid	Valid	
K8.3	T-type gearshift revolution limit	Invalid	Valid	
K8.4	Whether the 2nd spindle gearshift has the gear detection	Invalid	Valid	
K8.6	Synchronous spindle function	Invalid	Valid	
K8.7	Selection of single spindle or double spindles	Single spindle	Double spindles	
K9.0	Hard overtravel detection of all axes	Yes	No	
K9.4	Fourth axis overtravel alarm detection	Yes	No	
K9.5	Fifth axis overtravel alarm detection	Yes	No	
K10.0	X-axis key inversion	Normal	Invert	
K10.1	Y-axis key inversion	Normal	Invert	
K10.2	Z-axis key inversion	Normal	Invert	
K10.3	Lubrication overload	Connect to normally open	Connect to normally closed	
K10.5	Chip flushing alarm inversion	Connect to normally open	Connect to normally closed	
K10.6	Tooling lock 4-axis (spare)	Off	On	
K10.7	K1 (USER2) tooling control	Off	On	
K11.0	Lubrication alarm input signal	Connect to	Connect to	

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Address	Function	Set Value: 0	Set Value: 1	Remark
		normally open	normally closed	
K11.1	Protective door alarm input signal	Connect to normally open	Connect to normally closed	
K11.2	Hydraulic alarm input signal	Connect to normally open	Connect to normally closed	
K11.3	Air pressure alarm input signal	Connect to normally open	Connect to normally closed	
K11.4	Cooling pump alarm input signal	Connect to normally open	Connect to normally closed	
K11.5	Chip remover alarm input signal	Connect to normally open	Connect to normally closed	
K11.6	Tool magazine/carrier alarm input signal	Connect to normally open	Connect to normally closed	
K11.7	Mechanical arm alarm input signal	Connect to normally open	Connect to normally closed	
K12.1	Servo motor tool carrier C	Ordinary motor	Servo motor	Clamp-arm tool magazine
K12.2	Mechanical arm with M-code control	Sequence control	M-code control	Disc type tool magazine
K12.3	Turret tool magazine	Off	On	Clamp-arm tool magazine
K12.4	Servo motor tool carrier B	Off	On	Disc type tool magazine
K12.5	Disc mechanical arm tool magazine	Off	On	Disc type tool magazine
K12.6	Function of tool magazine of carousel type	Off	On	Tool magazine of carousel type
K12.7	Servo motor tool carrier A	Off	On	Tool magazine of carousel type
K13.0	Red light beep output	Close	Open	
K13.1	Yellow light beep output	Close	Open	
K13.3	Spindle cooling overload alarm signal	Connect to normally	Connect to normally	

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Address	Function	Set Value: 0	Set Value: 1	Remark
		open	closed	
K13.4	Hydraulic rotary table with thimble	No	Yes	4-axis hydraulic rotary table
K13.5	Hydraulic rotary table position detection	No	Yes	4-axis hydraulic rotary table
K13.6	Rack push-pull hydraulic rotary table	Off	On	4-axis hydraulic rotary table
K13.7	Spindle oil cooler alarm signal	Connect to normally open	Connect to normally closed	
K14.2	Spindle C/S axis function	Off	On	
K14.3	Spindle positioning function	Off	On	
K14.4	Servo tool carrier/magazine fine-tuning	Off	On	
K14.6	Tool setter (probe control)	Off	On	
K14.7	Handwheel simulation function	Off	On	
K15.0	Reset non-stop spindle	Off	On	
K15.1	External robot control	Off	On	
K15.2	Program called externally by the robot	Off	On	Valid when K15.1=1
K15.3	Automatic start after program call	Off	On	Valid when K15.1=1
K15.6	Conditional shielding of servo tool carrier rotation	Off	On	
K16.0	Tool release mode selection	Not in operation	Manual only	
K16.2	Fan alarm inversion	Connect to normally open	Connect to normally closed	
K16.3	Air conditioning alarm inversion	Connect to normally open	Connect to normally closed	
K16.4	Coolant low level alarm	Connect to normally open	Connect to normally closed	
K16.6	3 auxiliary alarm on	Off	On	
K16.7	M50~M53 and output	Off	On	
K18.0	I/O analog	Off	On	

3.24.2 C parameter setting

Counter Number	Current Value	Preset Value	Function
1	Oil supply time of lubrication pump (seconds)	Lubrication pump stop interval (minutes)	
2	Tool change position and tool case number of tool magazine	Total number of tools in the tool magazine	

Note: The PLC before the MV1.34 version utilizes the T parameter to set the lubrication time, T6+T7 is the total stop interval time of the automatic lubrication pump, and T8 is the oil pumping time, in unit of ms.

3.24.3 T parameter setting

Timer Number	Meaning During Setting	Reference Value
3	Chip remover stop time	1200000ms
4	Chip remover working time	300000ms

3.25 List of M-codes

M Code	Function	M Code	Function
M00	Program stop	M37	Probe blowing on
M01	Optional stop	M38	Probe blowing off
M02	End of program	M39	Cancellation of rigid tapping state
M03	Spindle turning counter-clockwise	M41	Spindle 1st gear
M04	Spindle turning clockwise	M42	Spindle 2nd gear
M05	Spindle stop	M43	Spindle 3rd gear
M06	Tool change	M44	Spindle 4th gear
M07	Workpiece blowing cooling	M35	Forward rotation of chip conveyor
M08	Cooling pump on	M36	Chip remover stop
M09	Cooling, air blowing off	M54	Spindle tool release
M10	Fourth axis clamping	M55	Spindle tool clamping
M11	Fourth axis release	M60	Tool magazine selection (tool magazine of carousel type)
M16	Tool change by mechanical arm	M61	Check of tool change conditions
M18	Spindle positioning (return to zero point)	M65	Tool magazine forward/tool case vertical
M19	Spindle orientation	M66	Tool magazine back/tool case horizontal
M20	Fifth axis clamping	M76	Automatic tool arrangement of disc type tool

M Code	Function	M Code	Function
			magazine
M21	Fifth axis release	M77	1^{st} spindle selection command
M23	Cancellation of spindle positioning	M78	2^{nd} spindle selection command
M26	Spindle CS switches to position	M88	Data acquisition on
M27	Spindle CS switches to speed	M89	Data acquisition off
M29	Rigid tapping	M98	Subprogram call
M30	End of program end and return	M99	Subprogram return or cycle
M32	Water valve chip flushing open		
M33	Water valve chip flushing close		
M34	Reverse rotation of chip conveyor		

3.26 Debugging of tool magazine of carousel type

3.26.1 Description of the tool change action of tool magazine of carousel type

After executing the M6 Txx command, the program judges whether the command T tool number meets the specification requirements, and then enters the tool change macro program.

(1) The Z-axis returns to the second reference point to reach the tool return position, and orients the spindle.

(2) The tool magazine moves forward to clamp the tool on the current spindle.

(3) The gas cylinder hits to release the tool on the spindle.

(4) The Z-axis returns to the first reference point (returning the spindle tool to the tool magazine).

(5) Rotate the tool carrier to the new tool number position of the T command.

(6) The Z-axis returns to the second reference point, and a new tool is loaded into the spindle.

(7) Clamp the tool.

(8) The tool magazine moves back, and the tool change is completed.

3.26.2 Basic parameters to be set before tool magazine debugging

(1) When K 12#6, the function of tool magazine of carousel type is valid (0: OFF/1: ON).

(2) When K3#6=1, it enters the tool magazine debugging mode, and when K3#6=0 (it exits from the tool magazine debugging mode).

Note: After entering the tool magazine debugging mode, you can use the panel keys to operate the tool magazine actions, or move the feed axis at a low speed in the non-backward position of the tool magazine. Because some interlocks are canceled by the debugging state, please operate with caution.

(3) Counter C2 [Preset Value] can set the total number of tools in the tool magazine.

(4) Counter C2 [Current Value] can set the tool carrier position number of the current tool change position of the tool magazine.

(5) K2#5=1 (Only one forward valve controls the forward and backward actions of the tool magazine).

K2#5=0 (The tool magazine forward and backward are controlled by two valves respectively).

(6) K3#0=0 (When the tool carrier stops at the correct position, the counting sensor is in non-inductive state diagnosis X14.2=0).

K3#0=1 (When the tool carrier stops at the correct position, the counting sensor is in the induction state diagnosis X14.2=1).

3.26.3 Setting of the second reference point of the Z-axis (tool pickup point)

The tool pickup point of the tool magazine is set at the second reference point of the Z-axis. After the tool change position is adjusted, the current machine coordinate value is entered into the axis corresponding to the NC parameter #1051.

3.26.4 Setting of spindle orientation position

After rotating the spindle for a few turns, swing it to the position corresponding to the spindle tool position and the position of the tool carrier slot, and set the drive or system parameters:

(1) When matching the GR3000Y spindle drive, view the GSK25iMc system diagnosis No.404 or the value of the spindle drive DP-APO, and enter this value into the system NC parameter #5403, then the parameter position is the spindle orientation position.

(2) When matching the DAP03 spindle drive, view the value in the drive DP-APO, and write the value into parameter PA-58 of the driver, and then save the parameter.

(3) When matching the GS3000 spindle drive, view the value in DP-APO, and write this value into the parameter PA-103 of the drive, and then save the parameter.

Note: When using the bus-type GR3000Y series spindle drive, the orientation position is set on the NC parameters.

3.26.5 Operation and signal check in the debugging state

Press the 

button to advance the tool magazine to the spindle; the input mode command M65 can also advance the tool magazine toward the spindle. Observe whether the tool magazine conducts the forward action, and whether the corresponding output point has output and other information, so as to judge and check whether the CNC system has the output of tool magazine forward and backward control signals, thus further diagnosing whether the connection between the tool magazine forward relay and the solenoid valve of the machine is correct, and whether it is faulty.

3.26.6 Parameter setting of tool change macro program call

(1) The tool change macro program is stored in the system O9001. #1610.4 can set whether to display and lock the rights prohibited from modification by the tool change macro program. When #1610=0, the system displays the O9001 tool change macro program, which can be modified.

(2) The parameter of the system parameter M-code calling the tool change macro program O9001 is: #6071=06.

3.26.7 Trial tool change

After the reference point of each axis and the position of spindle positioning are adjusted, the tool magazine debugging state must be canceled. In the input mode, M6 Txx can be run by a single block (where M6 is the tool change macro program that calls the system, and the value after Txx is the tool number to be changed). Observe whether the tool change action is correct.

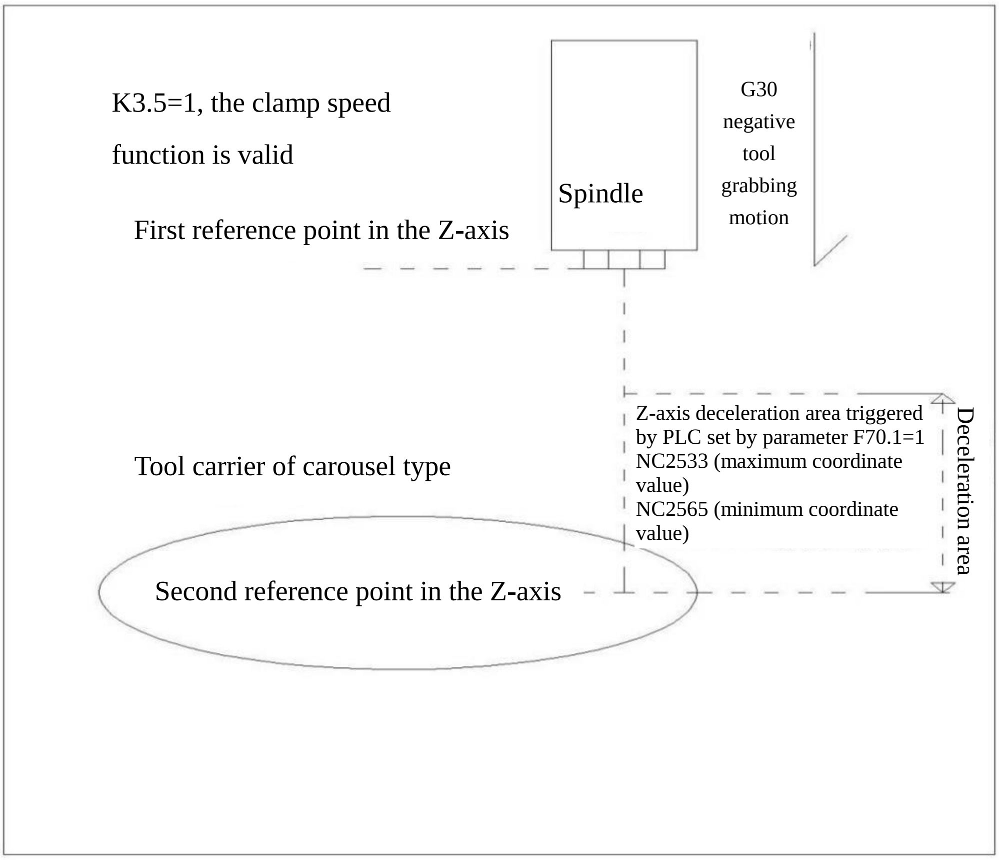
3.26.8 Z-axis speed clamp function in the high-speed machine change

Function and purpose

When the Z-axis movement speed of the machine reaches more than 10 m/min, during the tool change process of the tool magazine of carousel type, it is necessary to consider the impact of the spindle tool magazine on tool carrier after the tool carrier is pushed under the spindle, when the Z-axis moves at high speed from the first reference point to the second reference point to grab the tool. It needs to restrict the Z-axis movement speed, so as to reduce the impact force of the spindle tool magazine (integrated with the Z-axis) on the tool carrier. The specific method is to set the Z-axis position switch parameters, so that when the Z-axis moves from the first reference point to the second reference point (tool grab/fetch position) at a high speed, the Z-axis deceleration signal is triggered when it approaches the position above the tool handle. Move the Z-axis at a low speed according to the parameter set value, so as to reduce the impact and protect the machine and tool magazine.

Caution: The second position switch set by parameters #2533/#2565 constitutes an interval. During tool change, when the Z-axis moves in the interval set by the position switch parameter (with the position switch signal F70.1=1), the Z-axis movement speed will be not limited. When the Z-axis of the machine moves out of the set interval, the position switch signal F70.1=0, the PLC triggers an external deceleration signal, and the Z-axis movement speed is clamped to that set by #1250/#1251. Since there is a little hysteresis in the change of the PLC switch signal F70.1, it is necessary to adjust the trigger point of the position switch to an appropriate position according to the maximum Z-axis movement speed of the machine, so as to ensure that the deceleration movement of the Z-axis is triggered promptly, and that the machine and tool magazine are protected.

Schematic Diagram of the Anti-shock Function of the Tool Magazine of Carousel Type



Parameter setting

(1) #1000.4=1: The external deceleration function is valid.

(2) #2401.3=1: The position switch function is valid.

(3) #2501=3: Set the servo axis number corresponding to the second position switch (PSW02/F70.1) of the PLC as the Z-axis.

(4) #1250 ≈100mm/min~1000mm/min: It is the external deceleration rate triggered during cutting feed (the data given above are only reference values, which can be flexibly adjusted according to the actual movement speed of the machine).

(5) #1251≈100 mm/min~1000 mm/min: It is the external deceleration speed triggered by rapid traverse (the data given above are only reference values, which can be adjusted flexibly according to the actual movement speed of the machine).

(6) #2533 = The machine coordinate of the positive maximum range corresponding to the 2nd position switch (PSW02/F70.1) (it is generally set to the machine coordinate of the 1st reference point of the machine Z-axis or a nearby machine coordinate).

(7) #2565 = The machine coordinate of the negative maximum range corresponding to the 2nd position switch (PSW02/F70.1) (it is generally set to the machine coordinate 30 mm~100 mm above the second

reference point of the machine Z-axis).

(8) #1050=0 (The machine coordinate of the 1st reference point of the Z-axis).

(9) #1051= The machine coordinate of the tool pickup point of the Z-axis (that is, the machine coordinate of the 2nd reference point of the Z-axis).

(10) #1002.5=0 (The negative external deceleration signal is valid when fast).

(11) #1002.6=0 (The positive external deceleration signal is valid when fast).

(12) K3.5=1: The Z-axis speed clamp function is valid during tool change

Example

The machine coordinate of the 1st reference point of the machine is 0, that of the 2nd reference point (tool pickup/return point) is -355.000, the trigger parameter #2533 in the positive range of the position switch can be set to 0 (or 1), and the trigger point parameter #2565 in the negative direction can be set to -300.000. Hence, during tool change, when the Z-axis moves down from the first reference point to the machine coordinate -300.000, the Z-axis deceleration signal is triggered, the machine starts to decelerate, and stops after reaching the second reference point (tool pickup position).

Note: 1. During the length compensation, the tool change will automatically cancel the compensation. After tool change, please re-specify the H-codes of the relevant tool.

2. During the radius compensation, the tool change will automatically cancel the compensation. After tool change, please re-specify the D-codes of the relevant tool.

Part II Debugging

3.27 Mechanical-arm tool magazine debugging

3.27.1 Description of mechanical-arm tool change action

(1) In the automatic and input mode, after executing the Txx M6 command, the program firstly judges whether the input tool number command meets the specification requirements, and then selects the tool.

(2) The selected tool case in the tool carrier falls down.

(3) The Z-axis returns to the second reference point, and the spindle is oriented.

(4) The mechanical arm grabs the tool.

(5) The spindle tool cylinder releases the tool.

(6) The mechanical arm rotates 180 degrees to exchange the tool.

(7) The spindle tool cylinder clamps the tool.

(8) The mechanical arm returns to the origin.

(9) The tool case is raised.

(10) Cancel the orientation and complete the tool change.

The entire tool change process is automatically completed by the CNC, and the user only needs to input the command M6 Txx to run.

3.27.2 Basic parameters to be set before tool magazine debugging

(1) When K12#5=1, the disc mechanical-arm tool magazine function is valid (0: OFF/1: ON).

(2) K3#6=1 (enter the tool magazine debugging mode), K3#6=0 (exit from the tool magazine debugging mode).

(3) Counter C2 [Preset Value] can set the total number of tools in the tool magazine.

(4) Counter C2 [Current Value] can set the tool case number of the tool magazine's current tool reverse position.

(5) K3#3 can select whether the tool count and tool in-position detection are input by using the same sensor. Yes: K3#3 is set to 1, and the tool counting signal is wired to X14.2. No: K3#3 is set to 0, then the counting signal is wired to X14.2, and the in-position signal is wired to X14.0.

(6) K3.4 can select whether the tool count signal is in the induction state when the tool case is rotated in place. If in the induction state, X14.2=1 is diagnosed when it is in place, then K3#4 is set to 1.

3.27.3 Setting of second reference point of the Z-axis (tool snap point)

The position of tool snap point of the mechanical arm is set at the second reference point of the Z-axis. After the tool snap position is adjusted, the current mechanical coordinate value is input into the axis corresponding to the NC system parameter #1051.

3.27.4 Setting of spindle orientation position

After rotating the spindle several times, swing it to the position corresponding to the spindle tool position and the tool carrier slot, and set the drive.

GR3000 can view the system diagnosis No.206 or the value of the spindle drive DP-APO, and enter it in the NC parameter 5403.

DAP03 spindle drive can view the value in DP-APO, write it into PA-58, and then save the parameter.

For GS300 spindle drive, view the value in DP-APO, write it into PA-103, and then save the parameter.

Note: When using the bus-type GD3000Y series spindle drive, the orientation position is set on the NC parameter.

3.27.5 Data table settings of tool magazine

(1) Description of the meaning of the data table:

Tool Case No.	Data Address	Data	Description of Meaning
	D0000	3	Tool No.3 mounted on the spindle
1	D0001	1	Tool No.1 mounted on the tool case No.1
2	D0002	2	Tool No.2 mounted on the tool case No.2

Tool Case No.	Data Address	Data	Description of Meaning
3	D0003	5	Tool No.5 mounted on the tool case No.3
4	D0004	8	Tool No.8 mounted on the tool case No.4
5	D0005	10	Tool No.10 mounted on the tool case No.5
……	……		……

(2) Data table of automatically arranged tools:

The tool carrier returns to zero. In the zeroing mode, press the 

button, and the tool magazine transfers the No.1 tool position to the tool change position and completes the zero return. If the tool magazine does not have a zero return switch, manually switch the No.1 tool position of the tool magazine to the tool change position, then set the PLC parameter K3.0 as 1, and press the 

button in the zeroing mode.

In the MDI mode, run the M76 command.

View [PLC]-[PLC Parameter]-[Data]-[Data Display], in which the address D0000 of the data table is the tool No.0 on the spindle, and the tool numbers installed in the other tool carriers are the same as the tool case numbers. Then, the data table initialization is completed.

3.27.6 Operation and signal check in the debugging state

In the manual mode, press the 

button, and the tool case will fall down. Press the 

button to lift the tool case; press the 

button to rotate forward one position, and stop when the tool position is reached; press the 

button to reverse one position, and stop after the tool position is reached.

In the debugging state, press the 

button. When K3.1=0, the mechanical arm moves in a jog mode. The action stops when the button is released, and it can be stopped at any position by controlling the duration of the button. When K3.1=1, press the tool changer button on the panel, and the mechanical arm moves step by step, and it will act one step upon each pressing.

In the zeroing mode, press the 

button to start the forward rotation of the tool carrier. If the tool carrier has a zero return switch, it will stop at the zero position switch. If the zero return switch is not connected, the tool carrier will continue rotating until the machine gives an alarm of tool change timeout.

In the debugging state, the protection conditions related to the machine will be shielded. When operating manually, pay attention to the mechanical position and safety.

3.27.7 Setting of tool change macro program and exit from debugging

Set the NC system parameter #6071=6; it is used for M-code to call the tool change subprogram O9001, and the system parameter #1610.4 sets whether the macro program is locked from change and display.

After the reference point of each axis and the position of spindle positioning are adjusted, exit from the debugging state and set K3.6=0 subsequent to the step-by-step action detection. In the automatic mode, you can issue the tool change command M6 Txx.

3.27.8 Examples of tool pre-selection

```
M6  T4                          (Call the tool No.4 for machining)
T2                              (Pre-select the tool No.2)
G54 G90 G00  X0 Y0 Z50          (Machining with the tool No.4)
G01 X100 F200                   (Machining program of the tool No.4)
G01 Y200                        (Machining program of the tool No.4)
G02 X200  Y300 R100 F100        (Machining program of the tool No.4)
M6                              (Tool exchange. Return the tool No.4 to the library, and call out the tool No.2 for machining)
T12                             (Pre-select the tool No.12)
G54 G90 G00  X10 Y10 Z150       (Machining with the tool No.2)
G01 X200  Y100  F200            (Machining program of the tool No.2)
G01 Y200   X50                  (Machining program of the tool No.2)
G02 X200  Y300 R100 F100        (Machining program of the tool No.2)
M6                              (Tool exchange. Return the tool No.2 to the library, and call out the tool No.12 for machining)
T6                              (Pre-select the tool No.6)
……
……
```

3.27.9 Control of tool change macro program by mechanical arm with M-codes (setting the NC system parameter #6076=6)

```
O9006
N010 IF[#1001EQ1]GOTO250
N020 G15G40G49G80G69G50
N030 G50.1X0Y0Z0
N040 #1=#4003
N050 M65
```

```
N060 G30G91Z0M19
N070 M53
N080 M54
N090 M56
N100 M55
N110 M57
N120 M66
N130 IF[#1006EQ0]GOTO240
N140 IF[#1003EQ1]GOTO160
N150 GOTO240
N160 IF[#1004EQ1]GOTO130
N170 M65
N180 M53
N190 M54
N200 M56
N210 M55
N220 M57
N230 M66
N240 M5 G#1
N250 M99
%
```

Caution:

In the radius compensation, the tool change will automatically cancel the compensation. After the tool change, please re-specify the D code of the relevant tool.

3.27.10 Large tool management function of mechanical arm

1. Description of the large tool function

Some users need to use relatively large tools for workpiece machining. Since the tools are relatively large, they may interfere or squeeze adjacent tools when inserted into the tool carrier. In order to avoid mutual collision of large tools in the tool carrier, we have compiled a special PLC program of large tool management, which can be used to manage, schedule and use large tools in the tool carrier. These rules for managing, scheduling and using large tools in the tool carrier are called large tool management function.

2. K parameter to enable the large tool management function

The PLC of this large tool management function is modified and expanded on the basis of MV1.55B. After the mechanical arm's tool magazine function is enabled, set K0#4=1, and the large tool management function will become active.

3. Rules that must be followed before enabling the large tool function

1) Before enabling the large tool management function (K0.4=1), the tool magazine's data table must be initialized first, so that the tool case number in the data table is consistent with the tool number. Namely: data table D000=0, D001=1, D002=2, D003=3 ...... D00n=n.

2) In the data table D101, D102, D103, set 3 large tool numbers to be used respectively. These large tool numbers should not be the adjacent tool numbers on the tool carrier, for example: when D101=3 (set the tool No.3 as the large tool), then D102≠2, D102≠4, D103≠2, D103≠4; also, they should not be set to the same large tool number, for example: D101=D102=D103=2, otherwise the system will generate a PLC alarm. If the above rules are violated, and the incorrect setting triggers an alarm of the large tool setting data error, the tool magazine's data table must be initialized or manually rearranged, and the tool case number in the data table must be consistent with the tool number. Then, reset the new large tool number.

3) Once the large tool number is set by D101~D103 in the data table, large tools can only be inserted into the large tool case set by D101, D102 and D103 during tool change, and the tool case adjacent to the large tools cannot be searched since it is assigned a value exceeding the range of the total tool number.

4) For the initial setting, the current spindle tool number D000 in the data table is a small tool by default, namely: D101~D103≠0.

4. Description of large tool change operation

When there is a small tool on the spindle, the tool change rules are the same as before. The tool can be pre-selected with a separate T** code, and Y can also use M6 T** to change the tool at any time and at randomly. When there is a large tool on the spindle, T** code can not be used separately for preselecting tools. The new tool to be used can only be commanded in the format of M6 T**; otherwise the system PLC will give an alarm. When the command M6 T** is used to call the tool, the mechanical arm will first return the large tool on the spindle to the tool carrier where it was taken out. Then, the mechanical arm will rotate the tool carrier to select the tool to be called, and perform the second exchange action.

5. Handling of data table errors

When the tool number is disordered for other reasons, please turn off the large tool function (set K0.4=0) if the data table initialization operation is required. Run the M76 command in the MDI mode to initialize the data table. After the initialization, activate the large tool function again (K0.4=1).

6. Tool change macro program for large tool function

To use the large tool function, you must use the new version of tool change macro program with the large tool judgment function. This macro program, which is compatible with the previous one without the large tool function, can automatically identify the setting status of the K parameter of the large tool function. When the large tool function is disabled (K0.4=0), only M76 is needed to re-initialize the tool magazine's data table, and it is not necessary to change the tool change macro program.

3.28 Turret (clamp-arm) type tool magazine (K12#3=1)

3.28.1 Description of tool magazine's tool change operation

(1) Lift the Z-axis to return to the first reference point (to the outer edge of the tool magazine).

(2) Orient the spindle.

(3) M61 opens the first soft limit II (the Z-axis travel extends to the tool change area of the tool magazine).

(4) The Z-axis is positioned to the second reference point (that is, the tool selection point, to return the old tool to the magazine).

(5) The tool magazine rotates to select the tool.

(6) The Z-axis descends to the first reference point (tool pickup).

(7) M5 cancels the spindle orientation and closes the first soft limit II (recovering normal travel of the Z-axis).

(8) Tool change is completed.

3.28.2 Debugging of turret type tool magazine

(1) Concepts of tool change area and tool change permission point

Tool change area: The tool change area of the turret type tool magazine lies in the interval above the first reference point and below the second reference point of the Z-axis.

Tool change point: It locates near the second reference point of the Z-axis (that is, the position where the tool carrier can rotate without interference).

(2) K parameter settings K4#2 and K4#3 related to the hardware switch in the tool change area

The tool change point of the Z-axis is set at the second reference point. When the Z-axis reaches the second reference point, the tool change area switch and the tool change permission switch should be pressed.

When there is a tool change area switch, the K parameter K4#2 should be set to 1. When there is a tool change permission hardware switch, K4#3 should be set to 1, and the NC parameters in the following table should be set.

When there is no tool change area switch, the K parameter K4#2 should be set to 0; when there is no tool change permission hardware switch, K4#3 should be set to 0, and the NC parameters in the table should be set.

Parameter Number	Parameter Notes	Set Value	Notes
2401.3 SWI	Position switch valid sign	1	Enable the position switch function
2505	Axis number corresponding to the position switch 6	3	Set the range of the tool change area, with the corresponding PLC signal F70.5
2537	Maximum value in the action range of the position switch 6	Same as the second boundary value of the Z-axis set by parameter 1086	
2569	Minimum value in the action range of the position switch 6	Z-axis first reference point +1 mm (it should be higher than the first reference point)	
2507	Axis number corresponding to the position switch 8	3	Set the range of tool change permission, with the corresponding PLC signal F70.7
2539	Maximum value in the action range of the position switch 8	Value of the second reference point + 1 mm	
2571	Minimum value in the action range of the position switch 8	Value of the second reference point - 1 mm	

(3) Operation restrictions in the tool change area

1) The spindle cannot enter the tool change area without orientation. After entering the tool change area, if the spindle orientation is canceled, the Z-axis can only move in the negative direction at a low speed. In order to move up, you need to set the debugging parameter K3.6=1.

2) Rotating the spindle and starting the program command are not allowed if the spindle lies in the tool change area.

3) When the rotation of the tool carrier is not in place, all axes are locked and cannot move.

(4) Setting of tool number and soft limits

1) The current value of the No.2 counter and the tool number of the current tool change position must be consistent, and the preset value is the total number of tools in the tool magazine.

2) The 1st soft limit (with parameters 1080 and 1081) and the 1st soft limit II (with parameters 1086 and 1087) are switched by the commands in the tool change macro program through the PLC signal G7.6. They are the soft limits during machining operation and tool change, respectively.

ZH5120C setting example:

Parameters	Function	X-axis	Y-axis	Z-axis
1080	Positive boundary of the stored stroke detection 1	500.5	0.5	0.5
1081	Negative boundary of the stored stroke detection 1	-0.5	-400.5	-300.5
1086	Positive boundary II of the stored stroke detection 1	500.5	0.5	140
1087	Negative boundary II of the stored stroke detection 1	-0.5	-400.5	-300.5

T parameter (timer)

Timer Number	Timer Address	Set Value	Function	Remark
40	T78	232	Tool magazine stop delay	Unit: ms

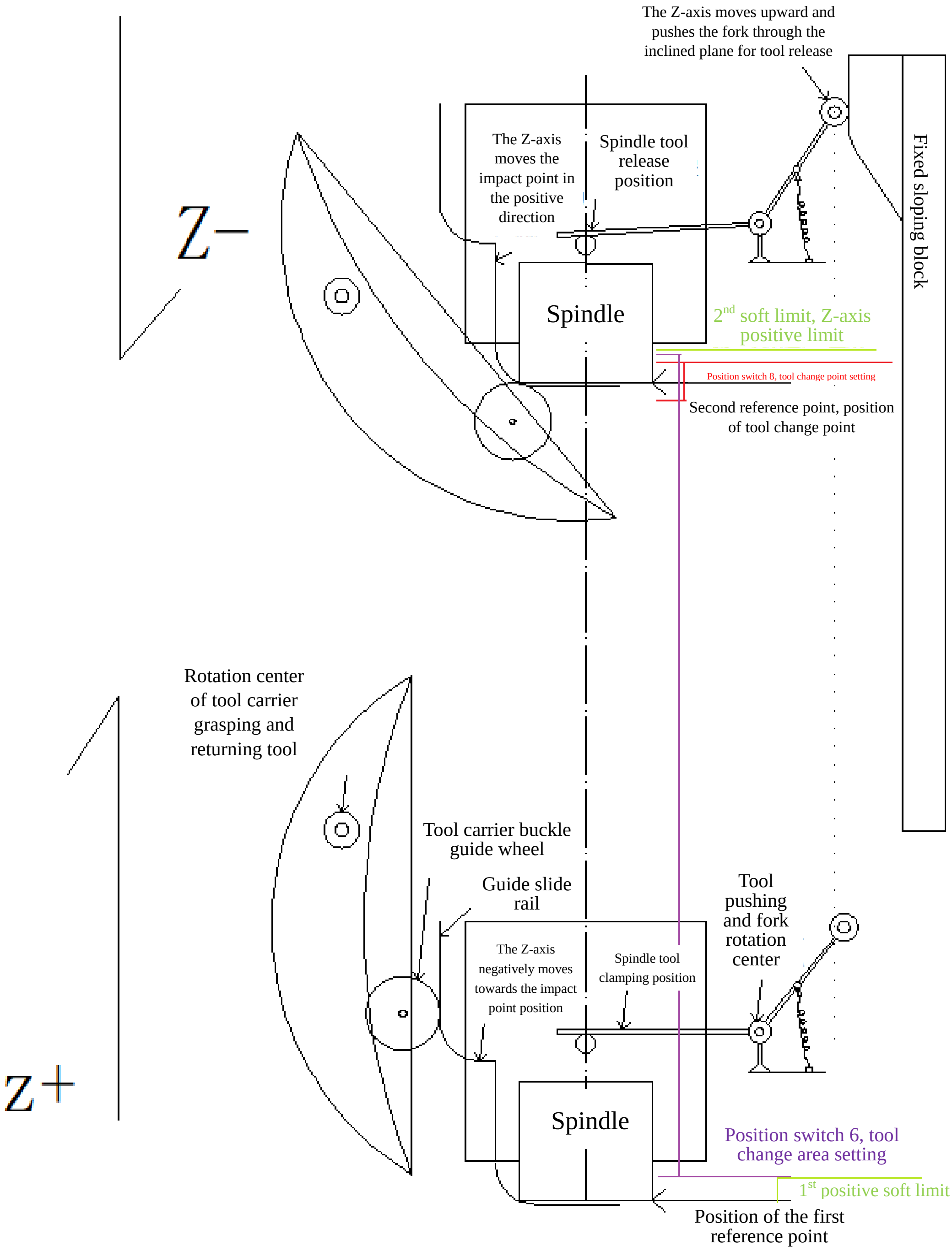
C parameter setting

Counter Number	Counter Address	Current Value	Preset Value	Function
1	C0	Working time of automatic lubrication pump	Stop interval of automatic lubrication pump	
2	C4	Spindle tool number	Total number of tools in the tool magazine	

3.28.3 Impact prevention by Z-axis deceleration during tool change

If the movement speed of the machine is greater than 10 m, during tool change of the clamp-arm type tool magazine, when the Z-axis moves upward from the first reference point to pass through the tool release area or moves downward from the second reference point to grab the tool, a relatively large impact force will be generated. In order to reduce the impact between the spindle and the tool, the movement speed of the Z-axis can be decelerated within a certain interval. The schematic diagram is illustrated below.

Structural Diagram of the Clamp-arm Type Tool Magazine



3.28.4 Positions of third and fourth reference points to be set for the Z-axis clamp speed and anti-impact function

(1) When the Z-axis moves in the positive direction to return the tool, after reaching the impact point, write the machine coordinates into the third reference point of the Z-axis in parameter 1052.

(2) When the Z-axis moves in the negative direction to install the tool, after reaching the impact point, write the machine coordinates into the fourth reference point of the Z-axis in parameter 1053.

(3) In the tool change macro, the position of the excessive impact point at a low G01 speed will be handled.

3.29 Servo tool carrier (K12#4=1)

K12#1=1 The clamp-arm type tool magazine adopts servo control.

K12#4=1 The disc type tool magazine's tool carrier adopts servo control.

K12#7=1 The tool magazine of carousel type adopts the servo control.

(1) The servo tool carrier means that the tool carrier motor is controlled by the PLC axis.

(2) After setting parameters correctly according to the tool magazine used, the servo tool carrier function will become valid.

(3) The tool carrier axis corresponding to parameter NO.7010 is set to 5.

(4) Selection of the tool carrier direction: To change the axis movement direction: If the command is opposite to the actual movement direction, the parameter needs to be modified.

(5) Parameters: NO.4003#5 (servo command direction), NO.4003#6 (servo feedback direction) To modify the axis movement direction, set NO.4003.5 and NO.4003.6 as 0 or 1 at the same time.

Note: Changing one parameter alone may trigger a jog movement and an out-of-tolerance alarm.

(6) Move the tool No.1 on the tool carrier to the zero point of tool carrier, change parameter NO.4001#3 (APZ) to 0 and then change it to 1 to set the tool carrier zero point.

(7) Setting of tool number and soft limits.

The current value of the C4 counter must be consistent with the tool number of the current tool change position, and the preset value is the total number of tools in the tool magazine.

3.30 Three-in-one tool change macro program for carousel, mechanical arm, and turret type tool magazines

(McV2.18ABCS version PLC standard three-in-one tool change macro program)

```
O9001
(20170504)
N010 IF[#1007EQ1]GOTO190
N012 IF[#1008EQ1]GOTO400
N020 IF[#1005NE1]GOTO610
N030 IF[#1001EQ1]GOTO600
N040 G15G40G49G80G69G50            (The tool change section of the disc type magazine begins)
N050 G50.1X0Y0Z0
N060 M65
N070 #1=#4003
N080 G30G91Z0M19
```

```
N090 M16
N100 G#1
N110 IF[#1006EQ0]GOTO600
N120 IF[#1003EQ1]GOTO140
N130 GOTO600
N140 IF[#1004EQ1]GOTO100
N150 M65
N160 M16
N170 G#1
N180 GOTO600                (The tool change section of the disc type magazine ends)
N190 IF[#1000EQ1]GOTO600    (Tool change beginning section of the tool magazine of carousel type)
N200 M61
N210 G15G40G49G80G69G50
N220 G50.1X0Y0Z0
N230 #1=#4003
N240 G30G91Z0M19
N250 M65
N260 M54
N270 G4X0.2
N280 G28G91Z0
N290 M60
N300 G04X0.05
N310 G30G91Z0
N320 M55
N330 M66
N340 G#1M05
N360 GOTO600                (Tool change ending section of the tool magazine of carousel type)
N400 IF[#1000EQ1]GOTO600    (Tool change beginning section of the clamp-arm type tool magazine)
N402M19M61
N440G53G0Z0
N442G53G01Z[#510522-2.5] F28000
N450G53G1Z#510522 F1500
N460G53G0Z#510512
N470M60
N480G53G0Z[#510522+0.2]
N490G53G01Z[#510522-2.5] F2500
```

N520G53G0Z0 (Tool change ending section of the clamp-arm type tool magazine)

N600 M99

N610 #3000=199(MAGAZINE MODEL NOT SET UP)

%

3.31 PLC alarm messages

PLC Address	Alarm Number	Alarm Messages	Handling Method
A0.0	2000	Low lubricant level alarm. Related parameter addresses are K11.0, X11.0	1. Add the lubricating oil of the guide rail 2. The alarm signal line breaks
A0.1	1001	The protective door is not closed. Related parameter addresses are K11.1, K1.2, X11.1	1. The protective door is not closed during automatic machining 2. The protective door detection signal line breaks
A0.2	1002	The hydraulic motor is overloaded. Related parameter addresses are K11.2, X11.2	1. The overload switch is tripped, please check the motor and switch 2. The detection signal line is in poor contact
A0.3	1003	Low air pressure alarm, and the related parameter addresses are K11.3, X11.3	1. Check the air pressure 2. The detection signal line is in poor contact
A0.4	1004	Cooling motor overload, and the related parameter addresses are K11.4, X11.4	1. The overload switch is tripped, please check the motor and switch 2. The detection signal line is in poor contact
A0.5	1005	The chip removal motor is overloaded, and the related parameter addresses are K11.5, X11.5	1. The overload switch is tripped, please check the motor and switch 2. The detection signal line is in poor contact
A0.6	1006	The tool carrier motor is overloaded, and the related parameter addresses are K11.6, X11.6	1. The overload switch is tripped, please check the motor and switch 2. The detection signal line is in poor contact
A0.7	1007	The mechanical arm motor is overloaded, and the related parameter addresses are K11.7, X11.7	1. The overload switch is tripped, please check the motor and switch 2. The detection signal line is in poor contact
A1.0	2010	Lubrication pressure switch status error	The lubrication pressure signal is normally closed, the pressure switch is faulty and the pressure signal line is short-circuited

PLC Address	Alarm Number	Alarm Messages	Handling Method
A1.1	1011	The tool release/clamp signal is abnormal, and the related parameter addresses are K7.3, X12.5, X12.6	1. The tool release/clamp signal is all 0 or 1 2. The tool release/clamp detection switch is faulty 3. The detection signal line is in poor contact
A1.2	1012	The tool release/clamp command times out,and the related addresses are X12.5, X12.6	The corresponding status signal is not detected by the tool release/clamp command in the specified time 1. Machine, gas cylinder or oil cylinder for checking the tool pushing mechanism 2. Adjust the position of the tool release/clamp detection switch
A1.3	2013	Tool release is not allowed while the spindle is running	1. Tool release during the spindle rotation 2. The tool is released when the spindle stops, but there is no feedback from the zero-speed signal
A1.4	1014	After the tool is selected, the tool carrier does not rotate or the counting signal does not change. , and the related address is X14.2	The tool carrier does not rotate 1. Check the overload switch, relay, contactor and motor line fault of the tool carrier motor 2. The tool carrier motor is faulty Counting signal X14.2 does not change 1. The counting switch is faulty or disconnected 2. The I/O unit is faulty
A1.5	1015	The tool selection command is timeout	The tool carrier does not rotate in place after the specified time, the tool carrier is faulty, the counting signal X14.2 is faulty, and the zero return signal is not detected
A1.6	1016	The tool carrier is dislocated. Please return the tool magazine to zero or manually jog the tool carrier to return to its original position	1. In the manual mode, the tool carrier may be rotated positively according to the forward or reverse rotation of the tool carrier 2. If the tool carrier does not run by a tool position, please whether check the X14.2 signal is faulty
A1.7	1017	Lift the tool case or it falls timeout	The tool magazine lift/fall command is executed in excess of the specified time, and the tool magazine lift/fall in-position signal has not been detected. Check the tool magazine lift/fall position signals X14.3 and X14.4
A2.0	1020	The tool case is lifted, and the fall signal is abnormal, and the related addresses are X14.3, X14.4	The tool magazine up/down signal is 1 or 0 at the same time

PLC Address	Alarm Number	Alarm Messages	Handling Method
A2.1	1021	The mechanical arm does not lie at the origin related addresses X14.5, X14.6, X14.7	1. Check the mechanical-arm origin signal, the origin state is X14.5=0, X15.6=1, X14.7=0 2. Open the mechanical arm brake, and shake the mechanical arm to the zero position with a wrench
A2.2	2022	The spindle should not be rotated if it is not clamped, and the related addresses are X12.5, X12.6	1. Check the spindle clamping signal X12.6, and normally it is 1 2. Check the tool release signal, and normally X12.5 is 0
A2.3	1023	The commanded tool number exceeds the C4 setting for the total number of tools in the tool magazine	The executed T command exceeds the setting of the total number of tools in the tool magazine, and re-executes the T command within the range of the total tool number
A2.4	1024	The spindle cooling system gives an alarm, and the related parameter addresses are K12.3, X12.3	1. The spindle oil cooler gives an alarm, and the problem may be checked according to the oil cooler manual 2. The detection signal line is in poor contact
A2.5	1025	Operation panel communication interruption	The communication line between the operation panel and the host is disconnected or the operation panel is faulty
A2.6	2026	The k3.6 debugging state is enabled; please operate with caution, and close it in time after the debugging is completed	K3.6 is set to 1; after changing to 0, the alarm may be cleared
A2.7	1027	The tool case is not lifted, and the related address is X14.4	When the tool magazine lift signal is 0, the tool magazine rotation command is executed. Check the tool case status or the tool case level signal X14.4
A3.1	2031	The spindle cannot be manually operated in the rigid tapping state	The spindle is switched to the manual mode in the rigid tapping state, and the operations of forward and reverse rotation and orientation are performed.
A3.2	2032	Insufficient lubrication pump pressure, and the related address is X12.4	Lubrication pressure signal X12.4 is not detected within 5 seconds of the lubrication motor operation 1. Check the oil pipe for oil leaks 2. Check whether the signal line is broken
A3.3	1033	No T code is commanded when executing the M06 tool change command	When using the servo tool carrier, tool magazine of carousel type, and clamp-arm type tool magazine, the M06 tool change command is executed, and the T code needs to be commanded in the same program block

PLC Address	Alarm Number	Alarm Messages	Handling Method
A3.4	1034	The 4th axis is locked, relevant to G132.3, G134.3	1. Check the fourth axis release output Y10.4 in the PLC diagnosis 2. Check whether the fourth axis release signal X13.0 is 1 in the PLC diagnosis 3. Check the circuit
A3.5	1035	The 5th axis is locked, relevant to G132.4, G134.4	1. Check the fourth axis release output Y10.6 in the PLC diagnosis 2. Check whether the fourth axis release signal X13.4 is 1 in the PLC diagnosis 3. Check the circuit
A3.6	1036	The spindle cooling system is overloaded, and the related parameter addresses are K13.3, X13.3	1. The overload switch trips. Please check the motor, circuits and switches 2. The detection signal line is in poor contact
A4.0	1040	The spindle orientation is timeout, and the related address is F45.7	After the spindle orientation is output, the spindle orientation completion signal is not detected within the specified time. 1. Check the parameter settings of servo drive for orientation according to the spindle servo drive 2. Non-bus spindle drive, check whether the signal connection line is open circuited
A4.1	1041	Spindle VP switching timeoutand the related address is F76.3	The rigid tapping speed position mode is not completed 1. Check the parameter settings of servo drive for speed/position switching according to the spindle servo drive 2. Non-bus spindle drive, check whether the signal connection line is open circuited
A4.2	1042	The tool changer cannot be started in the non-reverse position of the tool magazine or in the debugging mode	Set K3.6 as 0, check the tool magazine's backward position signal, and ensure that the tool magazine is in the backward position for automatic tool change
A4.3	2043	Setting error: The preset value of the counter C0 should be greater than the current value of C42	The oil pump stop time is set less than the time when the oil pump has stopped, and it is cleared in the current counter No.11.
A4.4	1044	Spindle gearshift action is timeout	The gear shifting is not successful after the set time 1. There is no gear position detection signal after the gear shifting is completed 2. The gearing is not successful. Please check the machine

PLC Address	Alarm Number	Alarm Messages	Handling Method
A4.5	2045	The spindle gear signal is wrong, and the related addresses are X12.0, X12.1, X12.2	The spindle gear detection signal is wrong. There are two gear signals at the same time or no gear signal. Please check the detection switch
A4.6	1046	Mutually exclusive M-codes are commanded at the same time	M-codes of the Y output for controlling interlock are executed at the same time
A4.7	1047	The tool number of the T command was not found. Please check the data table.	The T tool number that is not stored in the data table is commanded. Please check the T command
A5.0	1050	The Z-axis is not at the reference point, so the tool cannot be selected by commands	During the automatic tool change, the Z-axis is not at the reference point, so the tool selection is not allowed
A5.1	1051	The Z-axis is not at the second reference point, so the tool magazine cannot be commanded to move forward	During the automatic tool change, the Z-axis does not reach the second reference point, and the tool magazine forward M65 is executed
A5.2	1052	The spindle is not oriented, so the tool magazine cannot be commanded to move forward	During the automatic tool change, the spindle is not oriented, but the tool magazine forward M65 is executed
A5.3	2053	The protective door is opened, and the speeds of the spindle and feed axis are restricted.	When the spindle or feed axis is running, the protective door is opened, and the speeds of the spindle and feed axis are restricted.
A5.5	1055	The air supply pressure is too low or the pressure detection circuit is faulty	1. Check if the air source pressure is too low 2. Check whether the detection circuit is faulty
A5.6	1056	During cutting, it is detected that the tool clamping signal X12.6 is jittering or lost	During cutting, it is detected that the tool clamping signal X12.6 is jittery or lost, the tool clamping detection switch is loose, or the signal line is not firmly connected.
A6.2	1062	The related addresses X13.2, K10.5 of the chip punching motor overload alarm	1. The overload switch trips, check whether the motor power line is short-circuited or the motor is faulty 2. The detection signal line is in poor contact
A6.4	1064	The 5^{th} axis is not clamped, and the related parameter addresses are K5.4, X13.5	When the 5^{th} axis has the clamping detection setting, the clamping signal is not detected after the 5^{th} axis is clamped. Please check the signal X13.5

PLC Address	Alarm Number	Alarm Messages	Handling Method
A6.5	1065	The 4th axis clamping signal is detected, relevant to K5.2, X13.1	The 4th axis tight signal is detected when the 4th axis moves. Please check the signal X13.1
A6.6	1066	The 4th axis release signal is not detected, relevant to K5.1, X13.0	The 4th axis release signal X13.0 is not detected when the 4th axis moves
A6.7	1067	The tool case is not lifted, and the tool magazine zero return cannot be executed.	The tool case is not lifted or the tool case lift signal X14.4 is abnormal when the tool magazine is returned to zero
A7.0	1070	Mechanical arm swap timeout	After the mechanical arm motor action is output, the mechanical arm motor does not move or the mechanical arm signal is faulty
A7.1	1071	The auxiliary function is locked, the machine is locked, and the tool cannot be changed.	The auxiliary function lock or machine lock is opened when executing the T command
A7.2	1072	The 5th axis clamping signal is detected, relevant to K5.4, X13.5	The 5th axis clamping signal is detected when the 5th axis moves. Please check the signal X13.5
A7.3	1073	The 5th axis release signal is not detected, relevant to K5.3, X13.4	The 5th axis release signal is detected when the 5th axis moves. Please check the signal X13.4
A7.4	1074	The 4th axis release/clamping parameter K5.0 is set incorrectly	The 4th axis is not set to execute the 4th axis release or clamping command. Please set parameters correctly according to the rotary table configuration
A7.5	1075	The 5th axis has a release/clamping K5.5 parameter setting error	The 5th axis is not set to execute the 5th axis release or clamping command. Please set parameters correctly according to the rotary table configuration
A7.6	1076	The 4th axis indexing worktable is not in place or clamped, relevant to K6.4	When the indexing worktable starts, the release completion signal X13.1 is not detected 1. Check the signal X13.1 2. A mechanical problem occurs because it can not be released normally
A7.7	1077	The indexing worktable does not detect the release in-position X13.0	When the indexing worktable is clamped in position, the clamping signal X13.0 is not detected 1. Check the signal X13.0 2. A mechanical problem occurs because it cannot be clamped properly
A8.0	1080	The commanded M-code is beyond the range of 255 confined by the PLC	The executed M command is greater than 255. Please use the correct M-code

PLC Address	Alarm Number	Alarm Messages	Handling Method
A8.2	2082	The spindle zero-speed signal is not detected or K7.1 is not set	The spindle zero-speed signal is not detected when it is stopped 1. Check whether the parameter settings of the spindle drive parameters involving zero speed are appropriate 2. If the matched drive has no zero-speed signal, K7.1 can be changed to 1 for shielding
A8.4	2084	Please press the [Tool Magazine Clockwise] button to turn the tool	When the tool carrier stops abnormally during rotation, in order to avoid tool disorder, it is necessary to rotate the tool carrier in the manual mode according to the original rotation direction.
A8.5	2085	Please press the [Tool Magazine Counterclockwise] button to turn the tool	When the tool carrier stops abnormally during rotation, in order to avoid tool disorder, it is necessary to rotate the tool carrier in the manual mode according to the original rotation direction.
A9.0	1090	In the low-speed gear, the commanded S value is already greater than 500 rpm	When the T-type gearshift function is selected, the upper limit speed of the low gear is limited to 800 rpm in the PLC, which can be turned off by setting K8.3 as 0
A9.1	1091	In the high-speed gear, the commanded S value is already smaller than 200 rpm	When the T-type gearshift function is selected, the lower limit speed of the high gear is limited to 200 rpm in the PLC, which can be turned off by setting K8.3 as 0
A9.3	1093	Please execute the spindle gear shifting first, and then command the rigid tapping	In the same program block, there are gear shifting and rigid tapping commands. Modify the program, execute and complete the gear shifting, and then perform the rigid tapping
A9.5	1095	The current coordinate does not match the tool number, and it must be returned to zero	When the tool carrier is controlled by a servo motor, it is checked that the current tool number does not match the actual position, and the tool carrier must return to zero
A9.6	2096	Servo tool coordinate position fine-tuning K14.4	K14.4=1 The servo tool magazine's tool carrier is being fine-tuned
A10.0	1100	The tool magazine servo drive gives an alarm	The servo alarm is controlled by the tool carrier. Please check the servo alarm number and identify the problem according to the corresponding manual
A10.1	1101	The tool magazine is not in the proper forward position, so the tool selection cannot be commanded	Check the tool magazine forward in-position signal X14.3

PLC Address	Alarm Number	Alarm Messages	Handling Method
A10.2	1102	The tool magazine is not in the backward position, the spindle is not released/oriented, and the axis cannot be moved	Check the tool magazine backward in-position signal X14.4
A10.4	2104	The tool magazine is not in a safe position, so the spindle is not allowed to run	When using the tool magazine of carousel type 1. Check the current position of the tool magazine, it must be in the backward position 2. Check the tool magazine's backward in-position detection signal X14.4
A11.0	1110	The tool carrier motor is overloaded. Please check the motor load and wiring	1. Check the circuit, exclude the motor, short circuit and switch problems, and close the overload switch for use 2. Check if the machine gets stuck
A11.1	1111	Execute the T code, but the tool carrier does not run, or the counting signal does not change	1. The tool carrier is not running. Please check whether the machine gets stuck 2. The tool carrier is running. Please check whether the X14.2 signal has any change 3. K3.3, K3.4 setting error
A11.3	1113	Stop position error of the tool magazine counting switch	1. When the clamp-arm type tool magazine is selected 2. The tool magazine stops abnormally during tool selection, K3.6 is changed to 1, and the tool carrier is turned positively by hand 3. Check whether K3.3 and K3.4 settings are wrong
A11.4	1114	It is forbidden to start program in the tool change area	When the clamp-arm type tool magazine is selected Move the Z-axis out of the tool change area and then perform the tool change operation
A11.5	1115	The position of the tool carrier is wrong, so it is not prohibited to move	1. The tool carrier of the clamp-arm type tool magazine fails to detect the in-position signal X14.2, so the XYZ manual and automatic movement is prohibited, but the MPG movement is supported. 2. Check the position of the tool carrier, and turn the tool carrier positively in the debugging mode 3. Check the tool carrier in-position signal X14.2, and check the switch
A11.6	1116	The tool magazine is not in a safe position, so the spindle is not allowed to run	For the clamp-arm type tool magazine, the Z-axis executes the spindle command in the tool change area Move the Z-axis out of the tool change area through MPG, and then execute the spindle command

PLC Address	Alarm Number	Alarm Messages	Handling Method
A12.0	1120	The spindle is not oriented into the tool change area, and the Z-axis cannot be moved in the positive direction	For the clamp-arm type tool magazine, the spindle isn't oriented, but moves into the tool change area: Manually execute the spindle orientation, or automatically execute M19 and then move the Z-axis into the tool change area
A12.1	1121	The B-code number restricted for use is commanded	When the hydraulic rotary table control is selected, the B command beyond the range is executed, and the correct B command is input again.
A12.2	1122	A B0 or B code is commanded beyond the set value of the total rotary table number	Re-enter the correct B code
A12.3	1123	The hydraulic rotary table gear shifting/disengagement signal is abnormal	When the hydraulic rotary table control is selected, there are no gear shifting/disengagement signals. Please check the X26.3 and X26.2 signals
A12.4	1124	The hydraulic rotary table forward and reverse in-position signal is abnormal	When the hydraulic rotary table control is selected, the forward and reverse rotation are not in place. Please check the X26.0 and X26.1 signals
A12.5	1125	The B code is not commanded	When the hydraulic rotary table control is used, When executing the rotary table rotation code, B is not commanded
A12.6	1126	The hydraulic rotary table does not have the stop in-position signals X16.4~16.7	When the hydraulic rotary table control is used, Please check the X16.4~16.7 signals to confirm whether the actual position of the rotary table is in place
A12.7	1127	The detection position of the rotary table is inconsistent with the counting position C38	When the hydraulic rotary table control is used, 1. Check the actual position of the rotary table 2. Check whether the detection switch is faulty 3. According to the actual position of the rotary table, set the current position to the current value of the 10th counter
A13.0	1130	The forward and reverse rotation is not in place and cannot be disengaged	When the hydraulic rotary table control is used, 1. The rotary table is not in place, and the gear shift operation cannot be performed 2. Check the rotary table in-position signal 3. Check the current position of the rotary table
A13.1	1131	The commanded B code cannot match the actual counting C38 position. Please make a verification	When the hydraulic rotary table control is used, 1. Check the current rotary table position and compare whether the counter No.10 is currently inconsistent 2. Rotary table counting error, rotary table positioning error

PLC Address	Alarm Number	Alarm Messages	Handling Method
A13.2	1132	Spindle fan overload alarm	1. Check whether the spindle fan is faulty 2. Overload trip, inspect the electrical cabinet, check X10.2 signal
A13.3	1133	Air conditioning overload alarm	1. Inspect the air conditioning equipment in the electrical cabinet 2. Inspect the overload switch in the electrical cabinet
A13.4	1134	Low coolant level alarm	Check the tank level, add coolant
A13.5	1135	Lubrication motor overload	Check whether the lubrication pump is faulty
A14.0	1140	M25 should exit out of the 2nd spindle synchronous control state first	1. After the spindle synchronization function is enabled, the second spindle control of M78 is commanded separately, thus triggering this alarm 2. After exiting from the spindle synchronization control, execute the second spindle switching
A14.1	1141	Wrongly set tool magazine type K12.3K12.5K12.6	Reset the tool magazine selection parameters K12.3K12.5K12.6 correctly, and only one type may be selected
A14.2	1142	More than two gearshift types K7.2K7.6K8.2 are wrongly set	According to the spindle gear shifting structure, reset the correct shifting function 1. M-type gearshift K7.2 2. T-type gearshift, K7.6 3. S1, S2, S3 gearshift K8.2
A14.3	1143	The servo tool carrier types A and B cannot be selected at the same time	Check the PLC parameters K12.4 and K12.7 cannot be selected as 1 at the same time
A14.4	1144	For the mechanical arm servo tool magazine, please select the servo tool carrier B	When the disc type tool magazine is used, the servo tool carrier control of the tool magazine of carousel type is wrongly selected: Set K12.7 as 0 and K12.4 as 1
A14.5	1145	For the tool magazine of carousel type, please select the servo tool carrier A	When using the tool magazine of carousel type, the servo tool carrier control of the disc type tool magazine is wrongly selected: Set K12.7 as 1 and K12.4 as 0
A14.6	1146	The turret servo tool magazine is not configured with the PLC control program	When the clamp-arm type tool magazine is used, the carousel or disc type tool magazine servo tool disc control is enabled: Set K12.7 and K12.4 as 0, the clamp-arm type tool magazine does not support the PLC axis control

PLC Address	Alarm Number	Alarm Messages	Handling Method
A15.0	1150	First, return the tool magazine to zero, and then use M76 to arrange the data table.	When a disc type tool magazine is used, M76 is executed without executing zero return of the tool magazine. 1. In the zeroing mode, press the tool magazine to return to zero, 2. After the tool carrier returns to the No.1 tool position, the tool magazine zero return light is on, and then execute M76 to re-arrange the tools.
A15.1	1151	The set tool number is out of range	The tool number exceeds the set value of the total tool number In the PLC parameter data, D101, D102, D103 correctly set the large tool number
A15.2	2152	After the tool returns to zero, the No.1 tool slot cannot have a tool	When the servo magazine control is used: Remind that after the tool magazine returns to zero, be careful about the tool in the No.1 tool position to avoid collision
A15.3	1153	The tool carrier returns to zero, and the No.1 tool signal is not detected	When the servo magazine control is used: After the tool carriers completes the zero return, the zero point signal X14.1 of the No.1 tool magazine is not detected 1. Check the zero point position of the tool magazine, and reset the zero point according to the zero point signal of the tool magazine 2. Check the zero signal X14.1, without sensing or with a line fault
A15.5	1155	The data table cannot be initialized under the large tool function. Please exit from the large tool function and then execute M76	For the disc type tool magazine, when the large tool function is selected, it is not allowed to rearrange the tools After setting K0.4 as 0, execute M76 to re-arrange the tools, and then set K0.4 as 1 to enable the large tool function
A15.6	1156	The large tools are set adjacent to each other. After reset, restart and initialize the M76 data table	For the disc type tool magazine, when the large tool function is selected, the tool number of the large tool is set incorrectly as the adjacent tool number
A15.7	1157	The spindle is a large tool, and it is forbidden to pre-select a tool with a separate T code, but M6T** must be commanded to select a tool.	For the disc type tool magazine, when the large tool function is selected 1. When a large tool is installed in the current spindle, it is not allowed to execute a separate T for pre-selecting tools 2. Completely input the M06Txx tool change command

PLC Address	Alarm Number	Alarm Messages	Handling Method
A16.0	1160	The large tool No.1 is set to the adjacent tool. After reset, it should be restarted and the M76 data table initialization must be executed.	For the disc type tool magazine, when the large tool function is selected, the tool number of the large tool is set incorrectly, and the No.1 large tool is set to the adjacent tool number of another large tool In the PLC parameter D101, reset the No.1 large tool number, and restart to re-arrange the tools
A16.1	1161	The No.2 large tool is set to the adjacent tool. After reset, it must be restarted and the M76 data table initialization must be executed.	For the disc type tool magazine, when the large tool function is selected, the tool number of the large tool is set incorrectly, and the No.2 large tool is set to the adjacent tool number of another large tool In the PLC parameter D102, reset the No.2 large tool number, and restart to re-arrange the tools
A16.2	1162	The No.3 large tool is set to the adjacent tool. After reset, it must be restarted and the M76 data table initialization must be executed.	For the disc type tool magazine, when the large tool function is selected, the tool number of the large tool is set incorrectly, and the No.3 large tool is set to the adjacent tool number of another large tool In the PLC parameter D103, reset the No.3 large tool number, and restart to re-arrange the tools
A16.3	1163	The large tool number is set to repeat the tool number. After reset, it must be restarted and the M76 data table initialization must be executed.	For the disc type tool magazine, when the large tool function is selected, the large tool with the same tool number is set Reset the PLC parameters D101, D102, D103, then restart and re-arrange the tools
A16.5	1165	Exit from the large tool function, and then power on again.	For the disc type tool magazine, when the large tool function is selected, the system needs to be restarted after the large tool function is turned off.
A17.0	1170	The 4th axis is not released or there is a clamping signal	When the 4th axis is not released or in the clamped state, the 4th axis is manually moved 1. Execute M11 to release the fourth axis and then move 2. Check the axis release X13.0 and lock X13.1 signals
A17.1	1171	The manual/handwheel operation is prohibited for the toothed plate indexing worktable	When the indexing worktable function is used for the fourth axis, the fourth axis is manually controlled. 1. The manual control of the fourth axis is prohibited 2. The fourth axis positioning is conducted using the program command

PLC Address	Alarm Number	Alarm Messages	Handling Method
A17.2	1172	The 5th axis is not released or there is a clamping signal	When the 5th axis is not released or in the clamped state, the 4th axis is manually moved 1. Execute M21 to release the fourth axis and then move 2. Check the axis release X13.4 and lock X13.5 signals
A17.3	1173	If the spindle is not oriented, the tool arm should not be turned	For the disc type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected, the orientation signal has no output Manually or after executing M19 orientation, execute M53, M56, M57
A17.4	1174	If the Y-axis is not positioned with two reference points, the tool arm should not be rotated	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected The Y-axis is not at the second reference point, and the mechanical arm action M-code is executed; G91G28G0Y0 can be executed, then the mechanical arm action can be executed after the Y-axis returns to the second reference point
A17.5	1175	If the Z-axis is not positioned with two reference points, the tool arm should not be rotated	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected The Z-axis is not at the second reference point, and the mechanical arm action M-code is executed; G91G28G0Y0 can be executed, then the mechanical arm action can be executed after the Z-axis returns to the second reference point
A17.6	1176	If the tool case doesn't have a vertical in-position signal, the tool arm cannot be rotated	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected 1. The tool case is not in the vertical position, the robot action is executed, check the actual position of the tool case, then check the vertical signal of the tool case 2. Check the external wiring

PLC Address	Alarm Number	Alarm Messages	Handling Method
A17.7	1177	The spindle is not oriented in place, the arm cannot be turned	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected 1. After the spindle orientation is executed, the mechanical arm action is executed without the orientation completion signal. 2. Check the spindle orientation completion signal, and find the cause according to the corresponding manual with consideration to the spindle servo drive
A18.0	1180	Tool arm origin disconnection alarm	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected 1. Check the X14.5 signal, and inspect external circuits or switches 2. Adjust the switch position, because the distance is too far 3. A mechanical problem occurs because the signal wheel is misplaced
A18.1	1181	Tool arm tool holding signal disconnection	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected 1. Check the X14.6 signal, and inspect external circuits or switches 2. Adjust the switch position, because the distance is too far 3. A mechanical problem occurs because the signal wheel is misplaced
A18.2	1182	Tool arm brake signal disconnection	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected 1. Check the X14.7 signal, and inspect external circuits or switches 2. Adjust the switch position, because the distance is too far 3. A mechanical problem occurs because the signal wheel is misplaced

PLC Address	Alarm Number	Alarm Messages	Handling Method
A18.3	1183	The tool arm detection signal line is all 0	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected 1. Check the X14.5, X14.6, X14.7 signals, and inspect external circuits or switches 2. Adjust the switch position, because the distance is too far 3. A mechanical problem occurs because the signal wheel is misplaced
A18.4	1184	Without the origin signal of the tool arm, the tool case cannot fall down	For the disc-type tool magazine, the mechanical arm is not at the origin, and it is forbidden to perform the tool case fall-down operation Check the mechanical arm origin position signal, X14.5=0, X14.6=1, X14.7=0
A18.5	1185	If no T code is commanded, or the commanded tool number does not match the count, the tool case cannot be reversed	The disc type tool magazine has never executed the T command, but executes the M65 tool reverse command In the MDT mode, run the T command to select the tool and then run M65 to reverse the tool case
A18.6	1186	The tool release position signal is not detected, and the tool arms cannot be exchanged	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected When the M56 mechanical arm exchange is executed, the spindle does not release the tool. Please check the release X12.5 signal, or the operation is wrong
A18.7	1187	The tool change macro program is wrongly called, and K12.2=0 is a macro program using an M16 rotary tool arm	Turn off K12.2, and select the continuous sequence control of the mechanical arm. The macro program is used incorrectly; please use the corresponding macro program
A19.0	1190	The 180 degree exchange of tool arm is timeout	For the disc type tool magazine, when the mechanical arm controls K12.2=1 and the M-code control action is selected, this will occur when M56 tool exchange is executed: 1. Check whether the mechanical arm is suffocated, and eliminate the fault of the motor circuit 2. Check the mechanical arm signals X14.5=1, X14.6=0, X14.7=0

PLC Address	Alarm Number	Alarm Messages	Handling Method
A19.1	1191	Tool arm returns to origin timeout	For the disc type tool magazine, when the mechanical arm controls K12.2=1, the M-code control action is selected. Executed to the M57 mechanical arm return for more than 1.2s, and the mechanical arm origin position signal isn't received 1. Check whether the mechanical arm gets stuck, and eliminate the fault of the motor circuit 2. Check the robot origin position signals X14.5=0, X14.6=1, X14.7=0
A19.2	1192	The tool arm can't return because the tool clamping in-position signal is not detected	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected If M57 is executed, when the mechanical arm returns, no tool clamping signal is detected. Please check the X12.6 spindle clamping signal
A19.3	1193	It is wrong to call the tool change macro program, K12.2=1 is a macro program that uses three M-codes to segment the rotation arm	After K12.2 is turned on, and the M-code control action of the mechanical arm is selected, the macro program is incorrectly used, and the corresponding macro program should be used.
A19.4	1194	Tool snapping timeout	For the disc-type tool magazine, when the mechanical arm control K12.2=1 and the M-code control action is selected If M53 is executed, when the mechanical arm snaps the tool, the in-position signal is received for more than 1.4s. Check the X14.5=1, X14.6=0, X14.7=0 signals in the PLC diagnosis, and inspect the switches and circuits.

When a PLC alarm with an alarm number in the range of 1000~1999 arises, the system displays the alarm state and stops autorun; the range of 2000~2999 is a prompt message, which does not affect the automatic operation state of the system.

3.32 Automatic tool setter function

Note: After the tool setter function is used for measuring, the Z-axis workpiece zero must be set in conjunction with the "Measure with Tool" in the workpiece coordinate system, in order to obtain an accurate method of use.

Step 1 Set the system parameter: #6050=237

#1051 X Center position of the tool setter in the X direction (machine coordinate)

Y Center position of the tool setter in the Y direction (machine coordinate)

#2401.6 MEL Set the measurement signal (0: Valid when 0 / 1: Valid when 1)

#2412 Set the X address of the received signal, only one group of input addresses can be set, and the first one is used by default

Example: If it is set to 16, the wiring address is X16.0.

Step 2 Set the system macro value #903 = the distance from end face of the spindle to that of the tool setter (the absolute value of the machine coordinate)

Step 3 Write the macro program O9010 into the system (the program name cannot be changed to another name)

Step 4 Command format:

G237 B_H_D_

B: The estimated length of the tool to be measured (from the spindle end face to the tool nose) is 300 by default if no value is assigned.

Note: The allowable estimated B error value is ±20 mm of the actual tool length.

H: Input the compensation number for the length offset of the tool to be measured; if not assigned it is defaulted to be the current T tool number.

D: The radius of the tool to be measured; if no value is assigned, the default value is 0.

Step 5 Action flow:

Action 1. The Z-axis is executed to return to the first reference point.

Action 2. The XY axis is executed to return to the second reference point.

Action 3. When there is a tool radius value, X is offset by a radius value in the positive direction.

Action 4. Quickly locate the tool nose to 25 mm from the surface of the tool setter.

Action 5. The Z-axis moves at the speed of F1000 to approach the surface of the tool setter.

Action 6. After the Z-axis senses the signal of the tool setter, it immediately retracts for 5 mm.

Action 7. The Z-axis moves at the speed of F100 to approach the surface of the tool setter.

Action 8. The Z-axis will return to the first reference point immediately after sensing the signal of the tool setter.

Action 9. Manually move the Z-axis to the workpiece zero (which is normally set on the workpiece surface), enter the workpiece coordinate system and perform the "Z-axis drop" operation to complete the length measurement of the tool and the setting of the workpiece Z zero. If the workpiece Z zero setting remains unchanged, it only needs to be set once.

Step 6 Appendix: Macro program

Part II Debugging

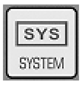
```
O9010(AUTOMATIC TOOL OFFSET)
(START)
N10 G40 G49 G80 M5
N15 #30=#4001          Store the mode information from one of G0, G1, G2 and G3
N20 #31=#4003          Store the mode information from one of G90 and G91
N30 IF[#11NE#0]GOTO50   Determine whether H is empty; if so, it is equal to the current tool
                        number
N40 #11=#4120
N50 IF[#2NE#0]GOTO70    Determine whether B is empty; if so, it is equal to 300
N60 #2=300
N70 IF[#7NE#0]GOTO90    Determine whether D is empty; if so, it is equal to 0
N80 #7=0
N90 G91G28G00Z0
N100 #22=#5043          Store the current position of the Z-axis in the workpiece coordinate system
N110 G30G91X0Y0
N120 X[#7/2]
N130 Z-[#903-#2-25]
N140 G31Z-99999.F1000
N150 G0Z5
N160 G31Z-99999.F100
N170 #25=#5063          The position to store the Z-axis skip signal of the working coordinate system
N180 G90 G10L10P#11R[#903- #22+#25]
N190 G91G28Z0           Z-axis back to origin
N200 G#30G#31M05        Return the mode of the stored G00 and G91 groups
M99
```

Note: Therefore, this function is not a default factory configuration. In order to use it, the tool setter overtravel alarm should be added in the PLC.

Part III Parameters

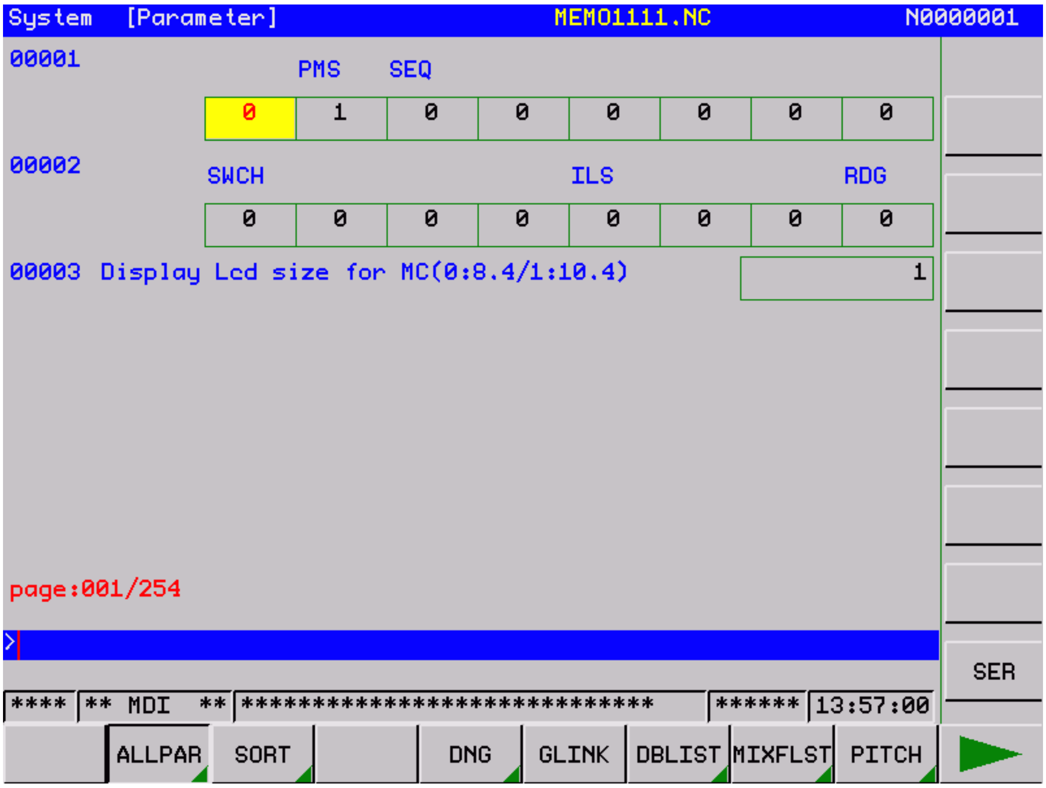
Chapter I Parameter Display

The operation steps for parameter display are detailed as follows:

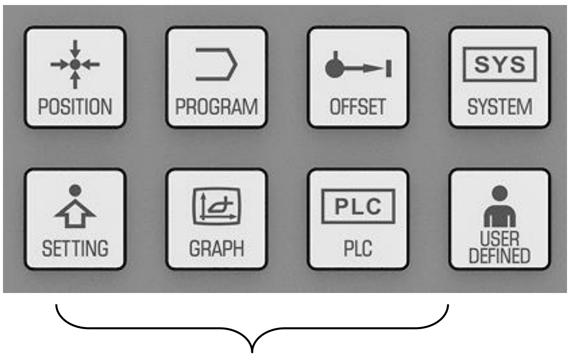
(1) Press the function key 

on the MDI panel for several times, or press the function key 

once, and then press the [Parameter] soft key to enter the parameter screen.



Back to menu key　　　　Soft key　　　　.Extended menu key



Function key

(2) The parameter screen consists of multiple pages. There are two methods to select the page on which the parameters to be displayed are located.

(a) First, use the soft keys to select the desired parameter category, and then use the page scroll key or cursor movement key to find the desired page

(b) After inputting the parameter number you want to display from the keyboard, press the soft key [Search] to display the page where the specified parameter is located, and the cursor lies at the specified parameter position (the data becomes the selected color).

Chapter II Setting Parameters in the MDI Mode

The operation steps for parameter setting are detailed as follows:

(1) Press the  key to enter the offset setting interface, and enter the corresponding password first.

In order to prevent the malicious modification of machining program and CNC parameters, etc., the system provides the permission setting functions, with eight password levels from high to low, including Level 0 (system high level), Level 1 (system service level), Level 2 (machine manufacturer level), Level 3 (installation and commissioning level), Level 4 (terminal management level), Level 5 (operator level 1), Level 6 (operator level 2) and Level 7 (operator level 3) respectively (see Figure 2-1).

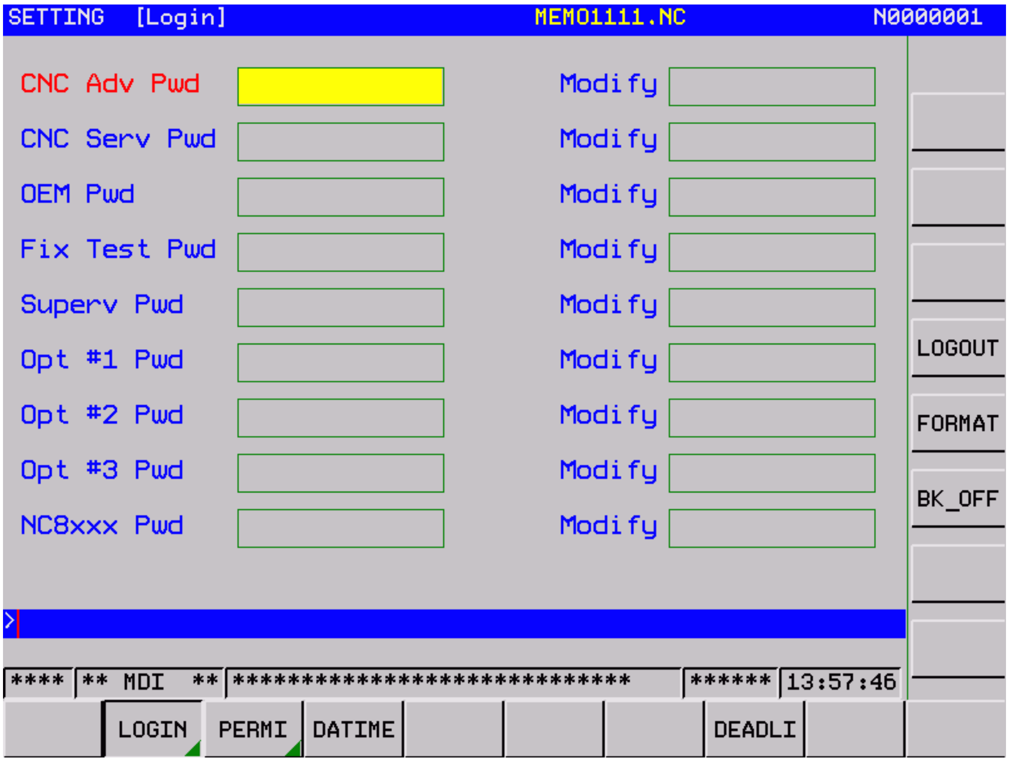


Figure 2-1

Level 0: The highest authority is reserved by the developer. Clear alarm/operation message.

Level 1: It may be used by the system manufacturer to provide services, including modification of various data in the system.

Level 2: It allows for PLC program modification, editing of PLC annotation and pitch compensation; start/stop of PLC; transfer-in and out of PLC and pitch compensation files; modification/transfer-in and out of the user customization interface rights.

Level 3: It allows for modifying the system and PLC parameters; or upgrading the system, interpolation and position control maintenance software

Level 4: It allows for modifying the program and tool offset value, setting various function set values on interface, workpiece coordinate system values, macro variable values, and modifying the programmer password.

Level 5, Level 6, Level 7: End-user administrators authorize the operation authority of the appropriate personnel by means of a bit parameter. Level 7 is the lowest level in the system by default, without the need of entering passwords.

NC8XXX password: The macro program related parameters of O8000~O8999 that the user can set the password lock cannot be modified.

Note: To modify the login password of the interface, first enter the original password to log in to the corresponding user, and then enter the password to be modified at the corresponding place (entered twice). The passwords of lower-level users can also be modified through advanced users, but users at the same level cannot modify passwords to each other.

It is defined by the bit parameter authorized by end user's administrator.

Bit	Meaning	Notes
0	G-code modification right	1 permitted
1	Tool offset modification permission	1 permitted
2	Wear modification permission	1 permitted
3	Setting modification permission	1 permitted
4	Coordinate system modification permission	1 permitted
5	Macro modification permission	1 permitted
6	Permission to copy G-code to USB flash disk	1 permitted
7	Retained	

(2) Enter the password of the corresponding level, and press the 

key; if it is correct, the text of the corresponding level will become red; if it is wrong, the system will prompt "Incorrect Password". If you log out directly by pressing [Log Out], the password will be cancelled immediately.

(3) Modify the corresponding parameters and settings.

(4) After modification, log out.

Chapter III System Parameter Setting or Maintenance Through the PC Software

3.1 Editing of system parameter

This software can edit parameters in the PC software, and upload and download the backup related parameter files through USB flash disk (see Figure 3-1, Figure 3-2).

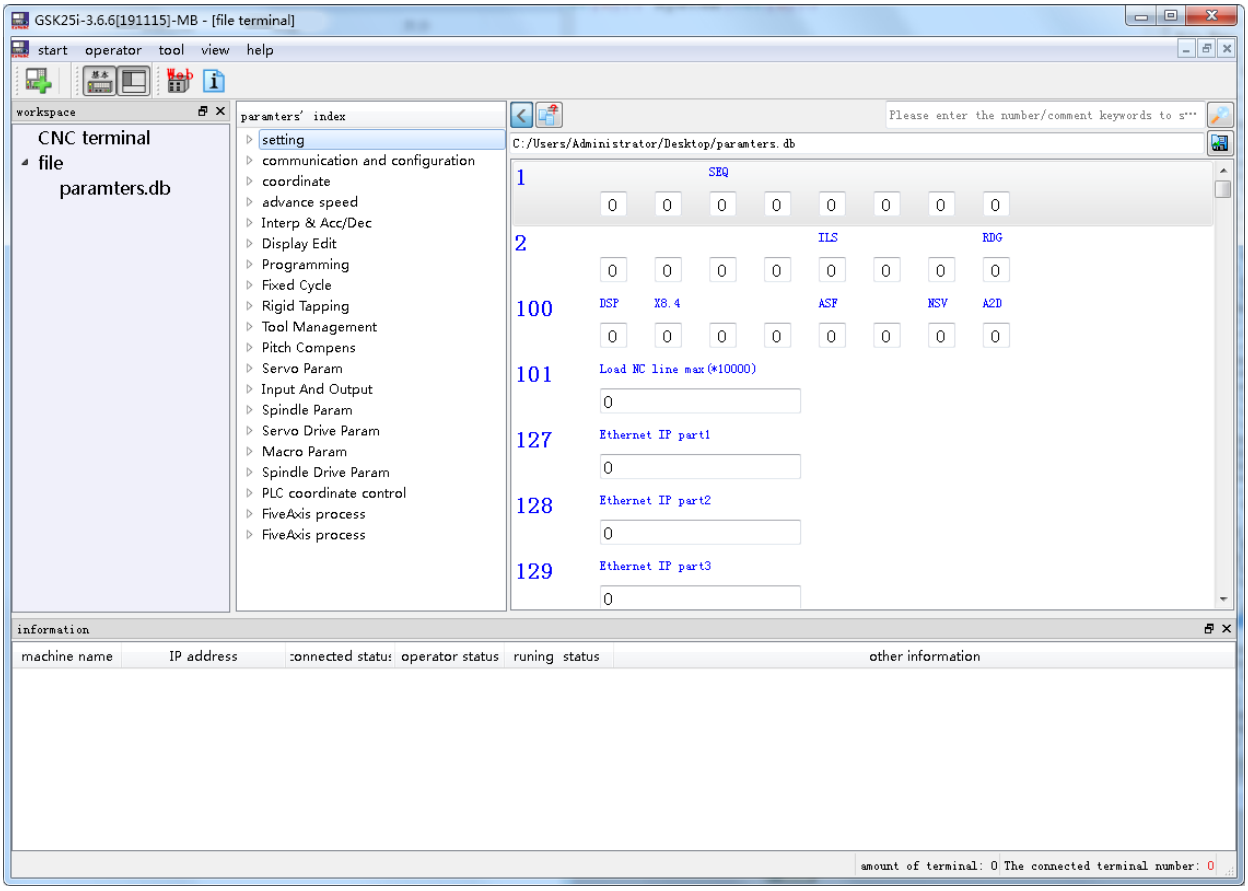


Figure 3-1 Editing of System Parameter

3.2 Editing of pitch compensation data

The editing of pitch compensation data is shown in Figure 3-2.

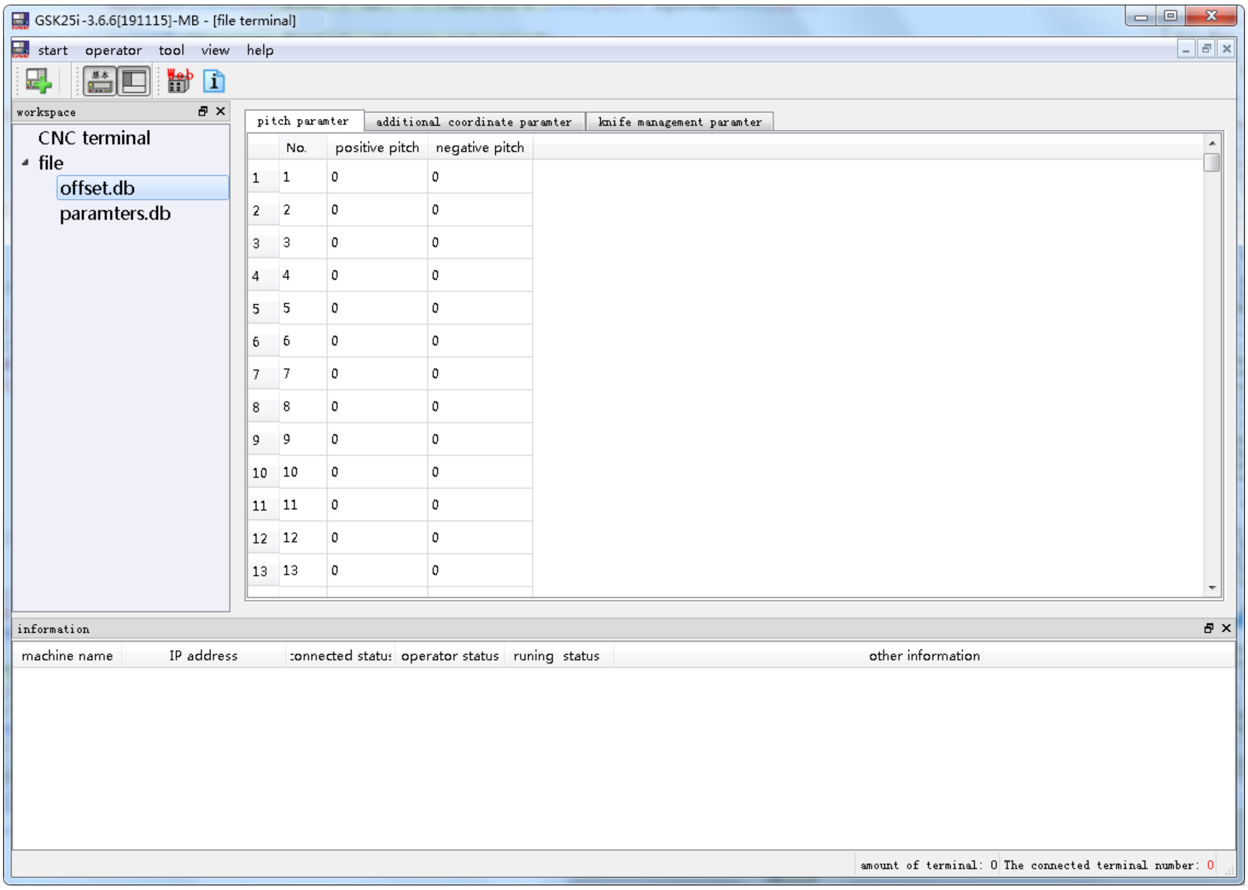


Figure 3-2 Editing of Pitch Compensation Data

Chapter IV Parameter Description

[Parameter Type]

The system parameters can be divided into the following categories according to the parameter types (see Table 4-1).

Table 4-1 Data Type and Valid Data Range

Data Type	Valid Data Range
Bit type	0 or 1
Bit axis type	0 or 1
Integer type	-999999~999999
Integer axis type	-999999~999999
Real number type	-999999.9999~999999.9999
Real number axis type	-999999.9999~999999.9999

The displayed number of axis type parameters is determined by the total number of axes set by the #800 parameter

[Parameter Format Description]

The system parameters are described in the following format

Parameter Number	Meaning of the parameter

Where special attention is required, there will be notes to remind the user of the precautions

Notes

1. Caution 1

2. Caution 2

3. Caution 3

4. …

4.1 Setting parameters (1~99)

	7#	6#	5#	4#	3#	2#	1#	0#
0001		PMS	SEQ					

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

SEQ: Automatic insertion of the sequence number

0: No, there is no change when a program block is inserted.

1: Yes, when a program block is inserted, N+4 digits will be automatically added before the block.

PMS: Reconfirm from the middle of the program

0: Invalid, the cursor lies at any position, the cycle starts, and there is no confirmation message.

1: Valid, the cursor lies not at the program header, the cycle starts, there is a confirmation prompt, and press the cycle start again to start running the program.

Note: The incremental value of the sequence number is set in parameter #1621.

	7#	6#	5#	4#	3#	2#	1#	0#
0002					ILS			RDG

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] After restart

RDG: Remote diagnostics

0: No

1: Yes

ILS: Splash screen selection

0: System default, the default splash screen of GSK is used.

1: User-defined, the user's own splash screen may be used upon startup.

003	Dedicated for MC display size	0

[Data type] Integer type

Explanation: 0: 8.4, the current MC display size is 8.4-inch

1:10.4, the current MC display size is 10.4-inch

4.2 Communication and configuration parameters (100~999)

	7#	6#	5#	4#	3#	2#	1#	0#
100	DSP	X8.4			ASF			

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 1 0 0 1

[Effective mode] After restart

ASF: Whether to automatically save the carried-forward current file when loading

0: No

1: Yes

DSP: Can DSP apply the new architecture

0: No

1: Yes

X8.4: The X8.4 emergency stop signal is valid

0: Valid, the emergency stop signal of the operation panel is processed directly in the software

1: Invalid, the emergency stop signal of the operation panel is processed in the PLC

101	Content capacity of G-code program (10,000 lines)	30

[Data type] Integer type

[Data unit] 10,000 lines

[Data range] 20~45

[Effective mode After restart

104	Graphical trajectory buffer length	120

[Data type] Integer type

[Data unit] ×1000

[Data range] 5~500

[Effective mode] After restart

106	Network protocol	0

0: Assistant, GSK25i application software - GSK25i Assistant

1: Debugging tool

2: TCP3, an interface of the GSK standard data dynamic link library

3: UDP, an interface of the GSK standard data dynamic link library

5: MODBUS protocol, used to transmit PLC signals and system data

127	Ethernet IP address (gateway) segment 1	192
128	Ethernet IP address (gateway) segment 2	168
129	Ethernet IP address segment 3	188
130	Ethernet IP address segment 4	123

[Data type] Integer type

[Data range] 2~250

[Effective mode] Reset

[Description] Set the IP address of the CNC system, which can be used to connect with the computer to establish communication.

133	Ethernet IP gateway segment 3	188

[Data type] Integer type

[Data range] 2~250

[Effective mode] Reset

[Description] Segments 1 and 2 in the gateway are shared with those of IP

134	Ethernet IP gateway segment 4	254

[Data type] Integer type

[Data range] 2~250

[Effective mode] Reset

[Description] Segments 1 and 2 in the gateway are shared with those of IP

135	Ethernet MASK code segment 1	255

[Data type] Integer type

[Data range] 0~250

[Effective mode] Reset

136	Ethernet MASK code segment 2	255

[Data type] Integer type

[Data range] 0~250

[Effective mode] Reset

137	Ethernet MASK code segment 3	255

[Data type] Integer type

[Data range] 0~255

[Effective mode] Reset

138	Ethernet MASK code segment 4	0

[Data type] Integer type

[Data range] 0~255

[Effective mode] Reset

140	Ethernet IP address port 1 (Mini Assistant)	5000

[Data type] Integer type

[Data range] 2~250

[Effective mode] Reset

141	Ethernet IP address port 2 (GSK Common Network TCP)	5000

[Data type] Integer type

[Data range] 0~65535

[Effective mode] Reset

142	Ethernet IP address port 3 (servo tuning monitoring network)	4546

[Data type] Integer type

[Data range] 0~65535

[Effective mode] Reset

143	Ethernet IP address port 4 (servo tuning acquisition network)	4547

[Data type] Integer type

[Data range] 0~65535

[Effective mode] Reset

144	Ethernet IP address port 2 (GSK universal network UDP)	2000

[Data type] Integer type

[Data range] 0~65535

[Effective mode] Reset

145	Ethernet IP address port 5 (MODBUS common network)	7000

[Data type] Integer type

[Data range] 0~65535

[Effective mode] Reset

200	Basic cycle of system communication (us)	1000

[Data type] Integer type

[Data unit] μs

[Data range] 500~2000

[Effective mode] After restart

[Settable value] 500, 1000, 2000

201	Communication command time (us)	100

[Data type] Integer type

[Data unit] μs

[Data range] 1~2000

[Effective mode] After restart

203	Cycle communication data length (bytes)	16

[Data type] Integer type

[Data unit] Byte

[Data range] 8~30

[Effective mode] After restart

204	Maximum number of retransmissions in a cycle	3

[Data type] nteger type

[Data unit] Number

[Data range] 0~32

[Effective mode] After restart

205	Servo communication ignored	0

[Data type] Integer type

[Data range] 0~1

[Effective mode] Immediately

[Description] 0: The system communicates with the slave station normally

1: The communication between the system and the slave station is fully disconnected, the communication alarm is shielded, and it can run offline.

> Note: When it is set to 1, the system will ignore its communication with the slave station and disconnect all signal interactions.

206	The largest error allowed by the synchronous MST packet of system communication	2

[Data type] Integer type

[Data unit] Number

[Data range] 1~8

[Effective mode] Immediately

207	The largest error allowed by the synchronous MDT packet of system communication	2

[Data type] Integer type
[Data unit] Number
[Data range] 1~8
[Effective mode] Immediately

210	Number of retransmissions allowed by GDT	3

[Data type] Integer type
[Data unit] Number
[Data range] 0~8
[Effective mode] Immediately

211	MDT packet CRC verification enable (1 enable)	1

[Data type] Integer type
[Data unit]
[Data range] 0 or 1
[Effective mode] Immediately

212	GDT packet CRC verification enable (1 enable)	1

[Data type] Integer type
[Data unit]
[Data range] 0 or 1
[Effective mode] Immediately

221	Number of slave station devices	5

[Data type] Integer type
[Data unit] Number

[Data range] 1~16

[Effective mode] After restart

[Description] The number of all devices connected to the bus, such as feed axis servo, spindle servo, I/O unit, etc.

222	Number of I/O devices	1

[Data type] Integer type

[Data unit] Number

[Data range] 1~8

[Effective mode] Immediately

[Description] The total number of I/Os and gateways on the bus connection.

225	The connection sequence number corresponding to the servo device	

[Data type] Axis type

[Data range] 1~15

[Effective mode] Immediately

[Description] Set the connection position of feed axis in the bus, starting from CN4 out of the host computer, CN4 out, CN5 in, with the order of: 1, 2, 3...

Note: The logical address setting of the servo is related to the servo network connection; the first slave station connected from the CN4 port of the system is 1, and so on. The logical address of the servo is the corresponding set value;

Usually the control axis number is the same as the set value of the logic address of the servo.

226	Connection sequence number corresponding to the spindle equipment	

[Data type] Axis type

[Data range] 1~15

[Effective mode] Immediately

[Description] Set the connection position of the spindle in the bus, and calculate from CN4 out on the host side, CN4 out, CN5 in, in the order of: 1, 2, 3...

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Note: The logical address setting of the servo is related to the servo network connection; the first slave station connected from the CN4 port of the system is 1, and so on. The logical address of the servo is the corresponding set value. Usually the spindle servo is placed after the feed axis servo and before the I/O.

227	Connection sequence number corresponding to the I/O gateway devices	

[Data type] Axis type

[Data range] 1~15

[Effective mode] Immediately

[Description] Set the connection position of the I/O gateway in the bus, calculating from CN4 out on the host side, CN4 out, CN5 in, in the order of: 1, 2, 3...

228	I/O, gateway device selection (0: I/O / 1: Gateway)	0

[Description] 0: Use the IOR series terminal wiring, and lead type standard I/O unit;

1: Use the input/output gateway device of GSK-Link communication, which is often used for signal interaction with GSK robots

Note: The logical address setting of the servo is related to the servo network connection; the first slave station connected from the P1 port is of the system is 1, and so on. The logical address of the servo is the corresponding set value.

800	Select the number of system control axes	4

[Data type] Integer type

[Data range] 2~8

[Effective mode] After restart

[Description] Set the total controlled number of feed axes.

801	Select the number of system linkage axes	4

[Data type] Integer type

[Data range] 2~8

[Effective mode] After restart

[Description] Set the maximum number of linkage axes allowed by the system.

810	Screensaver wait time	0

[Data type] Integer type

[Data unit] min

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set the system to enter the screensaver if it has no operation until the set time expires. Press any key on the display panel to exit from the screensaver. When it is set to 0, the screensaver function must be turned off.

811	Interpolation cycle	1

[Data type] Real number type

[Data unit] ms

[Data range] 0:0.5/1:1/2:2

[Effective mode] After restart

812	CNC interface refresh cycle (10ms)	12

[Data type] Real number type

[Data unit] ms

[Data range] 1~20

[Effective mode] Immediately

813	PLC execution cycle	8

[Data type] Real number type

[Data unit] ms

[Data range] 2~8

[Effective mode] Immediately

[Description] Set the scan cycle of the PLC

4.3 Coordinate parameters (1000~1199)

	7#	6#	5#	4#	3#	2#	1#	0#
1000	EFCT			EDC			ISC	

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 1 0

[Effective mode] After restart

ISC: Minimum mobile unit

0: 0.001 mm or 0.001 deg, axis coordinates display 3 digits after the decimal point

1: 0.0001 mm or 0.0001 deg, the axis coordinate displays 4 digits after the decimal point.

EDC: Whether to use the external deceleration function

0: Do not use the external deceleration function

1: After the PLC signal (G118 positive, G112 negative) is triggered, the feed axis proceeds to the deceleration speed set by the parameter;

EFCT: The backlash/pitch compensation mode upon power-on/emergency stop release

0: Invalid

1: Valid

	7#	6#	5#	4#	3#	2#	1#	0#
1001						SFD	DLZ	

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

DLZ: Function of reference point setting without stop block

0: Invalid, the machine zero needs to be established after passing through the stop block and returning to zero

1: Valid, the machine zero may be established without passing through the stop block and returning to zero

SFD: Whether to use the reference point offset function

0: Not used

1: Used

Note: When the DLZ (N1001#1) parameter is set to 0, this parameter is invalid, and when DLZ (N1001#1) is 1, this

parameter is valid. When the SFD (N1001.2) parameter is set to 1, the reference point offset of each axis in the parameter N4120 is valid (currently this parameter is invalid).

	7#	6#	5#	4#	3#	2#	1#	0#
1002			EDN	EDP	HJZ			

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 1 0 0 0

[Effective mode] Reset

HJZ: When returning manually after the reference point is established

0: When passing through the deceleration stop block, repeat the action of establishing the reference point

1: Quickly locate to the reference point, and return to the established reference point position at the G00 speed

Note: When an absolute value motor is used, the parameters are invalid, and they are all quickly positioned to the machine zero.

EDP: External deceleration signal in the positive direction of the axis

0: Fast and effective, valid in the G00 mode only, starting after the PLC signal G118 is connected

1: Rapid and cutting feeds are valid, both G00 and G01 modes are valid, and it may start after the PLC signal G118 is connected

EDN: External deceleration signal in the negative direction of the axis

0: Fast and effective, valid in the G00 mode only, starting after the PLC signal G120 is connected

1: Rapid cutting feed is valid, both G00 and G01 modes are valid, and it may start after the PLC signal G120 is connected

	7#	6#	5#	4#	3#	2#	1#	0#
1004	HIDEn	THIDn	ZMIn				HXS	

[Data type] Bit axis type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 1 0 0

[Effective mode] Reset

HXSn: MPG direction and axis movement direction

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0: Consistent, the MPG direction is the same as the axis movement direction

1: Invert, the MPG direction is opposite to the axis movement direction

ZMIn: Set thereference point return direction of each axis (it will affect which side of the motion direction the backlash exists on)

0: Negative direction, which will affect which side of the movement direction the backlash exists on

1: Positive direction, which will affect which side of the movement direction the backlash exists on

THIDn: Whether to hide the axis in the lathe settings

0: No, in the lathe mode, the corresponding servo axis is not hidden

1: Yes, in the lathe mode, the corresponding servo axis is hidden, and after logging into the system, the manufacturer password can be displayed again

HIDEn: Whether the machining center is set to hide the axis

0: No, in the machining center mode, the corresponding servo axis is not hidden

1: Yes, in the machining center mode, the corresponding servo axis is hidden, and after logging into the system, the manufacturer password can be displayed again

1020	Programming axis name of each axis	88

[Data type] Integer axis type

[Data range] 65~67, 85~90

[Effective mode] Immediately

[Description] Set the name of each feed axis according to the machine structure and customer needs, and set them according to the rules of Cartesian coordinates.

Note: The display name is its ASCII code, and the allowed values are X88, Y89, Z90, A 65, B 66, C 67, U 85, V 86, W 87.

1021	Subscript of the axis name	32

[Data type] Integer axis type

[Data range] 0~90

[Effective mode] Immediately

[Description] The subscript of the feed axis name is set to 0~9 as numbers (it will not be displayed if set to 0), 65~90 as ASCII codes, and 32 as blank

Note: 0~9 are numbers (which will not be displayed if set to 0), 65~90 are ASCII codes, and 32 is blank.

	7#	6#	5#	4#	3#	2#	1#	0#
1023		RABx	RRLx		RHAY	ROSn	ROTn	

[Data type] Bit axis type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

ROTn: Whether each axis is a rotation axis or a translation axis

0: Translation, the feed axis is a linear axis

1: Rotation, the feed axis is the rotation axis

ROSn: Coordinate axis type of the rotation axis

0: Rotation axis type, the coordinates of the rotation axis run within 360 degrees.

1: Linear axis type, the coordinate control of the rotation axis is the same as that of the linear axis

RHAY: Rotation axis interpolation method

0: Closest, the feed axis runs to the end value according to the closest principle

1: Not closest, the feed axis does not arrive at the end point value according to the closest principle.

RRLx: Relative coordinate display

0: Command value, the relative coordinate of the rotation axis is the command value, which is not displayed within 360 degrees.

1: Within 360 degrees, the relative coordinate of the rotation axis is displayed within 360 degrees

RABx: Absolute coordinate display

0: Command value, the absolute coordinate of the rotation axis is the command value, but not displayed within 360 degrees

1: Within 360 degrees, the absolute coordinate of the rotation axis is displayed within 360 degrees

Note: ROSn is used in combination with ROTn.

0 0 Linear axis type

1) Imperial/metric system conversion.

2) All coordinate values are of linear axis type (not cycled from 0 to 360).

3) The stored pitch error compensation is the linear axis type.

0 1 Rotation axis type

1) No imperial/metric system conversion is performed.

2) The coordinate value of the machine falls within the range of 0~360 degrees.

The parameters RRLx and RABx can be selected to determine the relative coordinate value and absolute coordinate.

Whether it is displayed as numerical value, or displayed between 0 and 360 degrees.

1) The stored pitch error compensation is a rotation axis type.

2) Automatic reference position return (G28~G30) returns to the direction from the reference position.

Start the process, and move no more than 1 circle.

1 0 Setting invalid

1 1 Linear axis type

1) No imperial/metric system conversion is performed.

2) The machine coordinate value, relative coordinate value, and absolute coordinate value are all of linear axis types (not displayed between 0 and 360 degrees).

3) The rotation axis moves in the direction specified by the command value symbol.

4) The stored pitch error compensation is the linear axis type.

5) It cannot be used with the cycle function of the rotation axis and the indexing worktable function at the same time.

1024	Attributes of Each Axis in the Basic Coordinate System	32

[Data type] Integer axis type

[Data range] 0~7

[Effective mode] Reset

Set Value	Meaning
0	Neither the basic 3-axis nor the parallel axis
1	X-axis of the basic 3-axis
2	Y-axis of the basic 3-axis
3	Z-axis of the basic 3-axis
5	Parallel to X-axis
6	Parallel to Y-axis
7	Parallel axis to Z-axis

1025	2nd character of the programmed axis name	32

[Data type] Integer axis type

[Data range] 0~90

[Effective mode] Reset

[Description] In the multi-axis control, the programming axis is named with two English characters, and the second character of each feed axis name is set.

Note: The display name is its ASCII code, and the allowed values are X88, Y89, Z90, A 65, B 66, C 67, U 85, V 86, W 87.

1026	3rd character of the programmed axis name	32

[Data type] Integer axis type

[Data range] 0~90

[Effective mode] Reset

[Description] In the multi-axis control, the programming axis is named with three English characters, and the third character of each feed axis name is set.

Note: The display name is its ASCII code, and the allowed values are X88, Y89, Z90, A 65, B 66, C 67, U 85, V 86, W 87.

	7#	6#	5#	4#	3#	2#	1#	0#
1030	ITI	IDX						

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Upon reset

IDX: Indexing sequence of the indexing worktable

0: A type, after the movement command is issued, and the indexing worktable is fully released, the motor is enabled for positioning; after the positioning, it is disabled and then clamped

1: B Type, after the movement command is issued, the motor is enabled, and then it will be disabled after moving and being tightly clamped.

ITI: Indexing function of the indexing worktable

0: Invalid, the indexing function of the indexing worktable is invalid

1: Valid, if the positioning is performed in multiples of the fixed angle, it needs the PLC for control

	7#	6#	5#	4#	3#	2#	1#	0#
1031	DNC	NKKJ						G_RET

Part III Parameters

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

G_RET: Whether the cursor always returns to the program header after reset

0: No (conditional), reset in the edit mode and when the program interface is displayed, and the cursor may return to the program header

1: Yes, reset by any method, on any interface, the system cursor will return to the program header

NKKJ: Incremental modification function

0: Invalid, the incremental modification function is invalid

1: Valid, when the program is edited manually, it will be added to the coordinate value by increments when modifying the command, such as: the original value is X10, which will be modified as X20 by increments after inputting X10

DNC: Whether the cursor returns to the program header after the local DNC is reset

0: No, it will not return to the program header after the DNC machining is completed

1: Yes, after the DNC machining is completed, it will return to the program header in case of reset

Note: When G_RET (N1031#0) is set to 0, the system is in the edit mode and resets when the program interface is displayed, and the cursor returns to the program header;

When G_RET (N1031#0) is set to 1, reset in any mode and on any interface, the system cursor may return to the program header.

1040	Offset of external workpiece origin	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Immediately

1041	Origin offset of the workpiece coordinate system 1 (G54)	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Immediately

1042	Origin offset of the workpiece coordinate system 2 (G55)	0

[Data Type] Real number axis type
[Data unit] mm
[Data range] -999999.9999~999999.9999
[Effective mode] Immediately

1043	Origin offset of the workpiece coordinate system 3 (G56)	0

[Data Type] Real number axis type
[Data unit] mm
[Data range] -999999.9999~999999.9999
[Effective mode] Immediately

1044	Origin offset of the workpiece coordinate system 4 (G57)	0

[Data Type] Real number axis type
[Data unit] mm
[Data range] -999999.9999~999999.9999
[Effective mode] Immediately

1045	Origin offset of the workpiece coordinate system 5 (G58)	0

[Data Type] Real number axis type
[Data unit] mm
[Data range] -999999.9999~999999.9999
[Effective mode] Immediately

1046	Origin offset of the workpiece coordinate system 6 (G59)	0

[Data Type] Real number axis type
[Data unit] mm
[Data range] -999999.9999~999999.9999
[Effective mode] Immediately

1050	Coordinate value of the 1st reference point of each axis in the machine coordinate system	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] The machine coordinate after the machine tool returns to the machine zero

1051	Coordinate value of the 2nd reference point of each axis in the machine coordinate system	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] The machine coordinate setting of the 2nd reference point of the machine

1052	Coordinate value of the 3rd reference point of each axis in the machine coordinate system	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] The machine coordinate setting of the 3rd reference point of the machine

1053	Coordinate value of the 4th reference point of each axis in the machine coordinate system	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] The machine coordinate setting of the 4th reference point of the machine

1060	Movement amount per revolution of the feed axis	0

[Data Type] Real number axis type

[Data unit] mm or deg

[Data range] 0~999.9999

[Effective mode] Reset

[Description] The movement amount of the linear axis for each revolution of the motor.

1068	Amount of rotation angle per revolution of rotation axis	0

[Data Type] Real number axis type

[Data unit] deg

[Data range] 0.001~9999.9999

[Effective mode] Reset

[Description] The angle of the rotation axis for one revolution

Note: This parameter is used during the cylindrical interpolation.

	7#	6#	5#	4#	3#	2#	1#	0#
1070		LZR		BAR	OT3	OT2		OUT

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 1 0 0 0 0 0 0

[Effective mode] Reset

OUT: Prohibited area of the stored stroke detection 2

0: Inner side, the coordinate of the feed axis lies in the set rectangular area, the system gives an alarm

1: Outer side, the coordinate of the feed axis lies out of the set rectangular area, and the system gives an alarm

OT2: Whether each axis is checked for the stored stroke detection 2

0: No

1: Check

OT3: Whether each axis is checked for the stored stroke detection 3

0: No

Part III Parameters

1: Check

BAR: Chuck tailstock switch

0: Invalid, the function of the chuck tailstock switch is invalid

1: Valid, the chuck tailstock switch function is valid

LZR: The stroke 1 detection is conducted before the machine coordinate system is established

0: No, when 4001.3APZ is 0, the soft limit is invalid

1: Yes, when 4001.3APZ is 0, the soft limit is valid

1080	Positive boundary coordinate value of the stored stroke detection 1 of each axis	9999

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] Set the machine coordinates at the positive boundary of the 1st soft limit

1081	Negative boundary coordinate value of the stored stroke detection 1 of each axis	-9999

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] Set the machine coordinates at the negative boundary of the 1st soft limit

1082	Set the positive boundary coordinate of the stored stroke detection 2 of each axis	9999

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] Set the machine coordinates at the positive boundary of the stroke detection 2

1083	Negative boundary coordinate of the stored stroke detection 2 of each axis	-9999

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] Set the machine coordinates at the negative boundary of the stroke detection 2

1084	Positive boundary coordinate of the stored stroke detection 3 of each axis	9999

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] Set the machine coordinates at the positive boundary of the stroke detection 3

1085	Negative boundary coordinate of the stored stroke detection 3 of each axis	-9999

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] Set the machine coordinates at the negative boundary of the stroke detection 2

1086	Positive boundary coordinate II of the stored stroke detection 1 of each axis	9999

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] Set the machine coordinates at the positive boundary of the 2nd soft limit When PLC signal G7.6=1, switch from the 1st soft limit to the 2nd soft limit.

Note: When PLC signal G007#6 EXLM is set to "1", use the boundary values of the stored stroke limit set by #1086 and #1087.

1087	Negative boundary coordinate II of the stored stroke detection 1 of each axis	-9999

[Data Type] Real number axis type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] Set the machine coordinates at the negative boundary of the 2nd soft limit When PLC signal G7.6=1, switch from the 1st soft limit to the 2nd soft limit

Note: When PLC signal G007.6 EXLM is set to "1", use the boundary values of the stored stroke limit set by #1086 and #1087.

1101	Chuck shape selection	0

[Data type] Real number type

[Data range] 0~1000000

[Effective mode] Reset

1102	Length L of chuck jaw	30

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1103	Radius W of chuck jaw	50

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1104	Clamping length L1 of chuck jaw	30

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1105	Clamping mouth radius W1 of the chuck jaw	25

[Data Type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1106	Chuck position CX	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1107	Chuck position CZ	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1111	Length L of tailstock	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1112	Diameter D of tailstock	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1113	Length L1 of tailstock	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1114	Diameter D1 of tailstock	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1115	Length L2 of tailstock	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1116	Diameter D2 of tailstock	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1117	Diameter D3 of tailstock top	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

1118	Position TZ of tailstock top	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1000000

[Effective mode] Reset

4.4 Feed speed parameter (1200~1399)

	7#	6#	5#	4#	3#	2#	1#	0#
1200	LNS	RDR			FCC			RPD

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

RPD: Manual rapid from power-on to reference point return

0: Invalid, when the reference point is established, the feed axis can move rapidly

1: Valid, when the reference point is not established, the feed axis will be prohibited from rapid running, and will be limited to move at the manual feed speed

FCC: Feed speed combination function

0: Invalid

1: Valid

Instructions for use:

Feed F speed is the resultant speed of one axis or several axes specified in the control program. G351 X1 Y1 B1 C1 function is enabled, one axis or multiple axes can be selected, the G01 X_ Y_

C_ F__ program runs according to the resultant speed of several axes set in G351, the other axes follow the speed, G350 exits from the control, and it runs at the resultant speed of multi-axis linkage. Example:

G351 C1 Set the specified feed speed for the C axis

G91 X10 Y5 B20 C60 F3000 The system displays as F3000, which ensures that the running speed of the single axis of C axis is F3000, and the other axes automatically follow the speed of C axis.

……

G350 Exit control

RDR: During rapid feed

0: Dry run is invalid. After the dry run function is enabled, it will run at the rapid feed speed when encountering G00.

1: Dry run is valid. After the dry run function is turned on, it will run at the dry run speed when encountering G00.

LNS: G0 positioning does not transition

0: Invalid

1: Valid

1209	The default high-speed machining mode when the system is powered on	3

[Data type] Real number type

[Data range] 0~3

[Effective mode] Reset

[Description] Select the default algorithm for program processing:

0: Neither high-speed nor high-precision, G05P0;

3: Three-axis high-speed and high-precision mode, G05P3;

4: Four-axis high-speed and high-precision, G05P4.

1210	Dry run speed (common to all axes)	4000

[Data type] Real number type

[Data unit] mm/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] After the [Dry run] is lighted on, the F speed will run the program at the set speed

Note: Set the dry running speed when the feed override is 100%.

1211	Default cutting feed speed in the automatic mode (common to all axes)	100

[Data type] Real number type

[Data unit] mm/min

[Data range] 0~10000

[Effective mode] After restart

[Description] After power-on, before the F speed is commanded, the default feed speed of the system

Note: Set the default commanded feed speed value when no cutting feed speed is commanded.

1224	Maximum cutting feed resultant speed (common to all axes)	10000

[Data type] Real number type

[Data unit] mm/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] In the case of multi-axis linkage, the upper limit of the multi-axis resultant cutting speed

1225	Maximum cutting feed speed for each axis in automatic mode	Linear axis 10000 / rotation axis 4000

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] In the case of autorun the upper limit of the maximum cutting speed of each axis is valid during linear interpolation.

Note: 1. Set the maximum cutting feed speed of each axis in the automatic mode, and the feed speed of each axis during the cutting process is limited within this set value. 2. The parameter is only valid during linear interpolation. Parameter No.1224 can be used for speed limits of circular interpolation and cylindrical interpolation, etc. 3. If the set value of each axis is 0, the machine does not move when the related axis movement is involved, and the program runs in the current segment all the time.

1226	Fast moving speed of each axis in automatic mode	Linear axis 15000 / rotation axis 4000

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] In the case of autorun, the upper limit of the maximum rapid positioning speed of each axis, that is, the speed when the override is 100%

Note: Set the rapid traverse speed when the rapid override is 100%.

1231	F0 speed of rapid traverse override (common to all axes)	100

[Data type] Real number type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] The default speed of G00 in the F0 gear

1232	Manual (JOG feed 100%) feed speed for each axis	1000

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] When the movement of each axis is controlled in the manual mode, and the [Quick] button is not lit, the feed speed under the condition of 100% override

Note: The JOG feed speed is set when the manual feed override is 100%.

1233	Manual rapid traverse speed of each axis	10000

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] If the movement of each axis is controlled in the manual mode, when the [Quick] button is lit, the traverse speed under the condition of 100% override

1234	FL speed of each axis returning to the reference point	Linear axis 300 / rotation axis 75

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~15000

[Effective mode] Reset

1235	Reference point return speed of each axis	Linear axis 10000 / rotation axis 8000

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Effective mode] Reset

1236	2nd FL speed reference point return of each axis	Linear axis 7/ rotation axis 2

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~15000

[Effective mode] Reset

1239	Maximum feed of manual feed rate	10000

[Data type] Real number type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] In the manual mode, control the maximum speed of cutting feed of each axis

1240	Maximum speed of the manual single step	10000

[Data type] Real number type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Description] In the manual mode, after the [Single Step] is lit, control the maximum speed limit of the feed cycle movement

1241	Maximum speed of S-type MPG feed	15000

[Data type] Real number type

[Data unit] mm/min or deg/min

[Data range] 0~100000

[Effective mode] Reset

[Description] Set the maximum feed speed of MPG feed

1242	Number of pulses with the highest override of handwheel simulation	55

[Data type] Real number type

[Data unit] PLUS

[Data range] 0~500

[Effective mode] Reset

[Description] Control the speed change of the MPG trial cut. When using

1250	External deceleration rate during cutting feed	1000

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] After the signal is triggered by the PLC, the G01 speed of the feed axis will decelerate to this speed value

1251	External deceleration rate when moving fast	1000

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~1000000

[Effective mode] Reset

[Description] After the signal is triggered by the PLC, the G00 speed of the feed axis will decelerate to this speed value

1260	Safety limit speed during the rapid traverse and cutting feed	100

[Data Type] Real number axis type

[Data unit] mm/min or deg/min

[Data range] 0~10000

[Effective mode] Reset

[Description] After the PLC signal (G19#6) is triggered, the feed axis enters the safe speed set by the parameter

Note: The maximum speed of rapid traverse and cutting feed when the PLC signal G019#6 FVL is set to "1".

4.5 Interpolation and acceleration/deceleration control parameters (1400~1599)

	7#	6#	5#	4#	3#	2#	1#	0#
1400	HRE	PACD	PPCK	SAMP	REC+	IMP	JRV	JHD

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 1 0 0 0 0 0 0

[Effective mode]　Reset

JHD: MPG feed under the manual mode

0: Invalid MPG control is invalid in the manual mode

1: Valid, in the manual mode, MPG can control the movement of the feed axis

JRV: Manual feed mode

0: Feed per minute mode, move the feed axis in the mode of feed per minute during manual feeding

1: Feed per revolution, move the feed axis in the mode of feed per revolution during manual feed

IMP: The impact control function of high-speed machining mode G05P3

0: Off, the impact control function is invalid

1: On, the impact control function is valid

REC+: Accumulation of interpolation DSP alarm record

0: Off

1: On

SAMP: Interpolation DSP alarm record function

0: Off

1: On

PPCK: In-position detection

0: No

1: Yes

PACD: Front acceleration and deceleration mode

0: The acceleration and deceleration are linear, with slow control and large axis compact. At present, this control mode is basically not selected.

1: Fast acceleration, small impact, and the acceleration and deceleration curve is exponential

HRE : Handwheel simulation function

0: Unidirectional, after shaking the MPG, the program can only run forward

1: Bidirectional (only valid for G1G2G3), the MPG program will run forward in the forward direction, and the program will run backward by shaking the MPG in the reverse direction. This function is not yet perfect and is not recommended for the time being.

	7#	6#	5#	4#	3#	2#	1#	0#
1401	ALS	ATF		WFM				LRP

[Data type]　Bit type

[Data range]　0 or 1

[Factory default]　0 0 0 1　0 0 0 0

[Effective mode]　Reset

LRP: G00 linear or non-linear positioning of lathe

0: Nonlinear

1: Linear

WFM: MPG interpolation processing

0: The reservoir mode is adopted. After receiving the pulse, it will be stored first and then sent out for control. There is a large lag in the movement of the machine

1: The real-time mode is adopted. The machine movement is controlled in a real-time manner after receiving pulses

ATF: Corner feed override

0: The inside corner is valid, and at the angle set by parameter 1510, the inside corner feed override is valid

1: Both the inner and outer corners are valid. At the angle set by parameter 1510, the feed override of the inner and outer corners is valid.

ALS: Automatic corner feed function

0: Invalid

1: Valid

Note: According to the circular interpolation, the offset command is used, so when the tool center does not coincide with the program path, it lies on the inner side of the arc (that is, the arc is close to the center side), and the feed speed can control its override by this functionality.

	7#	6#	5#	4#	3#	2#	1#	0#
1403	HJF		RCOK		HSEL			HIS

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 1 0 0 0 1 0

[Effective mode] Reset

HIS: MPG insertion mode selection

0: Insert in the axial direction of each feed axis

1: Insert in the direction of the RTCP tool axis

HXEL: Second MPG function

0: Invalid

1: Valid

RCOK: Backlash compensation

0: No, the system is invalid for the mechanical backlash compensation of each axis

1: Yes, the system is valid for the mechanical backlash compensation of each axis

HJF: Selection of the manual or MPG function

0: Linear type, for the manual or MPG control, the linear acceleration/deceleration is used

1: S-type, in the manual or MPG control, use the S-type acceleration and deceleration speed, with the small S-type acceleration and deceleration impact, and fast acceleration

1404	Number of bit-controlled buffers	20

[Data type] Integer type

[Data unit] Segment

[Data range] 4~100

[Effective mode] Reset

1405	The number of read-ahead segments during read-ahead processing	10

[Data type] Integer type

[Data unit] Segment

[Data range] 0~2000

[Effective mode] Reset

1406	Number of read-ahead segments in the high-speed interpolation read-ahead processing	1000

[Data type] Integer type

[Data unit] Segment

[Data range] 0~2000

[Effective mode] Reset

1407	Feed override filter time	10

[Data type] Integer type

[Data unit] ms

[Data range] 10~500

[Effective mode] Reset

1408	Maximum override of rapid traverse speed of the MPG simulation	60

	function	

[Data type] Integer type

[Data unit] %

[Data range] 1000

[Effective mode] Reset

[Description] In the trial cut of MPG, control the traverse speed, the bigger the speed, the faster.

1409	The number of look-ahead blocks when using look-ahead	70

[Data type] Integer type

[Data unit] Segment

[Data range] 1~2000

[Effective mode] Reset

Note: Set the number of look-ahead blocks when using look-ahead.

1410	Acceleration/deceleration S-type acceleration/deceleration time constant T1 before fast feed	64

[Data type] Integer axis type

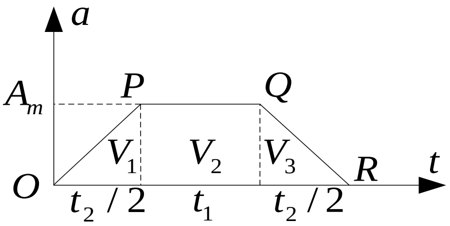
[Data unit] ms

[Data range] 1~4000

[Effective mode] Reset

[Description] During rapid traverse, the time used in the constant acceleration stage from 0 to the maximum speed (parameter 1226)

Use the P+parameter number to represent the parameter value corresponding to the parameter number, for example, P1233 can represent the parameter 1233. The calculation method of S-type acceleration and deceleration is illustrated in the figure below, where t1 is the constant acceleration time, t2 is the increase and decrease deceleration time, and Am is the maximum acceleration.



As shown above, the area of the trapezoid: $V_m = \frac{(t_1+t_1+t_2)*A_m}{2}$

The calculation method to get the maximum acceleration is: $A_m = \frac{2V_m}{(2t_1+t_2)}$

The calculation method of the increase deceleration is: $J_m = \frac{2A_m}{t_2}$

For the linear acceleration and deceleration, it can be understood as a special case of the S-type acceleration and deceleration when t2=0.

Therefore, the calculation formula of the maximum acceleration of the acceleration and deceleration S type before G00 rapid traverse is: $A_{m00} = \frac{2\times P_{1226}}{(2\times P_{1410}+P_{1411})}$, calculation of the maximum acceleration of the acceleration and deceleration of S type before G00 rapid traverse $J_{m00} = \frac{2A_{m00}}{P_{1411}}$.

Note: In the actual application process, when applying this formula to calculate acceleration or increase acceleration, please be careful about the unit conversion according to the unit of the parameter.

1411	S-type acceleration/deceleration time constant T21 before rapid feed	96

[Data type] Integer axis type

[Data unit] ms

[Data range] 1~4000

[Effective mode] Reset

[Description] During rapid traverse, the sum of the control time of increase and decrease accelerations from 0 to the maximum speed (parameter 1226), the increase acceleration time is equal to that of the decrease acceleration

Note: In the actual application process, when applying the formula to calculate the increase and decrease accelerations, please be careful about the unit conversion according to the unit of the parameter.

1418	The axis impact compensation function is valid	0

[Data type] Integer type
[Data unit] r/min
[Data range] 0~1
[Effective mode] Reset

1419	Axis shock compensation coefficient 1	100

[Data type] Integer type
[Data range] 1~100
[Effective mode] Reset
[Description] The larger the value, the better the effect, but it will affect the efficiency.

1420	Axis shock compensation coefficient 2	300

[Data type] Integer type
[Data range] 50~5000
[Effective mode] Reset
[Description] The smaller the value, the better the effect, but it will affect the efficiency

1438	G05P4 maximum acceleration of circular interpolation feed	0.5

[Data type] Integer type
[Data unit] m/s^2
[Data range] 0~25000
[Effective mode] Reset
[Description] The maximum acceleration during circular interpolation under the four-axis high-speed and high-precision G05P4

1439	G05P4 Centripetal acceleration of circular interpolation	0.5

[Data type] Integer type

[Data unit] m/s^2

[Data range] 0~25000

[Effective mode] Reset

[Description] The curve centripetal maximum acceleration limit. It can affect the efficiency. The smaller the value, the lower the F speed. When the F speed is increased, the F speed will be higher, but the acceleration will change too much and cause vibration.

1440	Linear maximum acceleration	0.5 for linear axis / 125 for rotation axis

[Data Type] Real number axis type

[Data unit] m/s^2, the rotation axis is in unit of: $deg/m/s^2$, and the general rotation axis value is 250 times of the linear axis

[Data range] 0~25000

[Effective mode] Reset

Note: It is valid only for linear acceleration/deceleration control.

1442	Highest acceleration of circular interpolation feed	0.8

[Data type] Real number type

[Data unit] m/s^2

[Data range] 0~25000

[Effective mode] Reset

[Description] In the G05P3 mode, the maximum acceleration limit when executing arc

1443	Centripetal acceleration of curve interpolation	0.8

[Data type] Real number type

[Data unit] m/s^2

[Data range] 0~25000

[Effective mode] Reset

[Description] In the G05P3 mode, the maximum acceleration limit of the curve centripetal. It can affect the efficiency. The smaller the value, the lower the F speed will be. When the value is increased, the F speed will be higher, but the acceleration will change too much and cause vibration.

1444	Default acceleration of machine zero return	0.139 for linear axis / 80 for rotation axis

[Data Type] Real number axis type

[Data unit] m/s^2, the rotation axis is in unit of: deg/s^2, the general rotation axis value is 250 times of the translation axis

[Data range] 0~25000

[Effective mode] Reset

[Description] When the machine returns to zero, for the acceleration of the feed axis, the larger the set value, the faster the acceleration, and vice versa

1445	The acceleration for the deceleration during dwell or RESET during G05P0 operation	1.5

[Data type] Real number type

[Data unit] m/s^2

[Data range] 0~25000

[Effective mode] Reset

[Description] After pressing the dwell or reset key during operation, it is the acceleration when the feed axis stops, the greater the setting, the faster the feed axis stops

1446	Linear MPG acceleration m/(s*s)	1

[Data type] Real number type

[Data unit] m/s^2

[Data range] 0~25000

[Effective mode] Reset

[Description] It is the MPG acceleration/deceleration setting when parameter 1403.7=0, MPG selects the acceleration control during linear acceleration/deceleration

1447	Linear manual acceleration m/(s*s)	1

[Data type] Real number type

[Data unit] m/s^2

[Data range] 0~25000

[Effective mode] Reset

[Description] It is the manual acceleration/deceleration setting when parameter 1403.7=0, the acceleration control is manually selected during linear acceleration/deceleration

1448	Proportion of slave axis for the multi-axis manual correlated movement function	1

[Data type] Real number type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Reset

[Description] Through the manual correlated motion control controlled by the PLC signal, G121 is used to set the proportional relationship of movement and displacement between the feed axes

1450	S-type acceleration/deceleration time constant of manual feed	128

[Data type] Real number type

[Data unit] ms

[Data range] 0~1000

[Effective mode] Reset

[Description] It is valid when parameter 1403.7=1, the smaller the value, the faster the acceleration and deceleration

1451	S-type acceleration/deceleration time constant of manual rapid	128

[Data type] Real number type

[Data unit] ms

[Data range] 0~1000

[Effective mode] Reset

[Description] It is valid when parameter 1403.7=1, the smaller the value, the faster the acceleration and deceleration

1452	S-type acceleration/deceleration time constant of MPG feed	128

[Data type] Real number type
[Data unit] ms
[Data range] 0~1000
[Effective mode] Reset
[Description] MPG selects the acceleration/deceleration time setting during the S-type acceleration/deceleration. It is valid when parameter 1403.7=1. The larger the value, the faster the acceleration/deceleration.

1471	Arc corner speed control coefficient	0.01

[Data type] Real number type
[Data unit] mm
[Data range] 0~1
[Effective mode] Reset
[Description] In the G05P3 mode, the speed override of F when running to the arc corner

1472	Circular interpolation control accuracy	0.001

[Data type] Real number type
[Data unit] mm
[Data range] 0~1
[Effective mode] Reset
[Description] It is valid under P3\P4\RTCP to control the running accuracy of the arc trajectory. If set too small, it will decrease the speed. The speed can be enhanced by properly sacrificing the accuracy

1473	Maximum contour error of system	0.001

[Data type] Real number type
[Data unit] mm

[Data range] 0~1

[Effective mode] Reset

[Description] It is valid under P3\P4\RTCP, the maximum contour error when the system performs the path optimization

1474	Maximum length of the small line segment filter	0.5

[Data type] Real number type

[Data unit] mm

[Data range] 0.0001~999999.9999

[Effective mode] Reset

[Description] Under the high-speed and high-precision G05P3, the small line segment is filtered. When the length is less than this set value, the middle point will be ignored.

1475	G05P3 corner precision control angle	30

[Data type] Real number type

[Data unit] degrees

[Data range] 0~180

[Effective mode] Reset

[Description] Under the high-speed and high-precision G05P3, detect the corner angle for speed planning

1476	G05P3 corner precision control coefficient	0.5

[Data type] Real number type

[Data unit]

[Data range] 0~1

[Effective mode] Reset

[Description] Under the high-speed and high-precision G05P3, when the corner angle is less than the setting of parameter 1475, the deceleration control is performed according to the coefficient override setting of this parameter

1477	G05P3 Maximum length of the secondary filter of the small line segment	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~1

[Effective mode] Reset

[Description] Under the high-speed and high-precision G05P3, the small line segment is secondarily filtered. When the length is less than this set value, the middle point will be ignored

1480	Acceleration and deceleration S-type time constant T1 before cutting feed	64

[Data type] Integer axis type

[Data unit] ms

[Data range] 1~4000

[Effective mode] Reset

[Description] During cutting feed, the time used in the constant acceleration stage from 0 to the maximum speed (parameter 1225)

The calculation formula of the maximum acceleration of the S-type acceleration and deceleration before G01 rapid traverse is: $A_{m01} = \frac{2\times P_{1225}}{(2\times P_{1480} + P_{1481})}$, calculation of the maximum increase acceleration of the S-type acceleration and deceleration before G00 rapid traverse $J_{m01} = \frac{2A_{m01}}{P_{1481}}$.

Note: In the actual application process, when applying this formula to calculate acceleration or increase acceleration, please be careful about the unit conversion according to the unit of the parameter.

1481	Acceleration and deceleration S-type time constant T2 before cutting feed	96

[Data type] Integer axis type

[Data unit] ms

[Data range] 1~4000

[Effective mode] Reset

[Description] During cutting feed, the sum of the control time of increase and decrease acceleration from 0 to the maximum speed (parameter 1225), the time of increase acceleration is equal to that of decrease acceleration

1493	Non-orthogonal tilt angle	1

[Data type] Real number type

[Data unit] m/s^2

[Data range] 0~25000

[Effective mode] Reset

Note: In the actual application process, when applying the formula to calculate the acceleration or increase acceleration, be careful about the unit conversion according to the unit of the parameter.

1494	Retained	10

[Data type] Real number type

[Data unit] deg

[Data range] 0~30

[Effective mode] Reset

1495	Retained	0

[Data type] Real number type

[Data unit] deg

[Data range] 120~180

[Effective mode] Reset

1500	Post acceleration/deceleration time constant	0

[Data type] Integer axis type

[Data unit] ms

[Data range] 0~64

[Effective mode] Immediately

[Description] When this function is enabled, the speed is given priority to, but the contour accuracy is affected. It is usually set to 8 or 16, but should not be too large.

1501	The allowable speed variation of the feed axis during motion (mm/min)	200

[Data Type] Real number type

[Data unit] mm/min

[Data range] 0~1000

[Effective mode] Upon reset

[Description] It is the limit value of the maximum speed change of the feed axis

1502	Under the look-ahead mode, the permissible offset of the deceleration function for each axis in speed difference	50

[Data Type] Real number type

[Data unit] mm/min

[Data range] 0~10000

[Effective mode] Upon reset

1505	Minimum speed limit of circular interpolation	200

[Data type] Real number type

[Data unit] mm/min

[Data range] 0~9999.9999

[Effective mode] Reset

1506	The maximum value of the error between the end point of helical or conical interpolation and the end point of the command	1

[Data Type] Real number axis type

[Data unit] mm/min

[Data range] 0~9999.9999

[Effective mode] Reset

[Description] When performing the helical interpolation, the error value between the command end point and the actually calculated end point is detected, and an alarm is generated when the setting exceeds this value.

1510	Identified angle range of the inside corner override	178

[Data type] Real number type

[Data unit] deg

[Data range] 2~178

[Effective mode] Reset

[Description] The included angle between the front and rear line segments, if it is an arc, is the tangent drawn from the intersection, with the right side along the track direction being the inner side

1511	Override amount for the inside corner override	50

[Data type] Real number type

[Data unit] %

[Data range] 1~100

[Effective mode] Reset

[Description] When the control speed reaches the focus, it will decelerate to this override. The actual speed is F*(inside corner override)*(feed speed override)

1512	Start distance of the inside corner override	1

[Data type] Real number type

[Data unit] mm

[Data range] 0~5000.0000

[Effective mode] Reset

[Description] The remaining distance of the previous cutting command to the intersection

1513	End distance of inside corner override	1

[Data type] Real number type

[Data unit] mm

[Data range] 0~5000.0000

[Effective mode]	Reset

[Description]	The distance from the intersection point of the next cutting command

1550	Time constant for acceleration/deceleration of bidirectional MPG simulation (ms)	30

[Data type]	Real number type

[Data unit]	Interpolation cycle

[Data range]	1~100 (the smaller the value, the shorter the acceleration time)

[Effective mode]	Reset

[Description]	It is valid when the handwheel simulation selects the bidirectional control, and can control the acceleration/deceleration constant of the handwheel simulation control speed. The smaller the value, the shorter the acceleration time

1551	Step override for the bidirectional MPG simulation	1

[Data type]	Real number type

[Data unit]	multiples

[Data range]	0.1~10

[Effective mode]	Reset

[Description]	It is valid when the handwheel simulation selects the bidirectional control

4.6 Display and edit parameters (1600~1799)

1600	Language selection (0: Chinese / 1: English / 2: Other	0

[Data type]	Real number type

[Data unit]

[Data range]	0~2

[Effective mode]	After restart

[Description]	It is used to set the system language, and currently only the Chinese and English are supported

	7#	6#	5#	4#	3#	2#	1#	0#
1601						PINFO	PSORT	DIAL

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 1 0 0 0 0

[Effective mode] After restart

DIAL: Conversational function switch

0: Off, turn off the conversational function

1: On, the contour programming function during dialogue can be used for the graphic input of straight lines and arcs, customization of program headers and program tails, and automatic generation of complete NC programs

PSORT: Parameter classification function

0: Off, turn off the parameter classification function

1: On, the parameter classification items will be displayed in [System]-[Parameter]. The parameter classification list is determined by 25ipram.cfg in the system directory, which can be opened and modified through Notepad

PINFO: Parameter diagnosis sub-axis notes

0: Off

1: On

	7#	6#	5#	4#	3#	2#	1#	0#
1602	PUP	MNT				DISPH	FTC	G P L

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 00

[Effective mode] Immediately

GPL: Graphical drawing method

0: Point, the program trajectory simulation is drawn with points

1: Line, the program trajectory simulation is drawn with lines

FTC: Colored display of the block read-ahead font

0: Off, turn off the color display of the block read-ahead font

1: On, when running the program automatically, the program that has been read ahead and processed into the buffer will be displayed with different background colors

DISPH: Program scheduling interface switch

0: Off: disable the display of the program scheduling interface

1: On: Enable the display of the program scheduling interface, which can be used in the program-scheduling interface. In the DNC mode and when the G43.5 PLC signal is connected , the program can be loaded and run according to the times

MTN: Maintenance function

0: Off, disable the maintenance function

1: On, maintenance information related to the equipment operation, such as low servo battery power, etc.

PUP: System power-on operation record

0: Off, close the system power-on operation record

1: On, display the total running and processing time of the system in the [Information]-[Operation Information] interface, and calculate the utilization rate of the machine, etc.

	7#	6#	5#	4#	3#	2#	1#	0#
1603						SKMIX	PJUMP	PRCHK

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 00

[Effective mode] Immediately

PRCHK: Parameter check of the slave station drive

0: Off, after the system is powered on, its local parameters will not be compared with the drive parameters

1: On, after the function is enabled, when the system is powered on, it will verify the existing local servo parameters and the parameters actually used by the servo drive. If inconsistent, the system will give an alarm of "inconsistent servo parameter"

PJUMP: Special parameter comparison of the slave station drive

0: Skip

1: No skip

SKMIX: Custom generation of NC merge

0: Off

1:On

	7#	6#	5#	4#	3#	2#	1#	0#
1605	DALC	NPA	RTCP	SPDx		MKP		DPG

[Data type] Bit type

[Data range]   0 or 1

[Factory default]   0 0 0 0   0 0 1 1

[Effective mode]   Immediately

DPG: Drawing simulation function

0: Invalid

1: Valid

MKP: MDI program when M02 M30 % is executed under MDI

0: Do not delete automatically; after running the program in the MDI mode, do not delete the current program

1: Automatically delete; after running the program in the MDI mode, delete the currently running program

SPDx: The multi-spindle speed is displayed on the right side of the program position

0: No, the multi-spindle speed is not displayed

1: Yes, the position and program interface displays the speed of the 2^{nd}, 3^{rd}, and 4^{th} spindles

RTCP: Display of RTCP/3+2 absolute coordinate

0: Actual position, absolute coordinates are displayed as the position values relative to the machine coordinates

1: Programming position, absolute coordinates are displayed as the positions of the programming commands

NPA: Whether to switch to the alarm screen when an alarm arises

0: No, when the system generates an alarm, keep the current display interface

1: Yes, when the system generates an alarm, switch to the alarm screen!

DALC: Length compensated absolute coordinate display

0: Actual position, after executing the G43 H tool length compensation, the absolute coordinates show the actual position

1: Programming position, after executing the G43 H tool length compensation, absolute coordinates display the programming position

	7#	6#	5#	4#	3#	2#	1#	0#
1609	MARO	CPUR	BHMcF	HCRC	GPLNO	GDGN	BGDN	FCRC

[Data type]   Bit type

[Data range]   0 or 1

[Factory default]   1 0 0 0   0 0 0 0

[Effective mode]   Immediately

FCRC: Whether the copied file needs to be verified

0: Yes, after copying the files in and out with the USB flash disk and the system, the system will verify the files after the operation

1: No, do not verify the copied files

BGDN: Alarm status diagnosis data output

0: Invalid

1: Valid

GDGN: Alarm status G-code decoding record output

0: Invalid, no decoding record will be output

1: Valid. After it is enabled, the system will record the decoding and algorithm operation information. After pressing the emergency stop, the NCDSPALM.NC file will be automatically generated to the program list, which can be sent back to the R&D center for analysis.

GPLNO: Line number indication of graphical trajectory

0: Off

1: On

HCRC: Whether the sum check is valid

0: Invalid

1: Valid

Note: It should be set to invalid, otherwise there will be occasional decoding and algorithm communication error alarms. After communicating with the software, this alarm does not affect the normal use of the system.

BHMcF: Special functionality

0: Invalid

1: Valid

CPUR: Internal testing

0: Invalid

1: Valid

MARO: Abbreviation for macro program statement

0: Invalid

1: Valid

	7#	6#	5#	4#	3#	2#	1#	0#
1610	FCASE			NE9				NE8

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 1 0 0 0 1

[Effective mode] Immediately

NE8: Whether to prohibit the editing of subprograms of the program numbers 8000 - 8999

0: No, to view or edit the O8000-O8999 programs, you need to set this parameter as 0, and enter the password in the "NC8XXXX password" on the login interface before operation. Return to the prohibition state after power off and restart

1: Yes, viewing or editing the programs O8000-O8999 is prohibited

Note: The following editing operations are not allowed after prohibition

Program deletion (O8000-O8999 cannot be deleted)

Import and export of programs

Program loading

Editing and modification of programs

Program display

NE9: Whether to prohibit the editing of subprograms of the program numbers 9000-9999

0: No, to view or edit the O9000-O9999 programs, you need to set this parameter as 0 before operation. Return to the prohibition state after power off and restart

1: Yes, viewing or editing the programs O9000-O9999 is prohibited

Note: The following editing operations are not allowed in the case of prohibition:

Program deletion (O9000-O9999 should not be deleted)

Import and export of programs

Program loading

Editing and modification of programs

Program display

FCASE: Upper and low cases or duplication handling of NC/PLC file names

0: Off

1: Restart and execute once

1621	Incremental value upon automatic insertion of sequence number	10

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Accumulate and increment with this setting based on the next automatically inserted line number

1622	Interface data refresh cycle (ms)	5

[Data type] Integer type

[Data range] 0~200

[Effective mode] Immediately

[Description] The refresh interval of the interface. Enlarging this value will cause the interface to get stuck.

1623	Communication thread refresh cycle (ms)	8

[Data type] Integer type

[Data range] 0~200

[Effective mode] Immediately

[Description] The refresh interval of communication. Enlarging this value can slow down the communication response, which will lead to untimely servo response.

1640	Number of machined parts required: 1	0

[Data type] Integer type

[Data range] 0~999999

[Effective mode] Immediately

[Description] After the PLC signal G14.4 is triggered once, it will add 1 cumulatively. F62.4 will be turned on after the parameter reaches its value.

1641	Number of machined parts required 2	0

[Data type] Integer type

[Data range] 0~999999

[Effective mode] Immediately

[Description] After the PLC signal G14.5 is triggered once, it will add 1 cumulatively. F62.5 will be turned on after the parameter reaches its set value.

1642	Number of machined parts required: 3	0

[Data type] Integer type

[Data range] 0~999999

[Effective mode] Immediately

[Description] After the PLC signal G14.6 is triggered once, it will add 1 cumulatively. F62.6 will be turned on after the parameter reaches its set value.

	7#	6#	5#	4#	3#	2#	1#	0#
1687						DEF3	DEF2	DEF1

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 1

[Effective mode] Immediately

Note: DEF1-DEF3, the default plan of color configuration, all default bits are 0, DEF1 is valid.

	7#	6#	5#	4#	3#	2#	1#	0#
1688	POS	PROG	OFST	SYS	INFO	HELP	GRP	CUS

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] After restart

Initial Interface Selection of Power-on Display			Remark
BIT0	CUS	Customized interface	When it is 1, the custom interface will be displayed after power-on
BIT1	GRP	Graphic interface	When it is 1, the graphical interface will be displayed after power-on
BIT2	HELP	Help interface	When it is 1, the help interface will be displayed after power-on
BIT3	INFO	Information interface	When it is 1, the information interface will be displayed after power-on
BIT4	SYS	System interface	When it is 1, the system interface will be displayed after power-on
BIT5	OFST	Offset setting interface	When it is 1, the bias setting interface will be displayed after power-on

BIT6	PROG	Program interface	When it is 1, the program interface will be displayed after power-on
BIT7	POS	Position interface	When it is 1, the position interface will be displayed after power-on

4.7 Programming parameters (1800~1999)

	7#	6#	5#	4#	3#	2#	1#	0#
1800	G07	G7CIR	34.1					DPI

[Data type]　Bit type

[Data range]　0 or 1

[Factory default]　0 0 0 0　0 0 0 1

[Effective mode]　Immediately

DPI: Omit the decimal point when programming

0: Regarded as the minimum setting unit

1: Regarded as mm/sec

34.1: Whether the G01 mode is processed as screw milling

0: No, G01 screw milling is not supported

1: Yes, G01 may be programmed as per G34.1; for details about the format, please refer to the "GSK25iMcGSK25iTc Series Programming Operation Manual"

G7CIR: Whether the circular arc is coarsely interpolated during the cylindrical interpolation

0: No, when the G07 cylindrical interpolation is adopted, the coarse interpolation should not be used

1: Yes, when the G07 cylindrical interpolation is adopted, the coarse interpolation can be used

G07: Cylindrical interpolation rotation axis programming

0: Program by angle

1: Program by perimeter

	7#	6#	5#	4#	3#	2#	1#	0#
1801	G20		G43.8		G91	G19	G18	G01

[Data type]　Bit type

[Data range]　0 or 1

[Factory default]　0 0 0 0　0 0 0 0

[Effective mode]　Immediately

G01: The mode when the power is turned on, or it is in a cleared state

0: G00 mode, when powered on or cleared, the system is in G00 mode

1: G01 mode, when powered on or cleared, the system is in G01 mode

G18, G19: When the power is turned on, or it is in a cleared state, the plane is chosen as

When powered on, the default plane is the option set to 1. When G18 and G19 are set to 1 at the same time, G19 will become valid, and when both of them are set to 0, G17 will become valid

G91: When the power is turned on or the state is cleared, it is set to

0: G90 mode, the system is in G90 mode when powered on or cleared

1: G91 mode, the system is in G91 mode when powered on or cleared

G43.8: State selection at power-on

0: G43.8 mode, when using a joint robot, it is in G43.8 mode after power-on

1: G43.7 mode, when using a joint robot, it is in G43.7 mode after power-on

G20: State selection at power-on

0: G21 mode, after power-on, the system is in the metric mode

1: G20 mode, after power-on, the system is in the imperial mode

	7#	6#	5#	4#	3#	2#	1#	0#
1803	G22	M3B	G92					BCOD

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 1 0 0 0 0 0 0

[Effective mode] Immediately

BCOD: Second auxiliary function

0: Invalid

1: Valid, set the execution code, and after executing the code, transfer data to the PLC address G30 for the purpose of control

G92: Reset and clear the preset workpiece system

0: Invalid, the coordinate system set by G92 will not be cleared after resetting

1: Valid, the temporary coordinate system created by G92 will be cleared after resetting

M3B: The number of M-codes that can be commanded in a program

0: 1, only one M-code can be commanded in the same block

1: Up to 3, the same block can execute 1 to 3 M-codes at the same time, being associated with PLC, and the 1st, 2nd and 3rd M-codes use different strobe signals.

G22: The 2nd stroke detection at power on is

0: G23, power on, and detect the outer side of the rectangular area of the second stroke

1: G22, power on, and detect the inner side of the rectangular area of the second stroke

1805	Teach the beginning G-code (-1 is not inserted)	-1

[Data type] Integer type

[Data range] -1~9999

[Effective mode] Reset

[Description] G-code before the coordinate value upon teaching input

1807	Number of decimal places for G-code programming	4

[Data type] Integer type

[Data range] 3~10

[Effective mode] Immediately

[Description] The number of decimal points displayed in the coordinates and programming. If this number is too large, the coordinates may disappear. Please set it reasonably according to needs.

1808	Decoding cycle of G-code program	10

[Data type] Integer type

[Data unit] ms

[Data range] 2~120

[Effective mode] Immediately

1809	Scan level of G-code program compilation	12

[Data type] Integer type

[Data unit] Number of levels

[Data range] 1~120

[Effective mode] Immediately

1810	Modify the allowable error of arc radius	0.01

[Data type] Real number type

[Data unit] mm

[Data range] 0~999999.9999

[Effective mode] Immediately

1811	Minimum difference between start and end points of the arc	0.001

[Data type] Real number type

[Data unit] mm

[Data range] 0~999999.9999

[Effective mode] Immediately

1812	Minimum difference of the dedicated program block splitting	0

[Data type] Integer type

[Data unit] mm

[Data range] 0~1

[Effective mode] Immediately

1820	N number of sequence number comparison and stop	0

[Data type] Integer type

[Data unit] Number of levels

[Data range] 0~999999

[Effective mode] Immediately

[Description] After the line number is set, the program runs until the line is fully executed, and stops running the subsequent program. Then, it can run again after executing the cycle start

1822	Name of the 2^{nd} auxiliary function	66

[Data type] Integer type

[Data unit] Number of levels

[Data range] 0~99

[Effective mode] Immediately

This parameter can specify which of A, B, C, U, V, and W will be set to the address for the 2^{nd} auxiliary function. However, when the address used as the axis name is set, the 2^{nd} auxiliary function will be invalid.

Command address	A	B	C	U	V	W
Set Value	65	66	67	85	86	87

When a value other than the above is set, it will be the address B. However, the names U, V, and W can be used in the T series only in the case of G-code system B or C. When a value of 85~87 is set in this parameter using the G-code system A, the command address of the 2nd auxiliary function will become B.

	7#	6#	5#	4#	3#	2#	1#	0#
1850		XSC			SCL			RIN

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 1 0 0 0

[Effective mode] Immediately

RIN: Coordinate rotation angle

0: Absolute coordinate command, when the G68 command is used to rotate the coordinate system, the rotation angle is fixed to be the absolute coordinate command mode

1: G90/G91 command, when the coordinate system is used to rotate the G68 command, the rotation angle selects the absolute increment over G90/G91

SCL: Scaling function

0: Invalid, to disable the G51 scaling function

1: Valid, the G51 scaling function is valid

XSC: Scale by each axis

0: Invalid (specified with P), use P to specify the overall scaling factor

1: Valid (specified by IJK), use IJK to scale the command axis respectively

1860	Rotation angle used when there is no rotation angle instruction during rotation of coordinates	0

[Data type] Real number type

[Data unit] deg

[Data range] -360.000 ~ 360.000

[Effective mode] Immediately

[Description] When G68 is executed, if there is no command over-rotation angle R, the system will

Part III Parameters

rotate the coordinates at this set angle

1861	The scaling factor used when there is no scaling command factor	1

[Data type] Real number type

[Data range] 0~999999.9999

[Effective mode] Immediately

[Description] It is valid when parameter 1850=0. When there is no command scaling factor in the program, the system will specify this set factor

1862	Scaling factor of each axis	1

[Data Type] Real number axis type

[Data range] -999999.9999– 999999.9999

[Effective mode] Immediately

[Description] It is valid when parameter 1850=1. When there is no command scaling factor in the program, the system specify the scaling factor of each axis with this set factor

	7#	6#	5#	4#	3#	2#	1#	0#
1870		JOG						MDL

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

MDL: Unidirectional positioning G-code (G60)

0: It is not set to a mode code, and G60 is only valid in the current block

1: Mode code: G60 becomes the modal G-code of group 01, which can be canceled by using the G-code of other group 01

JOG: Whether the MPG insertion amount is superimposed on the current workpiece system

0: No, after the MPG insertion reset, clear the MPG insertion amount

1: Yes, after the MPG insertion reset, clear the MPG insertion amount, and superimpose the MPG insertion value to the current coordinate system

1880	Direction and overtravel of each axis for unidirectional positioning	0.5

[Data Type] Real number axis type

[Data unit] mm

[Data range] -1000~1000

[Effective mode] Immediately

[Description] Overshoot can be set through parameter #1880 and the dwell time is 0.5s. The orientation direction can be determined through the positive/negative overshoot set.

1931	Minimum angle of the indexing worktable	1

=

[Data type] Real number type

[Data unit] deg

[Data range] 0~360.000

[Effective mode] Immediately

[Description] It is used to set the minimum angle of the indexing worktable, and positioning can only be performed by an integer multiple of this value.

1932	Setting of indexing axis of the indexing worktable	4

[Data type] Integer type

[Data range] 0~8

[Effective mode] Reset

1	2	3	4	5	6	7	8
X	Y	Z	4th	5th	6th	7th	8th

	7#	6#	5#	4#	3#	2#	1#	0#
1940	SKF							SEB

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

SEB: Position read by G31/G37

0: Upon stopping of the movement, after the signal is triggered, read the position after the movement stops.

1: When the signal is triggered, read the position immediately

SKF: Whether dry run and override are valid for G31 jump command

0: Invalid, when G31 is executed, dry run and override are invalid

1: Valid, when G31 is executed, dry run and override are valid

	7#	6#	5#	4#	3#	2#	1#	0#
1950	MOU						JOG	MIN

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

MIN: Manual intervention and return function

0: Invalid, manual intervention and return invalid

1: Valid, it dwells during program running, switches to manual and moves each axis, and then returns to the automatic mode to start the program again. When the setting is valid, each axis can be set to return to the starting point of the dwelled block and then continue to run the program.

JOG: Manual absolute value switch function

0: Valid, dwell during program operation, after switching to manual movement of each axis, the program path will continue to run at the current position without returning to the initial point

1: Invalid, dwell during program operation, after switching to the manual movement of each axis, each axis returns first and then continues to run the program

MOU: Whether to output M, S, T, B codes when the program is restarted

0: No, when the program is executed and restarted, the program path is directly run without outputting MSTB commands

1: Yes, when the program is executed and restarted, the system scans MSTB codes in front of the startup segment, and executes and runs the program

1960	Movement sequence of each axis when the program restart or manual intervention is active	1, 1, 3, 2, 2

[Data type] Integer axis type

[Data Range] 1 – Number of control axes

[Effective mode] Immediately

[Description] Set by the serial number 1-total number of control axes, and return according to the set

Part III Parameters

serial number, the same serial number can be set

1961	Program restart scan level	20

[Data Type] Integer type

[Data range] 10 - 2500

[Effective mode] Immediately

	7#	6#	5#	4#	3#	2#	1#	0#
1972	TCYC			M98				DBUF

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

DBUF: Macro variable of the workpiece system for correcting the tool offset during interpolation read-ahead

0: Invalid, it is forbidden to modify the offset and macro variables during program running

1: Valid, the offset and macro variables are allowed to be modified during program running

M98: Memory release when M98 starts

0: Invalid

1: Valid

TCYC: Special fixed cycle command

0: Invalid, the special fixed cycle command is invalid

1: Valid, the special fixed cycle command after G100 will run, which can simplify the manual programming and processing of shapes, holes, grooves, etc.

4.8 Fixed cycle parameters (2000~2099)

	7#	6#	5#	4#	3#	2#	1#	0#
2000	PCP	M29	RD2	RD1	EXC	M5T		FXY

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

FXY: The drilling axis of the drilling fixed cycle is

0: Z-axis, the drilling axis is fixed as the Z-axis

1: Axis selection by the program, which selects the drilling axis through the plane, G17-Z/G18-Y/G19-X

M5T: Spindle direction switching in the tapping cycle

0: M05 is not output

1: M05 is output

EXC: G81 meaning

0: Adopting fixed cycle command

1: Command external action

RD2, RD1: Set the direction of the retraction axis for G76 or G87

RD2	RD1	G17	G18	G19
0	0	+X	+Z	+Y
0	1	-X	-Z	-Y
1	0	+Y	+X	+Z
1	1	-Y	-X	-Z

M29: Specify the method of rigid tapping

0: M29, use M29 to switch to rigid tapping

1: Without M-codes, it directly proceeds to the rigid tapping after executing G84, and specifies the spindle speed through M03 S__ in the same block

PCP: Rigid tapping

0: The high-speed deep-hole tapping is adopted. During peck tapping, the tool retracts by the retraction amount set by parameter 2112 each time it is lifted

1: The high-speed deep-hole tapping is not adopted. During pecking tapping, the tool is lifted to the R point each time

	7#	6#	5#	4#	3#	2#	1#	0#
2001							BTAP	TAT

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode]   Immediately

TAT: The rigid tapping axis is

0: Inclined plane axis; the single-axis tapping of the XYZ basic axes and the rigid tapping under the inclined plane that supports G68.2

1: Additional axis; the additional axis other than the XYZ basic axes can be commanded as the tapping axis, the parallel axis function needs to be turned on by G102 or through the PLC signal, and the parallel relationship between the additional axis and the basic axes should be set

BTAP: Tapping double-speed retraction switch

0: No, do not use the double-speed retraction function

1: Yes, use the double-speed retraction function, the override is parameter 2003, the Z-axis acceleration and deceleration during retraction is parameter 2004, and the spindle acceleration and deceleration is parameter 2005

2003	Tapping retraction override (%)	100

[Data type]   Real number type

[Data unit]   %

[Data range]   1~500

[Effective mode]   Immediately

[Description]   It is the override when the rigid tapping retracts

2004	Acceleration and deceleration S-type time constant T2 before the tapping double-speed retraction	1000

[Data type]   Real number type

[Data unit]   %

[Data range]   1~4000

[Effective mode]   Immediately

2005	Maximum acceleration of spindle for the tapping double speed retraction (r/(s*s))	500

[Data type]   Real number type

[Data unit]   %

[Data range]   0~4000

[Effective mode] Immediately

2010	Tool retraction amount of the high-speed deep hole cycle G73	2

[Data type] Real number type

[Data unit] mm

[Data range] 0~100

[Effective mode] Immediately

[Description] When G73 is executed, the retraction amount after each execution of the feed depth

2011	Reserve amount d of the fixed cycle G83	2

[Data type] Real number type

[Data unit] mm

[Data range] 0~100

[Effective mode] Immediately

[Description] When G83 is executed, the retraction amount after each execution of the feed depth

4.9 Rigid tapping parameters (2100~2299)

2105	Setting of rigid tapping synchronous error width	3000

[Data type] Integer type

[Data unit] Detection unit

[Data range] 0~999999

[Effective mode] Immediately

[Description] During rigid tapping, the absolute value after the subtraction of the following error of the tapping axis and the spindle exceeds this setting, and an out-of-tolerance alarm will be generated, which can be viewed through system diagnosis No.305

2106	In-place width of tapping shaft in rigid tapping	100

[Data type] Integer type

[Data unit] Detection unit

[Data range] 0~32767

[Effective mode] Immediately

[Description] During rigid tapping, the allowable error when the tapping axis reaches the command position can be viewed through system diagnosis No.301

2107	In-place width of spindle in rigid tapping	100

[Data type] Integer type

[Data unit] Detection unit

[Data range] 0~32767

[Effective mode] Immediately

[Description] During rigid tapping, the allowable error when the spindle reaches the command position can be viewed through system diagnosis No.300

2112	Retraction or reserve amount during the tapping cycle	2

[Data type] Real number type

[Data unit] mm

[Data range] 0~100

[Effective mode] Immediately

[Description] During peck tapping, the retraction amount after reaching the depth of each tapping.

2113	Default time when P is not specified in the tapping cycle	100

[Data type] Integer type

[Data unit] ms

[Data range] 0~1000

[Effective mode] Immediately

[Description] After the rigid tapping reaches the specified depth, the system will execute the set dwell time when there is no P dwell time in the command in the block.

Note: 1. This parameter is only valid in G74, G84 and G88.

2. This parameter also refers to: when G74 and G84 execute cutting and retraction, the dwell time for the spindle to rotate in the reverse direction.

2120	Limit value of position deviation in the movement of tapping shaft	120000

	in rigid tapping	

[Data type] Integer type

[Data unit] Detection unit

[Data range] 0~999999

[Effective mode] Immediately

[Description] During rigid tapping, the maximum following error of the tapping axis in the movement can be viewed through system diagnosis No.300

2121	Limit value of the deviation of spindle movement position during rigid tapping/Cs and spindle positioning	120000

[Data type] Integer type

[Data unit] Detection unit

[Data range] 0~999999

[Effective mode] Immediately

[Description] During rigid tapping/CS axis and spindle positioning, the maximum following error of the spindle during movement can be viewed through the system diagnosis No.300 (rigid tapping)/103 (CS axis and spindle positioning) respectively.

2122	Limit value of position deviation in the stop of tapping shaft in rigid tapping	1000

[Data type] Integer type

[Data unit] Detection unit

[Data range] 0~32767

[Effective mode] Immediately

[Description] During rigid tapping, the maximum following error of the tapping axis after stopping can be viewed through system diagnosis No.301

2123	Limit value of the deviation of spindle stop position during rigid tapping/Cs and spindle positioning	3000

[Data type] Integer type

[Data unit] Detection unit

[Data range] 0~32767

[Effective mode] Immediately

[Description] During rigid tapping, the maximum following error of the spindle after stopping can be viewed through system diagnosis No.300

2140	Maximum rotational speed of the spindle during rigid tapping (1st gear)	6000

[Data type] Integer type

[Data unit] rpm

[Data range] 0~9999

[Effective mode] Reset

[Description] When the spindle is in the first gear, the highest S-command allowed by the system during rigid tapping

2141	Maximum rotational speed of the spindle during rigid tapping (2nd gear)	6000

[Data type] Integer type

[Data unit] rpm

[Data range] 0~9999

[Effective mode] Reset

[Description] When the spindle is in the second gear, the highest S-command allowed by the system during rigid tapping

2142	Maximum rotational speed of the spindle during rigid tapping (3rd gear)	6000

[Data type] Integer type

[Data unit] rpm

[Data range] 0~9999

[Effective mode] Reset

[Description] When the spindle is in the third gear, the highest S-command allowed by the system during rigid tapping

2143	Maximum rotational speed of the spindle during rigid tapping (4th gear)	6000

[Data type] Integer type

[Data unit] rpm

[Data range] 0~9999

[Effective mode] Reset

[Description] When the spindle is in the fourth gear, the highest S-command allowed by the system during rigid tapping

2170	Control loop gain of rigid tapping spindle and tapping axis position (1st gear)	350

[Data type] Integer type

[Data unit] 0.01/s

[Data range] 0~9999

[Effective mode] Immediately

[Description] When the rigid tapping is performed in the 1st gear of the spindle, the shared gain of the spindle and the tapping axis will be adjusted if the rigidity is too strong or too soft. The change of the following error can be seen in 300 and 301 of the system diagnosis. After the change, the two diagnoses will become smaller or larger at the same time.

2171	Control loop gain of rigid tapping spindle and tapping axis position (2nd gear)	350

[Data type] Integer type

[Data unit] 0.01/s

[Data range] 0~9999

[Effective mode] Immediately

[Description] When the rigid tapping is performed in the 2nd gear of the spindle, the shared gain of the spindle and the tapping axis will be adjusted if the rigidity is too strong or too soft. The change of the following error can be seen in 300 and 301 of the system diagnosis. After the change, the two diagnoses will become smaller or larger at the same time.

2172	Control loop gain of rigid tapping spindle and tapping axis position	350

	(3^{rd} gear)	

[Data type] Integer type

[Data unit] 0.01/s

[Data range] 0~9999

[Effective mode] Immediately

[Description] When the rigid tapping is performed in the 3^{rd} gear of the spindle, the shared gain of the spindle and the tapping axis will be adjusted if the rigidity is too strong or too soft. The change of the following error can be seen in 300 and 301 of the system diagnosis. After the change, the two diagnoses will become smaller or larger at the same time.

2173	Control loop gain of rigid tapping spindle and tapping axis position (4^{th} gear)	350

[Data type] Integer type

[Data unit] 0.01/s

[Data range] 0~9999

[Effective mode] Immediately

[Description] When the rigid tapping is performed in the 4^{th} gear of the spindle, the shared gain of the spindle and the tapping axis will be adjusted if the rigidity is too strong or too soft. The change of the following error can be seen in 300 and 301 of the system diagnosis. After the change, the two diagnoses will become smaller or larger at the same time.

2180	Spindle loop gain coefficient during rigid tapping (1^{st} gear)	320

[Data type] Integer type

[Data range] 0~32767

[Effective mode] Immediately

[Description] The spindle position loop gain when the rigid tapping is performed in the 1^{st} gear of the spindle will affect the synchronization error of the spindle during rigid tapping. You can view the changes in the system diagnosis No.300. It becomes small if changed to large, and vice versa. It affects the synchronicity with the tapping axis

2181	Spindle loop gain coefficient during rigid tapping (2^{nd} gear)	320

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[Data type] Integer type

[Data range] 0~32767

[Effective mode] Immediately

[Description] The spindle position loop gain when the rigid tapping is performed in the 2nd gear of the spindle will affect the synchronization error of the spindle during rigid tapping. You can view the changes in the system diagnosis No.300. It becomes small if changed to large, and vice versa. It affects the synchronicity with the tapping axis

2182	Spindle loop gain coefficient during rigid tapping (3rd gear)	320

[Data type] Integer type

[Data range] 0~32767

[Effective mode] Immediately

[Description] The spindle position loop gain when rigid tapping is performed in the 3rd gear of the spindle affects the synchronization error of the spindle during rigid tapping. You can view the change in system diagnosis No.300. It becomes small if changed to large, and vice versa. It affects the synchronicity with the tapping axis

2183	Spindle loop gain coefficient during rigid tapping (4th gear)	320

[Data type] Integer type

[Data range] 0~32767

[Effective mode] Immediately

[Description] The spindle position loop gain when the rigid tapping is performed in the 4th gear of the spindle affects the synchronization error of the spindle during rigid tapping. You can view the changes in the system diagnosis No.300. It becomes small if changed to large, and vice versa. It affects the synchronicity with the tapping axis

2210	Backlash amount of the rigid tapping spindle (teeth in the 1st gear)	0

[Data type] Integer type

[Data unit] 0.001deg

[Data range] 0~2000000

[Effective mode] Reset

[Description] During the 1st gear tapping process of the spindle, when there is a clearance in the reverse direction of the spindle, this parameter can be used to set the backlash of the spindle, and the set value of the backlash is the angle value

2211	Backlash amount of rigid tapping spindle (2nd gear)	0

[Data type] Integer type

[Data unit] 0.001deg

[Data range] 0~2000000

[Effective mode] Reset

[Description] During the tapping process of the 2nd gear of the spindle, when there is a clearance in the reverse direction of the spindle, this parameter can be used to set the backlash of the spindle, and the set value of the backlash is the angle value

2212	Backlash amount of rigid tapping spindle (3rd gear)	0

[Data type] Integer type

[Data unit] 0.001deg

[Data range] 0~2000000

[Effective mode] Reset

[Description] During the tapping process of the 3rd gear of the spindle, when there is a clearance in the reverse direction of the spindle, this parameter can be used to set the backlash of the spindle, and the set value of the backlash is the angle value

2213	Backlash amount of rigid tapping spindle (4th gear)	0

[Data type] Integer type

[Data unit] 0.001deg

[Data range] 0~2000000

[Effective mode] Reset

[Description] During the tapping process of the 4th gear of the spindle, when there is a clearance in the reverse direction of the spindle, this parameter can be used to set the backlash of the spindle, and the set value of the backlash is the angle value

4.10 Input and output parameters (2400~2599)

	7#	6#	5#	4#	3#	2#	1#	0#
2401	LIM	MEL	SKL	DEC	SWI		HIO	

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

HIO: High-speed I/O signal function

0: Invalid, the received signal is processed by the PLC, and the fastest response speed is the PLC scan cycle

1: Valid, it is directly received and processed by the system, with the signal response according to the communication cycle set by the system

SWI: valid signs of position switch

0: Invalid

1: Valid

Note: By setting two points on the machine coordinate, a range within the stroke of the feed axis is defined, after the feed axis enters this range. The system supports 32 position switches, corresponding to PLC signals F70.0 to F73.7 respectively.

DEC: Reference point return deceleration signal

0: Decelerate when it is 0; if a manual zero return is executed, it begins to decelerate when the deceleration stop block is touched, and the signal is 0

1: Decelerate when it is 1; if a manual zero return is executed, it begins to decelerate when the deceleration stop block is touched, and the signal is 1

SKL: Jump signal

0: Valid when it is 0; upon executing G31 jump, it jumps to the next block when the external signal is 0

1: Valid when it is 1; upon executing G31 jump, it jumps to the next block when the external signal is 1

MEL: Measurement signal

0: Valid when it is 0; upon executing G37 measurement signal, it jumps to the next block when the external signal is 0

1: Valid when it is 1; upon executing G37 measurement signal, it jumps to the next block when the external signal is 1

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LTM: Hard limit handling method

0: Hard limit deceleration handling, the feed axis will decelerate and stop after hitting the hard limit

1: Immediate stop, the feed axis stops immediately after hitting the hard limit

	7#	6#	5#	4#	3#	2#	1#	0#
2402	MHI		EOPF	EEMG			GP0	RLK

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

RLK: Start interlock

0: Invalid

1: Valid

Note: After the function is enabled, in the PLC, the stop operation of the movement command can be controlled by the signal G7.1; G8.1 controls whether to stop the operation during cutting feed; G8.3 controls the next block to not start running; during control of the signals, the autorun state will not be interrupted.

GP0: Whether G31 (P1-P8) additionally checks the P1 signal

0: Check: When the 0^{th} signal is used to jump, you need to specify P1 to run the G31 command

1: No: It is defaulted as P1, when the 0th signal is used to jump, there is no need to specify P1 additionally

EEMG: High-speed external emergency stop processing

0: Invalid

1: Valid

EOPF: HS external operation to finish processing

0: Invalid

1: Valid

MHI: High-speed MST function

0: Invalid

1: Valid

Note: Reduce the execution time of the MSTB code, with an independent FIN signal, and the execution is considered complete when the signal is flipped once.

2410	Delay time of strobe signals MF, SF, TF, BF	32

[Data type] Integer type

[Data unit] ms

[Data range] 16~32767

[Effective mode] Immediately

[Description] When the M/S/T/B auxiliary function is executed, the corresponding strobe F signal in the PLC will be set to 1 state; when it is connected to the completed FIN G signal, it will delay the set time and then turn off the strobe signal

2411	Receivable width of completed M, S, T and B signals	32

[Data type] Integer type

[Data unit] ms

[Data range] 16~32767

[Effective mode] Immediately

[Description] When the M/S/T/B auxiliary function is executed, the corresponding strobe F signal in PLC will be set to 1 state; when it is connected to the completed FIN G signal, the system will consider it as completed only when the time set by this parameter is connected

2412	Address assigned to jump signal	0

[Data type] Integer type

[Data range] 0~127 Invalid when the parameter is less than 10

[Effective mode] Immediately

[Description] he jump signal is a high-speed signal. Set the address of the signal connected to the I/O unit. For example, when it is set to 9, you can use G31 P1-P8 to select eight input points X9.0-X9.7 respectively. When there is no command P, the first input point is X9.0 by default

2413	X address assigned to measurement arrival and external high-speed signal PLC	0

[Data type] Integer type

[Data range] 0~127 Invalid when the parameter is less than 10

[Effective mode] Immediately

[Description] This is a high-speed signal. G37 is assigned to the X address of the measurement signal. It is processed directly by NC without PLC processing. A group of measurement signals for 8 input points can be set at a time, and they can be selected by specifying P1-P8, corresponding to Xn.0-Xn.7

2415	High-speed output signal address	0

[Data type] Integer type

[Data range] 0~127

[Effective mode] Immediately

2418	Output time of reset signal	600

[Data type] Integer type

[Data unit] ms

[Data range] 0~1000

[Effective mode] Immediately

2420	Input offset address corresponding to the I/O/gateway device	9
2421	Output offset address corresponding to the I/O/gateway device	8
2423	Communication data length of the operation panel	9
2424	Input analog address offset corresponding to the I/O slave station	0
2425	Input analog address offset corresponding to the I/O slave station	0
2426	Analog voltage input filter factor	0

[Data type] Integer type

[Data unit]

[Data range] 0~12

[Effective mode] Immediately

0: I/O endpoint addresses arranged in physical link order

1~12: I/O endpoint addresses assigned according to the specified address serial number. When the valid I/Os are all values within 1~12, the method of allocating I/O is valid. The base address corresponding to each I/O can be seen in the diagnostic parameters 80~87.

	7#	6#	5#	4#	3#	2#	1#	0#
2430								EMS

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

EMS: Extended external machine origin offset function

0: Invalid

1: Valid, it is achieved with the PLC external data input function

2431	Signal start address used in the extended external machine origin offset function	0

[Data type] Integer type

[Data range] 0~1844

[Effective mode] Immediately

[Description] For the R start address used by the external machine origin offset, each axis occupies 2 bytes (so that multiple axes can be offset at the same time); the offset is displayed in the diagnosis parameter 150

2432	Position offset function step	10

[Data type] Integer type

[Data range] 0~1844

[Effective mode] Immediately

[Description] Maximum offset step of each position control cycle

2500-2531	Servo axis corresponding to the position switch	0

[Data type] Integer type

[Data range] 0~8

[Effective mode] Immediately

[Notes] The servo axis corresponding to the position switch: 0 is invalid, 1-8 correspond to the 1st to 8th axis respectively

Note: The position switch function is valid when the bit SWI is 1. If it is 0, this position switch is invalid.

2532-2563	Positive maximum range of the position switch	0

[Data type] Real number type

[Data range] -999999.9999~999999.9999

[Effective mode] Immediately

[Description] The maximum machine coordinate in the positive direction of the required range of the position switch control axis

2564-2595	Negative maximum range of the position switch	0

[Data type] Real number type

[Data range] -999999.9999 ~ 999999.9999

[Effective mode] Immediately

[Description] The negative maximum machine coordinate of the required range of the position switch control axis

4.11 Tool management parameters (2600~2799)

	7#	6#	5#	4#	3#	2#	1#	0#
2600	TONF		TC+/-		TPRI	TMLU	TLB	SUB

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 1

[Effective mode] Immediately

SUB: Starting form of tool radius compensation

0: Type A, reaching the position where the radius compensation point is established by a straight line displacement

1: Type B, using a curve or multi-segment path to reach the starting position of the radius compensation program around the starting point

TLB: Select the type of tool length compensation

0: Mode A, regardless of plane selection, always being Z-axis

1: Mode B, the axis perpendicular to the specified plane, G17-Z axis/G18-Y axis/G19-Z axis, length compensation

TMLU: Tool management life unit

0: Minutes, the cumulative time of tool use when the unit is used, and the preset life reaches the upper limit of the total time

1: Times, the cumulative times of tool use when the unit is used, and the tool reaches the upper limit of the total times it can be usable

TPRI: Tool priority method

0: Sequence, the tools of the same type are called in the order of tool number

1: Maximum value, the tools of the same type are called in sequence with the largest residual life

TC+/-: Measurement input value processing

0: Add, after the measurement input is executed, the measured value is added to the input value and written into the corresponding tool length H offset number

1: Subtract, after the measurement input is executed, the measured value is subtracted from the input value and written into the corresponding tool length H offset number

TONF: Tool management display switch

0: Off, the tool management related setting items are not displayed in the offset page

1: On, the tool management related setting items are displayed in the offset page

	7#	6#	5#	4#	3#	2#	1#	0#
2601	ODI	LVK	C-T/H			CCN	TLC	

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 1 0 0 0 0 1 0 0

[Effective mode] Immediately

TLC: Tool length compensation type C

0: Off

1: On: When G43 is executed, specify the axis, and the tool length compensation will be compensated on the specified axis

CCN: Radius compensation G28 to the intermediate point

0: Cancel compensation, when G28 is executed, return to the intermediate point to cancel radius compensation

1: It will not be canceled until the reference point. When G28 is executed, the radius compensation will be canceled upon reference point return.

C_T/H: Consistency of T and H when measuring with a tool

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0: Do not check, the system directly writes the offset when it measures with a tool

1: Check, when it measures with a tool, check the current T tool number and offset H number before writing, execute writing when they are consistent, and give a prompt to prohibit writing when they are inconsistent

LVK: When the tool length offset is reset

0: Do not clear

1: Clear

ODI: Tool radius compensation setting

0: Diameter value, during radius compensation, the value called from the offset is the tool diameter value

1: Radius value, during radius compensation, the value written in the offset is the tool radius value

	7#	6#	5#	4#	3#	2#	1#	0#
2602						TPH	CNI	OIM

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

OIM: Whether the machine coordinates are converted between the metric and imperial systems

0: No, after G20/G21 is executed, the machine coordinates will not be converted between the metric and imperial systems

1: Yes, after G20/G21 is executed, the machine coordinates will be converted between the metric and imperial systems

CNI: During radius compensation

0: An interference check is performed; when running the program with radius compensation, the system will perform an interference check on the program path

1: No interference check is performed; when running a program with radius compensation, the system does not perform an interference check on the program path.

TPH: Offset number address of the tool offset G45-G48

0: D codes, execute with D codes

1: H codes, execute with H codes

	7#	6#	5#	4#	3#	2#	1#	0#
2603	T8V	T10V	T12V		T4H	T5H	T6H	OLDT

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] After restart

OLDT: Load the old tool offset

Converting from 0 to 1 is valid

T4H-T6H0: X column display of the offset list

If it is set to 1, the offset list can display X columns at the same time; if all set to 1, it will take effect according to the highest digit, and if all set to 0, it is 4 columns by default.

T8V-T12V: X line display of the offset

If it is set to 1, the offset list can display X lines at the same time; if all is set to 1, it will take effect according to the highest digit, and if all is set to 0, it is 10 lines by default.

2604	CAV							

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

CAV: Interference avoidance function

0: Invalid

1: Valid, if the tool path conflicts during infeeding after the tool compensation has been input, the tool path will be automatically optimized to avoid the path under interference

2609	Helical transition radius error value after compensation	0.0

[Data type] Real number type

[Data unit] mm

[Data range] 0~100000

[Effective mode] Immediately

[Description] Arc radius error after tool radius compensation

2610	Limit value ignored for minor movement amount caused by radius compensation	0.01

[Data type] Real number type

[Data unit] mm

[Data range] 0~100

[Effective mode] Immediately

[Description] Whether the distance of the tool radius compensation point smaller than this range is ignored

2611	Maximum value of tool wear compensation	300

[Data type] Real number type

[Data unit] mm

[Data range] 0~100000

[Effective mode] Immediately

[Description] In the tool offset, the maximum value of tool wear allowed to be set

2612	Number of blocks read in the tool radius compensation mode	8

[Data type] Real number type

[Data unit] Segment

[Data range] 0~100

[Effective mode] Immediately

[Description] In the process of executing the radius compensation, if there is no movement command in the program block within the number of continuous read-ahead set by this parameter, the distance from the tool center to the end point of the previous block is the radius value, and the straight line formed is perpendicular to the previous program block

2651	Feed speed of the G37 tool length measurement	1000

[Data type] Real number type

[Data unit] mm/min

[Data range] 0~15000

[Effective mode] Immediately

[Description] The default feed speed when the F designated speed is omitted during the execution of G37

2652	Deceleration position value of G37 tool length measurement	20

[Data type] Real number type

[Data range] 0~10000

[Effective mode] Immediately

[Description] Estimate the distance from the expected signal trigger point, switch the measurement speed F

2653	Allowable range of arrival signals for G37 tool length measurement position	40

[Data type] Real number type

[Data range] 0~10000

[Effective mode] Immediately

[Description] It is the distance D allowed to continue running after reaching the estimated signal trigger point, and this setting must be less than parameter 2652

2654	Maximum deformation of workpiece	0

[Data type] Real number type

[Data range] -10 0~100

[Effective mode] Immediately

4.12 Pitch compensation parameters (2800~2999)

	7#	6#	5#	4#	3#	2#	1#	0#
2800							WDIR	SCRW

[Data type] Bit axis type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 1

[Effective mode] Reset

SCRW: Screw pitch compensation

0: No, the pitch compensation function is disabled

1: Yes, the pitch compensation function is enabled

WDIR: Pitch compensation option

0: Unidirectional

1: Bidirectional, after turning on the bidirectional pitch compensation, the backlash can be compensated in parameter #2806

2806	Pitch error compensation value for reference point return	0

[Data type] Integer axis type

[Data unit] Detection unit

[Data range] -32768 ~ 32767

[Effective mode] Reset

[Description] If the set reference point return direction (parameter ZMI (#1004.5) is positive, it is the absolute value of the pitch error compensation at the reference point when returning to the reference point from the negative direction; or if the set reference point return direction is negative, it is the absolute value of the pitch error compensation amount at the reference point when returning to the reference point from the positive direction. It is the backlash value at the reference point. It is valid for the bidirectional pitch compensation

2810	Pitch error compensation number of reference points for each axis	0

[Data type] Integer axis type

[Data range] 0~1023

[Effective mode] Reset

2811	The number of the pitch error compensation point at the farthest end in the negative direction of each axis	0

[Data type] Integer axis type

[Data range] 0~1023

[Effective mode] Reset

[Description] Set the pitch compensation number of the limit position in the negative direction. The value of parameter 2811 must be greater than that of parameter 2812.

2812	The number of the pitch error compensation point at the farthest end in the positive direction of each axis	0

Part III Parameters

[Data type] Integer axis type

[Data range] 0~1023

[Effective mode] Reset

[Description] Set the pitch compensation number of the limit position in the positive direction. The value of parameter 2812 should be less than that of parameter 2811.

Note: The set value of this parameter is larger than that of #2810 (pitch compensation number of the reference point).

2813	Pitch error compensation override of each axis	10

[Data Type] Real number axis type

[Data unit] multiples

[Data range] 1~100

[Effective mode] Reset

[Description] The default minimum unit of pitch compensation value is 0.1μm

2814	Spacing between the pitch error compensation points of each axis	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] 0~999999.9999

[Effective mode] Reset

[Description] Set the distance between two pitch compensation points.

Note: The pitch error compensation point is the minimum value of the equally spaced pitch = maximum feed speed* (interpolation cycle/60000) * compensation override.

4.13 Turning cycle parameters (3000~3199)

	7#	6#	5#	4#	3#	2#	1#	0#
3000	GSC	GSB						GMT

[Data type] Bit type

[Data range] 0 or 1

Part III Parameters

[Factory default]　0 0 0 0　0 0 0 0

[Effective mode]　Immediately

GMT: The system upon power on

0: machining center

1: lathe

GSB: Lathe G-code B series

0: Invalid

1: Valid

GSC: Lathe G-code C series

0: Invalid

1: Valid

	7#	6#	5#	4#	3#	2#	1#	0#
3001	RTV	G75W	G75S		DIA	G75D		

[Data type]　Bit type

[Data range]　0 or 1

[Factory default]　0 0 0 0　0 0 0 0

[Effective mode]　Reset

G75D: EDM finishing direction

0: Left-right

1: Right-left

DIA: The command value of the X-axis in the program is

0: Diameter input

1: Radius input

G75S: G75 longitudinal cutting direction

0: Round trip

1: Individual direction

G75W: G75 longitudinal start cutting direction

0: From left to right

1: From right to left

RTV: The override during tool retraction in the thread cutting

0: Valid

1: Invalid

	7#	6#	5#	4#	3#	2#	1#	0#
3101	G75	4A		MACT				RAB

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

RAB: R point in the drilling cycle

0: Specify the incremental value

1: Specify the absolute value

MACT: Select the function of G71~G74

0: Multiple cycles of lathe

1: Multiple cycles of grinder

4A: The rotation axis of G75 4th axis is processed according to the programming command

0: Invalid

1: Valid

G75: G75 tool sharpener

0: Straight tool

1: Oblique tool

	7#	6#	5#	4#	3#	2#	1#	0#
3102	G75	+/-						

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

+/-: G75 tool direction

0: Forward installation

1: Reverse installation

G75C: 4th axis

0: Gradient to the value of parameter 3151 when the limit value of 3150 is exceeded

1: Always remain unchanged

3111	Dwell time of drilling cycles (G83, G87)	0.5000

Part III Parameters

[Data Type] Real number axis type

[Data unit] seconds

[Data range] 0~9999

[Effective mode] Immediately

	7#	6#	5#	4#	3#	2#	1#	0#
3112	M_T	R_T	U_PQ	TYP	R_TP	RTR		

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

RTR: Drilling cycle type

0: Not deep hole drilling

1: Deep hole drilling

R_TP: Retraction method of G71/G72 machining type I

0: Normal

1: Efficient

TYP: Type of G71/G72 machining path

0: Type I

1: Type II

U_PQ: The unit used when G74/G75 commands P/Q

0:0.001mm

1:1mm

R_T: G74/G75 return method

0: The first layer retraction is not 0

1: The first layer retraction is 0

M_T: G74/G75 rapid/feed retraction

1: Rapid retraction

1: Feed retraction

3114	Retraction distance of drilling cycles (G83, G87)	0.5000

[Data type] Real number type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Immediately

3130	Chamfering amount (0.1*pitch) of thread cutting cycle (G76, G92)	0

[Data type] Integer type

[Data unit] 0.1 times

[Data range] 0~99

[Effective mode] Immediately

3131	Axis number for thread cutting with rotation axis	4

[Data type] Integer type

[Effective mode] Immediately

3132	Cut depth of the rough turning cycle (G71, G72)	0.001

[Data type] Real number type

[Data unit] mm

[Data range] 0.001~99999.999

[Effective mode] Immediately

3133	Retraction amount of the rough turning cycle (G71, G72)	0.0001

[Data type] Real number type

[Data unit] mm

[Data range] 0.0001~99999.999

[Effective mode] Immediately

3135	Retraction amount in the X-axis direction of the closed cutting cycle (G73)	0

[Data type] Real number type

[Data unit] mm

[Data range] -999999.9999~999999.9999

[Effective mode] Immediately

3136	Retraction amount in the Z-axis direction of the closed cutting cycle (G73)	0

[Data type] Real number type
[Data unit] mm
[Data range] -999999.9999~999999.9999
[Effective mode] Immediately

3137	Number of splits of the closed cutting cycle (G73)	1

[Data type] Integer type
[Data unit] times
[Data range] 1~999999
[Effective mode] Immediately

3139	Retraction amount of multiple cycles (G74, G75)	0

[Data type] Real number type
[Data unit] mm
[Data range] 0~99999.999
[Effective mode] Immediately

3140	Minimum cut depth of the multiple thread cutting cycle G76 (0.001mm)	0

[Data type] Integer type
[Data unit] 0.001mm
[Data range] 0~99999
[Effective mode] Immediately

3141	Finishing allowance of the multiple thread cutting cycle G76 (0.001 mm)	0

[Data type] Integer type
[Data unit] 0.001mm
[Data range] 0~99999
[Effective mode] Immediately

3142	The number of finishing cycles of the multiple thread cutting cycle G76	1

[Data type] Integer type
[Data unit] times
[Data range] 1~99
[Effective mode] Immediately

3143	Tool nose angle of the multiple thread cutting cycle G76 (deg)	0

[Data type] Integer type
[Data unit] deg
[Data range] 0~99
[Effective mode] Immediately

3144	Switch to the M code for the machining center	0

[Data type] Integer type
[Data range] 100~999
[Effective mode] Reset

3145	Switch to the M code for the lathe	180

[Data type] Integer type
[Data range] 100~999
[Effective mode] Reset

3146	Retained	0

[Data type] Integer type
[Data range] 0~999

[Effective mode]　Reset

3147	Polar coordinate interpolation plane selection (1: G17 2: G18 3: G19)	1

[Data type]　Integer type

[Data range]　1~3

[Effective mode]　Reset

(1) The plane for the polar coordinate interpolation is determined by the linear axis parameter (#3147) for the polar coordinate interpolation.

Set value of #3147	Plane
1	G17 (XY plane)
2	G19 (YZ plane)
3	G18 (ZX plane)

3148	Polar coordinate interpolation rotation axis (axis number)	4

[Data type]　Integer type

[Data range]　4 to the number of axes set by the system

[Effective mode]　Reset

4: 4^{th} axis

5: 5^{th} axis

⋮　⋮

3149	Maximum cutting feed speed for polar coordinate interpolation	30000

[Data Type]　Real type

[Data range]　0~99999.999

[Effective mode]　Immediately

3150	Radius limit value for G75 grinding contour	0

[Data Type]　Real type

[Data range]　0~99999.999

[Effective mode] Immediately

3151	C-axis end position of the radius limit value of G75 grinding contour	0

[Data Type] Real type

[Data range] 0~99999.999

[Effective mode] Immediately

3152	G75 scream threshold	45

[Data Type] Real type

[Data range] 120~150

[Effective mode] Immediately

3153	Start of M-codes blocking buffer (120-150)	120

[Data Type] Real type

[Data range] 120~150

[Effective mode] Immediately

3160	Start of M-codes blocking buffer (120-150)	120

[Data Type] Real type

[Data range] 120~150

[Effective mode] Immediately

[Description] Set the M-codes between parameters 3160 to 3161 as the M-codes that block the buffer. When the program executes the M-codes, the system clears the buffer data and re-decodes

3161	End of M-codes blocking buffer (120-150)	150

[Data Type] Real type

[Data range] 120~150

[Effective mode] Immediately

[Description] Set the M-codes between parameters 3160 to 3161 as the M-codes that block the buffer. When the program executes the M-codes, the system clears the buffer data and re-decodes

3170	M-code 1 blocking buffer	27

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

3171	M-code 2 blocking buffer	9

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

3172	M-code 3 blocking buffer	28

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

3173	M-code 4 blocking buffer	0

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

3174	M-code 5 blocking buffer	0

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

3175	M-code 6 blocking buffer	0

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

3176	M-code 7 blocking buffer	0

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

3177	M-code 8 blocking buffer	0

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

3178	M-code 9 blocking buffer	0

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

3179	M-code 10 blocking buffer	0

[Data Type] Real type

[Data range] 0~9999

[Effective mode] Immediately

[Description] Set M-code as the type of buffer blocking

4.14 Servo parameters (4000~4999)

	7#	6#	5#	4#	3#	2#	1#	0#
4000	RTYP	PVCT	SCTP	LCR	PEC	BLC	MIGN	IGN

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

IGN: Whether to ignore the servo axis

0: No, the communication with the servo drive is normal, and it can accept and process the servo control and feedback signals

1: Yes, the servo axis is shielded, without processing any signal of the servo, nor sending any control signal

MIGN: Whether to ignore the servo motor

0: No, the motor encoder signal is received for servo motor control

1: Yes, the servo alarm is ignored, the encoder signal of the servo motor is received and used for other functions, but the operation of the motor is no longer controlled

BLC: Backlash compensation position when the dual position loop is valid

0: On the motor side, the mechanical backlash of the axis is measured, and the system will compensate the backlash on the positioning of the motor encoder

1: On the grating side, the backlash of the grating scale is measured, and the system compensates the backlash on the grating positioning

PEC: Pitch compensation position when the dual position loop is valid

0: On the motor side, the laser interferometer needs to measure the pitch compensation of the machine when the grating scale function is turned off. After the grating scale is turned on, the system will compensate the pitch compensation on the positioning of the motor encoder.

1: On the grating side, the grating scale is enabled to measure the pitch compensation, and the system will directly compensate the pitch compensation on the grating scale positioning

LCR: Setting of distance code grating

1: Valid

SCTP: Sin/Cos grating settings

1: Valid

PVCT: Location setting of position loop control

0: System, the system sends a speed command to the servo, and directly receives an encoder signal for PID regulation and control of the servo motor positioning

1: Servo, the system sends a position command to the servo, which can complete the positioning of the motor

RTYP: Grating type

0: Incremental, the 2nd encoder chooses to use the incremental encoder

1: Absolute, the 2nd encoder chooses to use the absolute value encoder

	7#	6#	5#	4#	3#	2#	1#	0#
4001	RAST	RDIR	DPOS		APZ			LVP

[Data type] Bit axis type

[Data range] 0 or 1

[Factory default] 0 0 0 0 1 0 0 0

[Effective mode] Immediately

LVP: Recover the default servo parameters of the system

0: No

1: Yes

After entering the password for parameter 4200 and the corresponding motor model code for 4201, in the emergency stop mode, when this parameter jumps from 0 to 1, the system will notify the servo to automatically call the default parameter

Note: The system reads the default parameters of the servo motor through the drive when the LVP is changed from "0" to "1".

APZ: Machine zero setting

0: Inconsistent, the machine zero is not established

1: Consistent, the machine zero has been established

Note: If an absolute encoder is being used, it should be set to "0" when the system is powered on for the first time or when the zero point is lost. The system will automatically set APZ from "0" to "1" after the manual reference point return is completed. Alternatively, the manual zero setting will be executed when the axis is manually moved to the position where the zero point is to be set, and APZ is set from "0" to "1". Then the absolute encoder zero is the same as the machine zero.

DPOS: Dual position loop control

0: Invalid, for axis running, the position is controlled by the grating scale feedback

1: Valid, the motor encoder feedback is used for position control during the axis movement, and the grating scale feedback is used for location positioning when the axis is stopped.

For equipment with insufficient machine rigidity and large mechanical clearance, there is a large vibration during operation, and it can be used when the servo rigidity cannot be improved.

RDIR: Grating scale direction

0: Positive

1: Negative

If the full closed-loop control is not enabled, manually move the axis, and check the feedback position of the grating scale through the system diagnosis 145 to determine the direction. The full-closed-loop control can be enabled only when it is consistent with the movement direction of the system diagnosis 40.

RAST: Grating closed loop function

0: No, disable the full closed-loop control function

1: Yes, enable the full closed-loop control function

	7#	6#	5#	4#	3#	2#	1#	0#
4003	SISB	FDIR	CDIR	INCW	FINS	FDBC		SAST

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

SAST: Servo in-position stop regulation function

0: Invalid, even after the command position is reached, the system still uses the grating scale feedback for the PID regulation of position

1: Valid INCW: In the incremental grating zero return mode, after the command position is reached, the system stops the PID regulation

When the mechanical clearance is large and the axis is stopped, there will be slight fluctuations in the detection position of the grating scale. According to the position of the grating scale, the system continuously controls the motor for regulation so as to reach the command position, which may cause problems such as stop vibration and motor heating, which may be improved by enabling this function

FDBC: Legality check of servo feedback position

0: Invalid

1: Valid

FINS: Fine interpolation function selection

0: Type A

1: Type B

Note: It is valid when the interpolation cycle and the position control cycle are inconsistent.

INCW: Zeroing mode of incremental grating

0: The motor code disc returns to zero, the zero point of the motor

1: The incremental grating returns to zero, and according to the settings, move beyond the setting distance, press zero return, and the grating scale will read the signal in the zero point direction and automatically sets the zero point

CDIR: Servo command direction

0: Positive

1: Negative

It is the same as the setting of parameter 4003bit6, and is used to invert the rotation direction of the motor.

FDIR: Servo feedback direction

0: Positive

1: Negative

It is the same as the setting of parameter 4003bit5, and is used to invert the rotation direction of the motor.

SISB: System detection accuracy setting

0: 0.1μ, the pulse equivalent is 10000

1: 1μ, the pulse equivalent is 1000

Note: The setting that affects the electronic gear ratio is temporarily forbidden to be set to 1, and the default pulse equivalent is 10000.

4009	Servo position proportional increase	245

[Data type] Integer axis type

[Data unit] circles

[Data range] 1~999999

[Effective mode] Immediately

[Description] Position loop gain. The larger the setting is, the faster the motor response, and the smaller the following error is, but when the adjustment is too large, an oscillation will occur

4013	Position loop gain percentage when the servo stops	0

[Data type] Integer axis type

[Data unit] %

[Data range] 0~200

[Effective mode] Immediately

[Description] After the servo motor stops, the position loop gain is adjusted to "(parameter 4009*parameter 4013)/100"

4014	Position feedforward gain	0

[Data type] Integer axis type

[Data unit] %

[Data range] 0~100

[Effective mode] Immediately

[Description] Temporarily unavailable

4015	Position feedforward low pass termination rate (HZ)	300

[Data type] Integer axis type

[Data unit] %

[Data range] 0~2000

[Effective mode] Immediately

[Description] Temporarily unavailable

4017	Electronic gear ratio numerator	8192

[Data type] Integer axis type

[Data range] 1~999999

[Effective mode] Immediately

[Description] It is used in combination with parameter 4018, and calculated according to the screw pitch A of the machine screw rod (unit: mm), number of lines C of the motor photoelectric encoder (unit: pulses/revolution), and pulse equivalent M of the system (unit: pulses/mm, with the fixed value of 10000), and the transmission ratio P (motor end: mechanical end);

Calculation formula: C/(M*A);

Calculation result: $\frac{\text{parameter 4017}}{\text{parameter 4018}}=\frac{C}{M*A*P}$, the numerator and denominator can be reduced and then input

4018	Electronic gear ratio denominator	5000

[Data type] Integer axis type

[Data range] 1~999999

[Effective mode] Immediately

[Description] Denominator of the electronic gear ratio, which needs to be used in combination with parameter 4017

	7#	6#	5#	4#	3#	2#	1#	0#
4020	TAIG				SPW		ADJ	SYN

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

SYN: effective signs for synchronization of the feed axis

0: Invalid, enable the synchronous axis function

1: Valid, disable the synchronous axis function

ADJ: Synchronous correction mode of the feed axis

0: No correction, the master and slave axes run synchronously

1: Correction, the synchronization is clear, so that the master and slave axes can run independently, and their positions may be adjusted through MPG

Please operate with caution after enabling to avoid damage to the machine

SPW: The detection amount of the machine coordinate synchronization error considers the starting position deviation

0: No, during initialization, when there is a deviation between the master and slave axes, the synchronization is established directly at the current position, and the slave axis follows the movement of the master axis

1: Yes, when the deviation of the master and slave axes is within the set deviation range, the synchronization will be established by the system after adjusting the position of the slave axis to be consistent with the master axis. When the deviation exceeds the allowable range set by the system, the system will give an alarm

TAIG: Whether to ignore teach axis

0: No

1: Yes

4021	Number of the main control axis	0

[Data type] Integer axis type

[Data range] 0~6

[Effective mode] Reset

[Description] Set the axis number of the spindle followed by the slave axis. The settings 1-6 correspond to the 1st to 6th axes respectively. When it is set to 0, there is no synchronization, and only the slave axis needs to be set.

4022	Synchronization error allowed by machine coordinates (detection unit)	0

[Data type] Integer axis type

[Data unit] 0.1μm

[Data range] 0~999999

[Effective mode] Immediately

[Description] When the difference between machine coordinates of the master axis and the slave axis exceeds this setting, the system will generate an alarm and stop running. You can check the real-time synchronization error in the system diagnosis 140

4023	Maximum value of master-slave position deviation in the synchronous axis control (detection unit)	0

[Data type] Integer axis type

[Data unit] 0.1μm

[Data range] 0~999999

[Effective mode] Immediately

[Description] When the difference between the following errors of the master axis and the slave axis exceeds this setting, the system will generate an alarm and stop running. You can check the real-time deviation value in system diagnosis 141

4025	Allowable error amount of synchronous torque	0

[Data type] Integer axis type

[Data unit] 0.1μA

[Data range] 0~999999

[Effective mode] Immediately

[Description] When the torque error between the master axis and the slave axis exceeds this setting, the system will generate an alarm and stop running. You can check the real-time error in the system diagnosis 142

4031	Set value of servo control torque	400

[Data type] Integer axis type

[Data unit] 0.01nm

[Data range] -800000~800000

[Effective mode] Immediately

[Description] Set the torque value of the servo output.

4032	Allowable torque difference	100

[Data type] Integer axis type

[Data unit] 0.01nm

[Data range] 0~100000

[Effective mode] Immediately

[Description] When it arrives at the servo feedback torques, if the difference between the command torque and the feedback torque exceeds this parameter value, PV133 gives an alarm: the torque deviation value is too large under the servo torque control

4033	Permissible speed set value under torque control	50

[Data type] Integer axis type

[Data unit] rpm

[Data range] 0~1000

[Effective mode] Immediately

[Description] The speed command of the servo motor in the torque control mode can be multiplied by the PLC signal G248

4035	Spindle number corresponding to the servo axis	0

[Data type] Integer type

[Data range] 0~4

[Effective mode] Immediately

[Description] After setting, enable the G127.0-G127.7 signal of the PLC to switch the corresponding feed axis to the designated spindle

	7#	6#	5#	4#	3#	2#	1#	0#
4040				MSCOE		MSCDR		MSCAC

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

MSCAC: Coupling always active flag

0: Invalid, the torque coupling function is disabled

1: Valid, the torque coupling function is enabled

MSCDR: Coupling direction inversion

0: No, the default torque control direction

1: Yes, reverse the torque control direction

MSCOE: The coupling control output is valid

0: No

1: Yes

4041	The main control axis number corresponding to the speed torque coupling	0

[Data Type] Real number axis type

[Data range] 0~8

[Effective mode] Reset

4042	Speed torque coupling preload	0

[Data Type] Real number

[Data range] -10000~10000

[Effective mode] Reset

4043	Speed torque coupling preload low-pass filter frequency (HZ)	0

[Data Type] Real number

[Data range] 0~10000

[Effective mode] Reset

4044	Velocity torque coupling weights	0

[Data Type] Real number

[Data range] 0~100

[Effective mode] Reset

4045	Speed torque coupling proportional gain	0

[Data Type] Real number

[Data range] 0~10000

[Effective mode] Reset

4046	Speed torque coupling integration time (ms)	0

[Data Type] Real number

[Data range] 0~10000

[Effective mode] Reset

4047	Speed torque coupling compensation control limit (rpm)	0

[Data Type] Real number

[Data range] 0~1000

[Effective mode] Reset

4050	Synchronous overlay control axis	0

[Data Type] Real number
[Data range] 0~100
[Effective mode] Reset

4051	Synchronous overlay in-position width	10

[Data Type] Real number
[Data unit] 0.1μm
[Data range] 1~1000
[Effective mode] Reset

4052	Synchronous overlap command speed	20

[Data Type] Real number
[Data unit] mm/min
[Data range] 1~1000
[Effective mode] Reset

4053	Synchronous overlap command acceleration	0.1

[Data Type] Real number
[Data unit] m/s^2
[Data range] 0.00 1~10
[Effective mode] Reset

4054	Synchronous overlap step size	10

[Data Type] Real number
[Data unit] 0.1μm
[Data range] 1~200
[Effective mode] Reset

4055	Reserved	10

[Data Type] Real number

[Data unit] 0.1μm

[Data range] 1~200

[Effective mode] Reset

4100	Pulse equivalent of each axis	1000

[Data Type] Integer type

[Data range] 1~999999

[Effective mode] Immediately

[Effective mode] This parameter is invalid

4109	Initial adjustment step size of each axis (inspection unit)	10

[Data Type] Integer type

[Data range] 1~1000

[Effective mode] Immediately

[Description] Before the servo motor is enabled and initialized, when the command position of the system and the current feedback position of the motor encoder are less than the deviation value set by parameter 4111, the system will adjust according to the set value of this parameter in each communication cycle until Control the motor to reach the command value position.

4110	In-position width of each axis (detection unit)	100

[Data type] Integer axis type

[Data unit] 0.1μm

[Data range] 1~32767

[Effective mode] Immediately

[Description] After the axis command stops running, when the detection deviation range is within the in-position width, the output is in-position, and the in-position check parameter is only valid when the in-position check parameter is turned on. (The latest processing method of the V382-4 version, the original version is output in place when the deviation is in place within 128ms, which will affect the efficiency)

4111	Maximum allowable position deviation when each axis is stopped (detection unit)	1000

[Data type] Integer axis type
[Data unit] 0.1μm
[Data range] 0~32767
[Effective mode] Immediately
[Description] When the feed axis is in a static state, when the difference between the command and the feedback position only exceeds the set value, an out-of-tolerance alarm will be generated

4112	Maximum allowable position deviation when each axis moves (detection unit)	120000

[Data type] Integer axis type
[Data unit] 0.1μm
[Data range] 0~999999
[Effective mode] Immediately
[Description] When the feed axis is in a motion state, when the difference between the command and the feedback position only exceeds the set value, an out-of-tolerance alarm will be generated

4114	Period length of grating signal (0.1um)	0

[Data type] Integer axis type
[Data unit] 0.1μm
[Data range] 0~1000
[Effective mode] Immediately
[Description] Linear grating size: It is set according to the accuracy of grating scale
Circular grating: It is set according to the number of encoder lines in one circle

4115	Allowable coordinate difference between grating scale and servo encoder (detection unit)	1000

[Data type] Integer axis type

[Data unit] 0.1μm

[Data range] 0~999999

[Effective mode] Immediately

[Description] When it is set to 0, the coordinate difference detection will not be performed.

When the difference between the feedback position of the grating scale and the feedback position of the motor encoder exceeds this setting, the system will generate an alarm and stop running. You can check the real-time difference in system diagnosis 146

Note: When set to 0, the coordinate difference detection is not performed. It is recommended to set the default value detection function when debugging the machine based on the grating scale and during operation, so as to realize protection under abnormal conditions.

4116	Primary delay time constant of dual position loop	0

[Data type] Integer axis type

[Data unit] ms

[Data range] 0~1000

[Effective mode] Immediately

[Description] It is valid when both the grating function and the dual position loop function are enabled. The longer the delay time is, the more it tends to be a semi-closed loop when moving, and it is always in a fully closed loop state after stopping. This is generally used when there are not many requirements for the contour error, and a special full-closed-loop filtering function will be added later to improve the contour quality.

4118	The incremental grating goes to the position of the virtual deceleration stop block	0

[Data type] Integer axis type

[Data unit] mm

[Data range] -10000~10000

[Effective mode] Immediately

[Description] When executing manual zero return, if the vector from the machine to the reference point established by the motor encoder is within the set range, it will enter a stage of deceleration

4119	The incremental grating goes to the length of the virtual deceleration stop block	0

[Data type] Integer axis type

[Data unit] mm

[Data range] 0~1000

[Effective mode] Immediately

[Description] It is the length setting of the deceleration stop block simulated by the system, that is, the vector of the machine reaching a deceleration point to the reference point established by the motor encoder

4120	Grid offset of each axis	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] 0~10000

[Effective mode] Reset

[Description] After the zero return finds and determines the zero point position, the position offset will be offset on this basis to establish the machine zero. It is currently invalid

4121	Backlash compensation amount of each axis	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -9.9999~9.9999

[Effective mode] Reset

[Description] Use tools such as laser interferometer, dial indicator, etc. to measure the backlash of the feed axis, set it in this parameter, and the system will compensate when the axis is reversed

4122	Reserved	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -9.9999~9.9999

[Effective mode] Reset

4123	Distance to complete backlash compensation	0.01

[Data Type] Real number axis type

[Data unit] mm

[Data range] 0~9999

[Effective mode] Reset

[Description] When each axis is in the reverse direction, the backlash compensation will be completed after moving this set distance

The following default parameters of 4200 to 4455 vary according to different motor models. For details, please refer to the appendix. It is compatible with GR2000 series servo drives.

4200	Parameter modification password	315

[Data type] Integer axis type

[Data range] 0~9999

[Effective mode] Immediately

4201	Motor Model Code	65

[Data type] Integer axis type

[Data range] 0~1329

[Effective mode] Immediately

4202	Motor type selection	0

[Data type] Integer axis type

[Data range] 0 or 1

[Effective mode] Immediately

4203	Power-on initial monitoring setting	0

[Data type] Integer axis type

[Data range] 0~21

[Effective mode] Immediately

4204	Operating mode selection	21

[Data type] Integer axis type

[Data range] 9~25

[Effective mode] Immediately

4205	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4206	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4207	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4208	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4209	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4210	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4211	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4212	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

4213	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

4214	Retained	0

[Data type] Integer axis type

[Data range]

[Effective mode]

4215	First proportional gain of the speed loop	200

[Data type] Integer axis type

[Data unit] Hz

[Data range] 10~3000

[Effective mode] Immediately

4216	First integral time constant of speed loop	100

[Data type] Integer axis type

[Data range] 1~3000

[Effective mode] Immediately

4217	Current command filter coefficient	800

[Data type] Integer axis type

[Data range] 10~5000

[Effective mode] Immediately

4218	Speed feedback detection filter coefficient	800

[Data type] Integer axis type

[Data range] 10~5000

[Effective mode] Immediately

4219	First proportional gain of position loop	40

[Data type] Integer axis type

[Data unit]

[Data range] 10~1000

[Effective mode] Immediately

4220	Retained	0

[Data type] Integer axis type

[Data range]

[Effective mode]

4221	Retained	

[Data type] Integer axis type

[Data unit] rpm

[Data range] -6000~6000

[Effective mode] Immediately

4222	Retained	0

[Data type] Integer axis type

[Data range]

[Effective mode]

4223	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4224	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4225	Position feedforward gain	0

[Data type] Integer axis type

[Data unit] %

[Data range] 0~100

[Effective mode] Immediately

4226	Position feedforward low-pass filter coefficient	2000

[Data type] Integer axis type

[Data unit] Hz

[Data range] 10~5000

[Effective mode] Immediately

4227	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4228	Invert the direction of position command	

[Data type] Integer axis type

[Data range] 0 or 1

[Effective mode] Immediately

4229	Numerator of the electronic gear ratio of position command	1

[Data type] Integer axis type

[Data unit]

[Data range] 1~32767

[Effective mode] Immediately

4230	Position command pulse frequency division factor	1

[Data type] Integer axis type

[Data range] 1~32767

[Effective mode] Immediately

4231	Position arrival range	20

[Data type] Integer axis type

[Data unit] plus

[Data range] 0~30000

[Effective mode] Immediately

4232	Position out-of-tolerance range	400

[Data type] Integer axis type

[Data unit] 100plus

[Data range] 0~4

[Effective mode] Immediately

4233	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

4234	Invert the position output signal	0

[Data type] Integer axis type

[Data range] 0~1

[Effective mode] Immediately

4235	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

4237	Pulse number output by position feedback	10000

[Data type] Integer axis type

[Data unit] plus

[Data range] 1024~30000

[Effective mode] Immediately

4239	Retained	0

[Data type]

[Data range]

[Effective mode]

4240	Retained	0

[Data type]

[Data range]

[Effective mode]

4241	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

4242	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

4243	Retained	0

[Data type]

[Data range]

[Effective mode]

4244	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

4245	Second proportional gain of speed loop	0

[Data type] Integer axis type

[Data unit] Hz

[Data range] 10~3000

[Effective mode] Immediately

4246	Second integral time constant of speed loop	100

[Data type] Integer axis type

[Data range] 1~3000

[Effective mode] Immediately

4248	Third proportional gain of speed loop	400

[Data type] Integer axis type

[Data unit] Hz

[Data range] 10~3000

[Effective mode]　Immediately

4249	Third integral time constant of speed loop	100

[Data type]　Integer axis type

[Data range]　1~3000

[Effective mode]　Immediately

4250	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

4251	Invert forward and reverse of speed command	0

[Data type]　Integer axis type

[Data range]　0 or 1

[Effective mode]　Immediately

4252	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

4253	Retained	

[Data type]

[Data unit]

[Data range]

[Effective mode]

4254	Maximum speed limit of speed command	2500

[Data type] Integer axis type

[Data unit] rpm

[Data range] 1~30000

[Effective mode] Immediately

4255	Retained	

[Data type]

[Data unit]

[Data range]

[Effective mode]

4256	Retained	

[Data type]

[Data range]

[Effective mode]

4257	Feedforward gain of speed command	0

[Data type] Integer axis type

[Data unit] ms

[Data range] 0~30000

[Effective mode] Immediately

4258	Time constant of linear acceleration	0

[Data type] Integer axis type

[Data unit] ms

[Data range] 0~10000

[Effective mode] Immediately

4259	Deceleration time of linear acceleration	0

[Data type] Integer axis type

[Data unit] ms

[Data range] 1~4

[Effective mode] Immediately

	Retained	0

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4261	Valid range of speed arrival	0

[Data type] Integer axis type

[Data unit] %

[Data range] 1~100

[Effective mode] Immediately

4262	Valid range of zero speed output	5

[Data type] Integer axis type

[Data unit] %

[Data range] 0~100

[Effective mode] Immediately

4263	Analog command multiplication factor	1

[Data type] Integer axis type

[Data unit]

[Data range] 1~1024

[Effective mode] Immediately

4264	Analog command frequency division factor	1

[Data type] Integer axis type

[Data unit]

[Data range] 1~1024

[Effective mode] Immediately

4265	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4266	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4267	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4268	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4269	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4270	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4271	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4272	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

42473	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4274	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4275	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4276	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4277	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4278	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode] Immediately

4279	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

4280	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

42481	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode] Immediately

4282	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4283	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4284	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4285	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4286	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4287	Retained	10

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4288	Mode selection for switching from speed to position	0

[Data type] Integer axis type

[Data range] 0 or 1

[Effective mode] Immediately

4289	Mode selection for switching from position to speed	0

[Data type] Integer axis type

[Data range] 0 or 1

[Effective mode] Immediately

4290	Low position of speed/position switching reference point	0

[Data type] Integer axis type

[Data range] 0~9999

[Effective mode] Immediately

4291	High position of speed/position switching reference point	2

[Data type] Integer axis type

[Data range] 0~30000

[Effective mode] Immediately

4292	Retained	0

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4293	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4294	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4295	Retained	0

[Data type] Integer axis type

[Data range] 0~30

[Effective mode]

4296	Code disc type selection at the 2nd position	0

[Data type] Integer axis type

[Data unit]

[Data range] 0~30

[Effective mode] Immediately

4297	Limit number selection of position feedback input	

[Data type] Integer axis type

[Data unit] Number of lines

[Data range] 0~2

[Effective mode] Immediately

4298	Number of encoder lines at the 2nd position	1024

[Data type] Integer axis type

[Data range] 10~30000

[Effective mode] Immediately

4299	Orientation speed	100

[Data type] Integer axis type

[Data unit] rpm

[Data range] 10~1000

[Effective mode] Immediately

4300	Orientation direction selection	0

[Data type] Integer axis type

[Data unit]

[Data range] 0~2

[Effective mode] Immediately

4301	Invert feedback input signal at the 2nd position	0

[Data type] Integer axis type

[Data unit]

[Data range] 0~1

[Effective mode] Immediately

4302	Position window while positioning	2

[Data type] Integer axis type

[Data unit] plus

[Data range] 0~100

[Effective mode] Immediately

4303	Orientation position low	0

[Data type] Integer axis type

[Data unit] plus

[Data range] 0~30000

[Effective mode] Immediately

4304	Orientation position high	0

[Data type] Integer axis type

[Data unit] plus

[Data range] 0~30000

[Effective mode] Immediately

4305	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4306	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4307	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4308	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

4309	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4310	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4311	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

4312	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

4313	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

4314	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode] Immediately

4315	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

4316	Retained	

[Data type] Integer axis type
[Data unit]
[Data range]
[Effective mode]

4317	Retained	

[Data type] Integer axis type
[Data unit]
[Data range]
[Effective mode]

4318	Internal forced enable	0

[Data type] Integer axis type
[Data unit]
[Data range] 0 or 1
[Effective mode]

4319	Retained	

[Data type] Integer axis type
[Data unit]
[Data range]
[Effective mode]

4324	Set jog running speed	120

[Data type] Integer axis type
[Data unit] rpm
[Data range] 0~12000
[Effective mode] Immediately

4325	Torque limit in manual and jog mode	100

[Data type] Integer axis type

[Data unit] rpm

[Data range] 0~300

[Effective mode] Immediately

4332	Spindle orientation alarm time	0

[Data type] Integer axis type

[Data unit]

[Data range] 0~30000

[Effective mode] Immediately

4333	Internal CCW torque limit	300

[Data type] Integer axis type

[Data unit] %

[Data range] 0~300

[Effective mode] Immediately

4334	Internal CW torque limit	-300

[Data type] Integer axis type

[Data unit] %

[Data range] 0~12000

[Effective mode] Immediately

4337	Invalid position out of tolerance	1

[Data type] Integer axis type

[Data unit]

[Data range] 0 or 1

[Effective mode] Immediately

4339	Invalid phase loss alarm	1

[Data type] Integer axis type

[Data unit]

[Data range] 0 or 1

[Effective mode] Immediately

4343	Braking time	375

[Data type] Integer axis type

[Data unit] 0.1ms

[Data range] 0~32000

[Effective mode] Immediately

4344	Overload time	

[Data type] Integer axis type

[Data unit]

[Data range] 0~32000

[Effective mode] Immediately

4345	Module overcurrent time	20

[Data type] Integer axis type

[Data unit] 1ms

[Data range] 0~32000

[Effective mode] Immediately

4346	Alarm time of long time saturation of speed regulator	1000

[Data type] Integer axis type

[Data unit] 5ms

[Data range] 0~30000

[Effective mode] Immediately

4347	Maximum deceleration time of motor before the ten-point brake is allowed to act	5000

[Data type] Integer axis type
[Data unit] ms
[Data range] 0~12000
[Effective mode] Immediately

4348	Servo lock delay time	50

[Data type] Integer axis type
[Data unit] ms
[Data range] 0~30000
[Effective mode] Immediately

4349	Motor speed when the power-off brake is actuated	30

[Data type] Integer axis type
[Data unit] rpm
[Data range] 0~300
[Effective mode] Immediately

4350	Spindle clamping interlock delay time	0

[Data type] Integer axis type
[Data unit] ms
[Data range] 0~32000
[Effective mode] Immediately

4356	GSK-Link servo axis number	1

[Data type] Integer axis type
[Data unit]
[Data range] 0~20

[Effective mode] Immediately

4.15 Spindle control parameters (5000~5999)

	7#	6#	5#	4#	3#	2#	1#	0#
5000	LOOPS		SSPS	SABS	AV	ALMS		

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 1 1 0

[Effective mode] Reset

ALMS: Spindle alarm effective level

0: Low level, when the analog spindle is used, the normally open signal is connected, and the ALM signal is normal when the signal is 0

1: When the analog spindle is used at a high level, the normally closed signal is connected, and the ALM signal is normal when the signal is 1

AV: Check of rigid tapping speed position switching signal of analog spindle

0: Yes, when switching to rigid tapping, the system detects the speed/position switching completion signal and then starts tapping

1: No, when switching to rigid tapping, the system does not detect the speed/position switching completion signal and enters tapping

SABS: Analog spindle output mode selection

0: Pulse + direction, the analog spindle speed control signal mode selects the pulse + direction to relax to

1: AB phase, select AB phase control for the analog spindle speed control signal mode

SSPS: Control output when simulating the spindle speed mode

0: Analog voltage, output 0-10V or positive and negative 10V analog voltage

1: Pulse, output quadrature pulse or pulse + direction, selected by parameter 5000.4

LOOPS: Spindle position control mode selection

0: Open loop, the system controls the spindle servo positioning by sending pulse commands

1: Closed loop, the system sends speed commands to control servo positioning through encoder feedback

	7#	6#	5#	4#	3#	2#	1#	0#
5001	LSP	GTT			SVAL		SAR	SVD

Part III Parameters

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Immediately

SVD: spindle speed fluctuation detection

0: Invalid, the system will not process when the spindle speed fluctuates

1: Valid, the motor speed is detected in real time, compared with the command difference of spindle speed, when it exceeds the set range of the system, an alarm will be generated

SAR: Spindle speed arrival signal

0: Not checked, before the program executes the cutting feed, the speed arrival signal is not detected, and cutting is performed directly

1: Checked, before executing cutting feed, cut until the speed arrival signal is detected

SVAL: Spindle speed display selection

0: Command speed, the command speed of the spindle is displayed on the position interface

1: Actual speed, the actual speed of the spindle is displayed on the position interface

GTT: Spindle gearshift mode selection

0: M type, output the PLC gear signals F34.0-F34.3 through S-command as the control signals for the 1st to 4th gears

1: T type, through the external inspection switch, connect the G28.0, G28.1 signals to identify the gear position for control

LSP: Restore the default parameters of the spindle

0: Invalid

1: Valid

Note: In the emergency stop mode, when this parameter changes from 0 to 1, the default parameter of spindle servo will be called.

	7#	6#	5#	4#	3#	2#	1#	0#
5002			SSYC		SWG		SCS	AXC

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

SCS: Cs axis function

0: Invalid

1: Valid

Note: It is necessary to add a feed axis, and set the connection sequence of parameter 225 to -1/-2 (-1 for the 1st spindle, and -2 for the 2nd spindle), and switch from spindle to rotation axis. Switch from spindle and to rotation axis through the PLC signal.

AXC: Spindle positioning function

0: Invalid

1: Valid

Note: It is necessary to add a feed axis, and set the connection sequence of parameter 225 to -1/-2 (-1 for the 1st spindle, and -2 is the 2nd spindle), switch the spindle to the indexing worktable control form of the feed axis, and the external action is completed with the assistance of the PLC.

SWG: Ignore the spindle alarm

0: No, receive and process the spindle servo signal

1: Yes, shield the spindle and do not process the servo spindle signal

SsYC: Spindle speed synchronization function

0: Off

1: On

5005	Selection of spindle number in the system	1

[Data type] Real number type

[Data range] 1 ~ 2

[Effective mode] After restart

[Description] Set the number of servo spindles controlled by the system, including the servo spindles under the bus and non-bus control

5006	Selection of the number of analog spindles	1

[Data type] Bit type

[Data range] 0 ~ 1

[Effective mode] After restart

[Description] Set the number of servo spindles not controlled by bus in the system

0: All servo spindles controlled by bus

1: A non-bus spindle that may be chosen as analog or pulse control is used

5008	Spindle name	49

[Data type] Integer type

[Data range] 0~255

[Effective mode] Reset

[Description] Use ASCII code to set the spindle name

5010	Set the spindle speed range for starting the spindle speed fluctuation detection	20

[Data type] Integer type

[Data unit] %

[Data range] 1~100

[Effective mode] Immediately

[Description] When starting the spindle, the allowable speed fluctuation range of the spindle

5011	Allowable spindle speed fluctuation rate of the spindle speed fluctuation detection	10

[Data type] Integer type

[Data unit] %

[Data range] 1~100

[Effective mode] Immediately

[Description] After the spindle reaches the speed, the allowable spindle speed fluctuation range is normal within the range (set value %); when it exceeds the range, the system will generate an alarm

5012	Allowable spindle speed fluctuation rate of the spindle speed fluctuation detection	100

[Data type] Integer type

[Data unit] rpm

[Data range] 0~32767

[Effective mode] Immediately

[Description] After the spindle reaches the speed, the allowable spindle speed fluctuation range is normal within the range of set value; when it exceeds the range, the system will generate an alarm

5013	Time between command change of the spindle speed and start of speed fluctuation detection (ms)	2000

[Data type] Integer type
[Data unit] ms
[Data range] 0~999999
[Effective mode] Immediately
[Description] It is the spindle acceleration time from the previous command to the current command speed, and no speed fluctuation detection will be performed within this time range

5020	Axis number corresponding to the slave spindle	0

[Data type] Integer type
[Data range] 0--2
[Effective mode] Immediately
[Description] Set the slave spindle number, 1 means the 1st spindle, 2 means the 2nd spindle, and 0 means no. The slave spindle follows the speed of the master spindle

5021	Difference range of synchronous spindle speed arrival	10

[Data type] Integer type
[Data unit] rpm
[Data range] 0--100
[Effective mode] Immediately
[Description] The slave control spindle runs with the master control spindle. When the speed difference reaches the set range, the system will give the speed synchronization completion F signal

5022	Difference range of synchronous spindle phase arrival	10

[Data type] Integer type
[Data unit] 0.1deg
[Data range] 0--100

[Effective mode] Immediately

[Description] The slave spindle runs with the master spindle, and when the master and slave phase angle reaches the set range, the system will issue the phase synchronization completion F signal

5023	Retained	

[Data type]

[Data unit]

[Data range]

[Effective mode]

5100	Gain adjustment data of spindle speed analog output (0.01%)	10000

[Data type] Integer type

[Data unit] 0.01%

[Data range] 1000~12500

[Effective mode] Reset

[Description] Set value=10 / analog voltage value output from actual measurement at the maximum command spindle speed ×10000

5101	Compensation value of analog output offset voltage of spindle speed	0

[Data type] Integer type

[Data range] -1024 ~ 1024

[Effective mode] Reset

[Description] Set the zero drift compensation value for the analog voltage of the spindle speed command

5102	Spindle acceleration	2222

[Data type] Real number type

[Data unit] revolution/[second ×second]

[Data range] 0~99999

[Effective mode] Reset

[Description] Set spindle acceleration controlled by the system

5103	Spindle orientation	0

[Data type] Integer type

[Data range] 0~3 (0: positive direction, 1: negative direction, 2 command inversion, 3 feedback inversion)

[Effective mode] Reset

Set Value	**Notes**
0	Normal
1	Invert
2	Command inversion
3	Feedback inversion

5104	S-type time constant T2 of front acceleration/deceleration during spindle position control	700

[Data type] Real number type

[Data unit] ms

[Data range] 1~4000

[Effective mode] Reset

[Description] Rigid tapping uses S-type acceleration and deceleration. The longer the time setting is, the smoother the acceleration will be.

5105	Maximum acceleration during spindle position control (r/(s*s))	139

[Data type] Real number type

[Data unit] m/s^2

[Data range] 0~99999

[Effective mode] Reset

[Description] In rigid tapping, limit the maximum acceleration of the spindle

5106	2^{nd} encoder selection of the spindle	0

[Data type] Integer type

[Data range] 0 or 1

[Effective mode] Reset

[Description] Spindle feedback signal source selection

0: 1st encoder

1: 2nd encoder

5108	Number of pulses per revolution of the position encoder (number of lines $\times 4$)	4096

[Data type] Integer type

[Data unit] Detection unit

[Data range] 1~32767

[Effective mode] Reset

[Description] When using an incremental encoder, input four times the number of encoder lines; when using an absolute encoder, directly input the number of encoder lines

5110	Motor speed when the spindle gear is shifted	100

[Data type] Integer type

[Data unit] r/min

[Data range] 0~100000

[Effective mode] Reset

[Description] When switching gears, the G29.5 signal is connected to the PLC, and the motor runs at the set speed

5111	Motor speed during spindle orientation	0

[Data type] Integer type

[Data unit] r/min

[Data range] 0~100000

[Effective mode] Reset

[Description] After executing the spindle orientation and the PLC signal connects G70.6, it is the spindle speed output by the system

5113	Check the time of the spindle speed arrival signal	64

[Data type] Integer type

[Data unit] ms

[Data range] 0~255

[Effective mode] Reset

[Description] The system receives the speed arrival signal, confirms the completion after the time set by this parameter, and executes the cutting feed

5115	Maximum rotational speed of the spindle	6000

[Data type] Integer type

[Data unit] rev/min

[Data range] 0~100000

[Effective mode] Reset

[Description] When using the analog spindle, it is the corresponding motor speed when the system outputs 10V voltage

5116	Upper limit of the spindle speed	6000

[Data type] Integer type

[Data unit] rev/min

[Data range] 0~100000

[Effective mode] Reset

[Description] Maximum spindle speed limit

5118	Spindle safety limit speed	100

[Data type] Real number type

[Data unit] rev/min

[Data range] 0~6000

[Effective mode] Reset

[Description] Maximum spindle speed limit

Note: It is the maximum speed of the spindle when PLC signal G033#4 SVL is set to "1".

5120	Maximum spindle speed of gear 1	6000

[Data type] Real number type

[Data unit] rpm

[Data range] 0~100000

[Effective mode] Reset

[Description] Set the upper limit of the speed of the 1st gear of the spindle, and the M/T type is valid

5121	Maximum spindle speed of gear 2	6000

[Data type] Real number type

[Data unit] rpm

[Data range] 0~100000

[Effective mode] Reset

[Description] Set the upper limit of the speed of the 2nd gear of the spindle, and the M/T type is valid

5122	Maximum spindle speed of gear 3	6000

[Data type] Real number type

[Data unit] rpm

[Data range] 0~100000

[Effective mode] Reset

[Description] Set the upper limit of the speed of the 3rd gear of the spindle, and the M/T type is valid

5123	Maximum spindle speed of gear 4	6000

[Data type] Real number type

[Data unit] rpm

[Data range] 0~100000

[Effective mode] Reset

[Description] Set the upper limit of the speed of the 4th gear of the spindle, and the M/T type is valid

5130	Spindle speed at gear 1 - gear 2 switching point	6000

[Data type] Real number type

[Data unit] rpm

[Data range] 0~100000

[Effective mode] Reset

[Description] When the S-command is less than 5130, the first-gear PLC signal F34.0 will be set to 1; when it is greater than parameter 5130 and less than 5131, the second-gear PLC signal F34.1 will be set to 1

5131	Spindle speed at gear 2 - gear 3 switching point	6000

[Data type] Real number type

[Data unit] rpm

[Data range] 0~100000

[Effective mode] Reset

[Description] When the S-command is greater than parameter 5131 and less than 5132, the third-gear PLC signal F34.2 will be set to 1

5132	Spindle speed at gear 3 - gear 4 switching point	6000

[Data type] Real number type

[Data unit] rpm

[Data range] 0~100000

[Effective mode] Reset

[Description] When the S-command is greater than parameter 5132, the 4^{th}-gear PLC signal F34.3 will be set to 1

5135	Spindle speed at gear 1 - gear 2 switching point during the tapping cycle	6000

[Data type] Real number type

[Data unit] rpm

[Data range] 0~100000

[Effective mode] Reset

5136	Spindle speed at gear 2-gear 3 switching point during the tapping cycle	6000

[Data type] Real number type

[Data unit] rpm

[Data range] 0~100000

[Effective mode] Reset

5160	Number of gear teeth on the spindle side (1^{st} gear)	1

[Data type] Integer type

[Data range] 1~999999

[Effective mode] Reset

$$\text{Motor speed} \times \left\{ \begin{array}{l} \frac{5165}{5160}(1^{st}\text{ gear ratio}) \\ \frac{5166}{5161}(2^{nd}\text{ gear ratio}) \\ \frac{5167}{5162}(3^{rd}\text{ gear ratio}) \\ \frac{5168}{5163}(4^{th}\text{ gear ratio}) \end{array} \right\} = \text{Spindle rotational speed}$$

5161	Number of gear teeth on the spindle side (2^{nd} gear)	1

[Data type] Integer type

[Data range] 1~999999

[Effective mode] Reset

5162	Number of gear teeth on the spindle side (3^{rd} gear)	1

[Data type] Integer type

[Data range] 1~999999

[Effective mode] Reset

Part III Parameters

5163	Number of gear teeth on the spindle side (4th gear)	1

[Data type] Integer type

[Data range] 1~999999

[Effective mode] Reset

5165	Number of gear teeth of spindle position encoder (1st gear)	1

[Data type] Integer type

[Data range] 1~999999

[Effective mode] Reset

5166	Number of gear teeth of spindle position encoder (2nd gear)	1

[Data type] Integer type

[Data range] 1~999999

[Effective mode] Reset

5167	Number of gear teeth of spindle position encoder (3rd gear)	1

[Data type] Integer type

[Data range] 1~999999

[Effective mode] Reset

5168	Number of gear teeth of spindle position encoder (4th gear)	1

[Data type] Integer type

[Data range] 1~999999

[Effective mode] Reset

5170	Number of gear teeth on the spindle side of the second code disc (first gear)	1

[Data type] Integer type

[Data range] 1~999999

[Effective mode]　Reset

[Description]　When there is a speed ratio between spindle encoder and spindle, it can be set

$$\begin{array}{c}\text{Spindle motor}\\ \text{speed}\end{array} \times \left\{\begin{array}{l} \frac{5165}{5160}\ (1^{st}\text{ gear ratio}) \\[2em] \frac{5166}{5161}\ (2^{nd}\text{ gear ratio}) \\[2em] \frac{5167}{5162}\ (3^{rd}\text{ gear ratio}) \\[2em] \frac{5168}{5163}\ (4^{th}\text{ gear ratio}) \end{array}\right\} \times \left\{\begin{array}{l} \frac{5175}{5170}\ (1^{st}\text{ gear ratio}) \\[2em] \frac{5176}{5171}\ (2^{nd}\text{ gear ratio}) \\[2em] \frac{5177}{5172}\ (3^{rd}\text{ gear ratio}) \\[2em] \frac{5178}{5173}\ (4^{th}\text{ gear ratio}) \end{array}\right\} = \text{Spindle rotational speed}$$

5171	Number of gear teeth on the spindle side of the second code disc (second gear)	1

[Data type]　Integer type

[Data range]　1~999999

[Effective mode]　Reset

5172	Number of gear teeth on the spindle side of the second code disc (third gear)	1

[Data type]　Integer type

[Data range]　1~999999

[Effective mode]　Reset

5173	Number of gear teeth on the spindle side of the second code disc (4^{th} gear)	1

[Data type]　Integer type

[Data range]　1~999999

[Effective mode]　Reset

5175	Number of gear teeth for the spindle position encoder of the second code disc (first gear)	1

[Data type] Integer type
[Data range] 1~999999
[Effective mode] Reset

5176	Number of gear teeth for the spindle position encoder of the second code disc (second gear)	1

[Data type] Integer type
[Data range] 1~999999
[Effective mode] Reset

5177	Number of gear teeth for the spindle position encoder of the second code disc (third gear)	1

[Data type] Integer type
[Data range] 1~999999
[Effective mode] Reset

5178	Number of gear teeth for the spindle position encoder of the second code disc (fourth gear)	1

[Data type] Integer type
[Data range] 1~999999
[Effective mode] Reset

5200	Position loop gain of the Cs spindle controlled the 1st gear	350

[Data type] Integer type
[Data range] 0~9999
[Effective mode] Immediately
[Description] It is the position loop gain after the spindle switches to the CS axis at the 1st gear position

5201	Position loop gain of the Cs spindle controlled the 2nd gear	350

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

[Description] It is the position loop gain after the spindle switches the CS axis in the 2nd gear position

5202	Position loop gain of the Cs spindle controlled the 3rd gear	350

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

[Description] It is the position loop gain after the spindle switches the CS axis in the 3rd gear position

5203	Position loop gain of the Cs spindle controlled the 4th gear	100350

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

[Description] It is the position loop gain after the spindle switches the CS axis in the 4th gear position

5210	Servo axis number interpolated with the Cs spindle control (group 1)	0

[Data type] Integer type

[Data range] 0~8

[Effective mode] Immediately

5211	1st gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5212	2nd gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type
[Data range] 0~9999
[Effective mode] Immediately

5213	3rd gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type
[Data range] 0~9999
[Effective mode] Immediately

5214	4th gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type
[Data range] 0~9999
[Effective mode] Immediately

5220	Servo axis number interpolated with the Cs spindle control (group 2)	0

[Data type] Integer type
[Data range] 0~8
[Effective mode] Immediately

5221	1st gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type
[Data range] 0~9999
[Effective mode] Immediately

5222	2nd gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5223	3rd gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5224	4th gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5230	Servo axis number interpolated with Cs spindle control (group 3)	0

[Data type] Integer type

[Data range] 0~8

[Effective mode] Immediately

5231	1st gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5232	2nd gear position loop gain of servo axis interpolated with the Cs	300

	spindle control	

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5233	3rd gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5234	4th gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5240	Servo axis number interpolated with the Cs spindle control (group 4)	0

[Data type] Integer type

[Data range] 0~8

[Effective mode] Immediately

5241	1st gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5242	2nd gear position loop gain of servo axis interpolated with the Cs	300

	spindle control	

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5243	3rd gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5244	4th gear position loop gain of servo axis interpolated with the Cs spindle control	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

5250	1st gear position gain in the spindle positioning mode	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

[Description] When the spindle is in the 1st gear position, it is the position gain when switching to spindle positioning

5251	2nd gear position gain in the spindle positioning mode	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

[Description] When the spindle is in the 2nd gear position, it is the position gain when switching to spindle positioning

5252	3rd gear position gain in the spindle positioning mode	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

[Description] When the spindle is in the 3rd gear position, it is the position gain when switching to spindle positioning

5253	4th gear position gain in the spindle positioning mode	300

[Data type] Integer type

[Data range] 0~9999

[Effective mode] Immediately

[Description] When the spindle is in the 4th gear position, it is the position gain when switching to spindle positioning

5300~5555 below are spindle servo parameters. The default parameter varies depending on the motor model. For servo drive with bus connection, taking GR3000 as an example, 5300 corresponds to GR servo parameter PA-00, and other cases may be treated similarly. In case of parameter change, the instruction manual of GR series should be followed.

5300	Parameter modification password	315

[Data type] Integer axis type

[Data range] 0~9999

[Effective mode] Immediately

5301	Motor Model Code	65

[Data type] Integer axis type

[Data range] 0~1329

[Effective mode] Immediately

5302	Motor type selection	0

[Data type] Integer axis type

[Data range] 0 or 1

[Effective mode] Immediately

5303	Power-on initial monitoring setting	0

[Data type] Integer axis type

[Data range] 0~21

[Effective mode] Immediately

5304	Operating mode selection	21

[Data type] Integer axis type

[Data range] 9~25

[Effective mode] Immediately

5305	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5306	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5307	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5308	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5309	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5310	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5311	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5312	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

5313	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

5314	Retained	0

[Data type] Integer axis type

[Data range]

[Effective mode]

5315	First proportional gain of the speed loop	200

[Data type] Integer axis type

[Data unit] Hz

[Data range] 10~3000

[Effective mode] Immediately

5316	First integral time constant of speed loop	100

[Data type] Integer axis type

[Data range] 1~3000

[Effective mode] Immediately

5317	Current command filter coefficient	800

[Data type] Integer axis type

[Data range] 10~5000

[Effective mode] Immediately

5318	Speed feedback detection filter coefficient	800

[Data type] Integer axis type

[Data range] 10~5000

[Effective mode] Immediately

5319	First proportional gain of position loop	40

[Data type] Integer axis type

[Data unit]

[Data range] 10~1000

[Effective mode] Immediately

5320	Retained	0

[Data type] Integer axis type

[Data range]

[Effective mode]

5321	Retained	

[Data type] Integer axis type

[Data unit] rpm

[Data range] -6000~6000

[Effective mode] Immediately

5322	Retained	0

[Data type] Integer axis type

[Data range]

[Effective mode]

5323	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5324	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5325	Position feedforward gain	0

[Data type] Integer axis type

[Data unit] %

[Data range] 0~100

[Effective mode] Immediately

5326	Position feedforward low-pass filter coefficient	2000

[Data type] Integer axis type

[Data unit] Hz

[Data range] 10~5000

[Effective mode] Immediately

5327	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5328	Invert the direction of position command	

[Data type] Integer axis type

[Data range] 0 or 1

[Effective mode] Immediately

5329	Numerator of the electronic gear ratio of position command	1

[Data type] Integer axis type

[Data unit]

[Data range] 1~32767

[Effective mode] Immediately

5330	Position command pulse frequency division factor	1

[Data type] Integer axis type

[Data range] 1~32767

[Effective mode] Immediately

5331	Position arrival range	20

[Data type] Integer axis type

[Data unit] plus

[Data range] 0~30000

[Effective mode] Immediately

5332	Position out-of-tolerance range	400

[Data type] Integer axis type

[Data unit] 100plus

[Data range] 0~4

[Effective mode] Immediately

5333	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

5334	Invert the position output signal	0

[Data type] Integer axis type

[Data range] 0~1

[Effective mode] Immediately

5335	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

5337	Pulse number output by position feedback	10000

[Data type] Integer axis type

[Data unit] plus

[Data range] 1024~30000

[Effective mode] Immediately

5339	Retained	0

[Data type]

[Data range]

[Effective mode]

5340	Retained	0

[Data type]

[Data range]

[Effective mode]

5341	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

5342	Retained	

[Data type]

[Data unit]

[Data range]

[Effective mode]

5343	Retained	0

[Data type]

[Data range]

[Effective mode] Immediately

5344	Retained	0

[Data type]

[Data unit]

[Data range]

[Effective mode]

5345	Second proportional gain of speed loop	400

[Data type] Integer axis type

[Data unit] Hz

[Data range] 10~3000

[Effective mode] Immediately

5346	Second integral time constant of speed loop	100

[Data type] Integer axis type

[Data range] 1~3000

[Effective mode] Immediately

5348	Third proportional gain of speed loop	400

[Data type] Integer axis type
[Data unit] Hz
[Data range] 10~3000
[Effective mode] Immediately

5349	Third integral time constant of speed loop	100

[Data type] Integer axis type
[Data range] 1~3000
[Effective mode] Immediately

5350	Retained	0

[Data type]
[Data unit] %
[Data range] 0~32767
[Effective mode] Immediately

5351	Invert forward and reverse of speed command	0

[Data type] Integer axis type
[Data range] 0 or 1
[Effective mode] Immediately

5352	Retained	

[Data type]
[Data unit]
[Data range]
[Effective mode]

5353	Retained	

[Data type]

[Data unit]

[Data range]

[Effective mode]

5354	Maximum speed limit of speed command	2500

[Data type] Integer axis type

[Data unit] rpm

[Data range] 1~30000

[Effective mode] Immediately

5355	Retained	

[Data type]

[Data unit]

[Data range]

[Effective mode]

5356	Retained	

[Data type]

[Data range]

[Effective mode]

5357	Feedforward gain of speed command	0

[Data type] Integer axis type

[Data unit] ms

[Data range] 0~30000

[Effective mode] Immediately

5358	Time constant of linear acceleration	0

[Data type] Integer axis type
[Data unit] ms
[Data range] 0~10000
[Effective mode] Immediately

5359	Deceleration time of linear acceleration	0

[Data type] Integer axis type
[Data unit] ms
[Data range] 1~4
[Effective mode] Immediately

5360	Retained	0

[Data type] Integer axis type
[Data unit] 0.001
[Data range] 0~6000
[Effective mode] Immediately

5361	Valid range of speed arrival	5

[Data type] Integer axis type
[Data unit] %
[Data range] 1~100
[Effective mode] Immediately

5362	Valid range of zero speed output	5

[Data type] Integer axis type
[Data unit] %
[Data range] 0~100
[Effective mode] Immediately

5363	Analog command multiplication factor	1

[Data type] Integer axis type

[Data unit]

[Data range] 1~1024

[Effective mode] Immediately

5364	Analog command frequency division factor	1

[Data type] Integer axis type

[Data unit]

[Data range] 1~1024

[Effective mode] Immediately

5365	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5366	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5367	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5368	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5369	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5370	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5371	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5372	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5373	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5374	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5375	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode] Immediately

5376	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode] Immediately

5377	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode] Immediately

5378	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode] Immediately

5379	Retained	

[Data type] Integer axis type

[Data range]

[Effective mode]

5380	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5381	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode] Immediately

5382	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5383	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5384	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5385	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5386	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5387	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5388	Mode selection for switching from speed to position	0

[Data type] Integer axis type

[Data range] 0 or 1

[Effective mode] Immediately

5389	Mode selection for switching from position to speed	0

[Data type] Integer axis type

[Data range] 0 or 1

[Effective mode] Immediately

5390	Low position of speed/position switching reference point	0

[Data type] Integer axis type

[Data range] 0~9999

[Effective mode] Immediately

5391	High position of speed/position switching reference point	2

[Data type] Integer axis type

[Data range] 0~30000

[Effective mode] Immediately

5392	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5393	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5394	Retained	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5395	Retained	

[Data type] Integer axis type

[Data range] 0~30

[Effective mode]

5396	Code disc type selection at the 2nd position	0

[Data type] Integer axis type

[Data unit]

[Data range] 0~30

[Effective mode] Immediately

5397	Limit number selection of position feedback input	

[Data type] Integer axis type

[Data unit] Number of lines

[Data range] 0~2

[Effective mode] Immediately

5398	Number of encoder lines at the 2nd position	1024

[Data type] Integer axis type

[Data range] 10~30000

[Effective mode] Immediately

5399	Orientation speed	100

[Data type] Integer axis type

[Data unit] rpm

[Data range] 10~1000

[Effective mode] Immediately

5400	Orientation direction selection	0

[Data type] Integer axis type

[Data unit]

[Data range] 0~2

[Effective mode] Immediately

5401	Invert feedback input signal at the 2nd position	0

[Data type] Integer axis type

[Data unit]

[Data range] 0~1

[Effective mode] Immediately

5402	Position window while positioning	2

[Data type] Integer axis type

[Data unit] plus

[Data range] 0~100

[Effective mode] Immediately

5403	Orientation position low	0

[Data type] Integer axis type

[Data unit] plus

[Data range] 0~30000

[Effective mode] Immediately

5404	Orientation position high	0

[Data type] Integer axis type

[Data unit] plus

[Data range] 0~30000

[Effective mode] Immediately

5405	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5406	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5407	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5408	Reserved	

[Data type] Integer axis type

[Data range]

[Effective mode]

5409	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5410	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5411	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5412	Reserved	

[Data type] Integer axis type

[Data range]

[Effective mode]

5413	Reserved	

[Data type] Integer axis type

[Data range]

[Effective mode]

5414	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode] Immediately

5415	Reserved	

[Data type] Integer axis type

[Data range]

[Effective mode]

5416	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5417	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5418	Internal forced enable	0

[Data type] Integer axis type

[Data unit]

[Data range] 0 or 1

[Effective mode]

5419	Reserved	

[Data type] Integer axis type

[Data unit]

[Data range]

[Effective mode]

5424	Set jog running speed	120

[Data type] Integer axis type

[Data unit] rpm

[Data range] 0~12000

[Effective mode] Immediately

5425	Torque limit in manual and jog mode	100

[Data type] Integer axis type

[Data unit] rpm

[Data range] 0~300

[Effective mode] Immediately

5432	Spindle orientation alarm time	0

[Data type] Integer axis type

[Data unit]

[Data range] 0~30000

[Effective mode] Immediately

5433	Internal CCW torque limit	300

[Data type] Integer axis type

[Data unit] %

[Data range] 0~300

[Effective mode] Immediately

5434	Internal CW torque limit	-300

[Data type] Integer axis type

[Data unit] %

[Data range] 0~12000

[Effective mode] Immediately

5437	Invalid position out of tolerance	1

[Data type] Integer axis type

[Data unit]

[Data range] 0 or 1

[Effective mode] Immediately

5439	Invalid phase loss alarm	1

[Data type] Integer axis type

[Data unit]

[Data range] 0 or 1

[Effective mode] Immediately

5443	Braking time	375

[Data type] Integer axis type

[Data unit] 0.1ms

[Data range] 0~32000

[Effective mode] Immediately

5444	Overload time	

[Data type] Integer axis type

[Data unit]

[Data range] 0~32000

[Effective mode] Immediately

5445	Module overcurrent time	20

[Data type] Integer axis type

[Data unit] 1ms

[Data range] 0~32000

[Effective mode] Immediately

5446	Alarm time of long time saturation of speed regulator	1000

[Data type] Integer axis type

[Data unit] 5ms

[Data range] 0~30000

[Effective mode] Immediately

5447	Maximum deceleration time of motor before the ten-point brake is allowed to act	5000

[Data type] Integer axis type

[Data unit] ms

[Data range] 0~12000

[Effective mode] Immediately

5448	Servo lock delay time	50

[Data type] Integer axis type

[Data unit] ms

[Data range] 0~30000

[Effective mode] Immediately

5449	Motor speed when the power-off brake is actuated	30

[Data type] Integer axis type

[Data unit] rpm

[Data range] 0~300

[Effective mode] Immediately

5450	Spindle clamping interlock delay time	0

[Data type] Integer axis type

[Data unit]   ms

[Data range]   0~32000

[Effective mode]   Immediately

5456	GSK-Link servo axis number	1

[Data type]   Integer axis type

[Data unit]

[Data range]   0~20

[Effective mode]   Immediately

4.16 User macro program parameters (6000~6999)

	7#	6#	5#	4#	3#	2#	1#	0#
6000	SBV	NAM						

[Data type]   Bit type

[Data range]   0 or 1

[Factory default]   0 0 0 0   0 0 0 0

[Effective mode]   Reset

NAM: Macro variable name programming:

0: Invalid

1: Valid

SBV: User macro program statement

0: Single-block stop, after single-block start. It will stop when the block with macro program is completed

1: Single block does not stop after single block start. The block with macro program will run continuously without stop

	7#	6#	5#	4#	3#	2#	1#	0#
6001	TSE					CCV	CLV	TCS

[Data type]   Bit type

[Data range]   0 or 1

[Factory default]　0 0 0 0　0 0 0 0

[Effective mode]　Reset

TCS: T code calls subprogram 9000

0: Invalid, the T command runs as a conventional command

1: Valid, when executing the T code, call the subprogram No.O9000 to run, and the T command in the subprogram is executed according to the conventional command

CLV: Local variables 1~33

0: Reset to "empty"

1: Reset without clearing

Note: "Empty" means no data, not 0.

CCV: Public variable 100~199

0: Reset to "empty"

1: Reset without clearing

Note: "Empty" means no data, not 0.

TSE: Macro interruption signal trigger mode

0: State trigger, valid after PLC signal G53.3 is connected

1: Edge trigger, valid only when triggering the rising edge of PLC signal G53.3

6020	G-code calls macro program O8010	0

6021	G-code calls macro program O8011	0

6022	G-code calls macro program O8012	0

6023	G-code calls macro program O8013	0

6024	G-code calls macro program O8014	0

6025	G-code calls macro program O8015	0

6026	G-code calls macro program O8016	0

6027	G-code calls macro program O8017	0

6028	G-code calls macro program O8018	0

6029	G-code calls macro program O8019	0

[Data type] Integer type

[Data range] 0~999

[Effective mode] Reset

Set G-code of the user macro program whose calling program number is 8010~8019. When it is set to 0, it is invalid.

Note: When the set value is 0, it is invalid, and G00 cannot call macro program.

6031	M-code calls subprogram O8001	0

6032	M-code calls subprogram O8002	0

6033	M-code calls subprogram O8003	0

6034	M-code calls subprogram O8004	0

6035	M-code calls subprogram O8005	0

6036	M-code calls subprogram O8006	0

6037	M-code calls subprogram O8007	0

6038	M-code calls subprogram O8008	0

6039	M-code calls subprogram O8009	0

[Data type] Integer type

[Data range] 0~999

[Effective mode] Reset

Set M-code of the subprogram whose calling program number is 8001~8009. When set to 0, it is invalid.

Note: When the set value is 0, it is invalid, and M00 cannot call subprogram.

6040	M-code calls macro program O8020	0

6041	M-code calls macro program O8021	0

6042	M-code calls macro program O8022	0

6043	M-code calls macro program O8023	0

6044	M-code calls macro program O8024	0

6045	M-code calls macro program O8025	0

6046	M-code calls macro program O8026	0
6047	M-code calls macro program O8027	0

6048	M-code calls macro program O8028	0

6049	M-code calls macro program O8029	0

[Data type] Integer type

[Data range] 0~999

[Effective mode] Reset

Set M-code of the user macro program whose calling program number is 8020~8029. When set to 0, it is invalid.

Note: When the set value is 0, it is invalid, and M00 cannot call macro program.

6050	G-code calls macro program O9010	0

6051	G-code calls macro program O9011	0

6052	G-code calls macro program O9012	0

6053	G-code calls macro program O9013	0

6054	G-code calls macro program O9014	0

6055	G-code calls macro program O9015	0

6056	G-code calls macro program O9016	0

6057	G-code calls macro program O9017	0

6058	G-code calls macro program O9018	0

6059	G-code calls macro program O9019	0

[Data type] Integer type

[Data range] 0~999

[Effective mode] Reset

Set G-code of the user macro program whose calling program number is 9010~9019. When set to 0, it is invalid.

Note: When the set value is 0, it is invalid, and G00 cannot call macro program.

6071	M-code calls subprogram O9001	0

6072	M-code calls subprogram O9002	0

6073	M-code calls subprogram O9003	0

6074	M-code calls subprogram O9004	0

6075	M-code calls subprogram O9005	0

6076	M-code calls subprogram O9006	0

6077	M-code calls subprogram O9007	0

6078	M-code calls subprogram O9008	0

6079	M-code calls subprogram O9009	0

[Data type] Integer type

[Data range] 0~999

[Effective mode] Reset

Set M-code of the user macro program whose calling program number is 9001~9009. When set to 0, it is invalid.

Note: When the set value is 0, it is invalid, and M00 cannot call subprogram.

6080	M-code calls macro program O9020	0

6081	M-code calls macro program O9021	0
6082	M-code calls macro program O9022	0

6083	M-code calls macro program O9023	0

6084	M-code calls macro program O9024	0

6085	M-code calls macro program O9025	0

6086	M-code calls macro program O9026	0

6087	M-code calls macro program O9027	0

6088	M-code calls macro program O9028	0

6089	M-code calls macro program O9029	0

[Data type] Integer type

[Data unit] 0~999

[Effective mode] Reset

Set M-code of the user macro program whose calling program number is 9020~9029. When set to 0, it is invalid.

Note: When the set value is 0, it is invalid, and M00 cannot call the user macro program.

4.17 PLC axis control parameters (7000~7199)

7010	DI/DO group selection for each axis in the PLC axis control	0

[Data type] Integer axis type

[Data range] 0-8

[Effective mode] After restart

This parameter sets the DI/DO group number used for the control axis command of each axis in the PLC axis control. For the signal address group number selection when the PLC axis controls the axis, 0 means not used, 1 to 8 correspond to A to H group signal address, respectively.

Set Value	Meaning
0	Fail to use PLC axis control
1	Use DI/DO signal of Group A
2	Use DI/DO signal of Group B
3	Use DI/DO signal of Group C
4	Use DI/DO signal of Group D
5	Use DI/DO signal of Group E
6	Use DI/DO signal of Group F
7	Use DI/DO signal of Group G
8	Use DI/DO signal of Group H

7022	Upper limit of PLC axis controlled movement speed	500

[Data type] Integer type

[Data range] 0~50000

[Effective mode] Reset

[Description] When the feed is controlled by the PLC axis, it is the movement speed limit of the PLC axis

7030	Acceleration when the PLC axis control is stopped	5

[Data type] Integer type

[Data range] 0~100

[Effective mode] Reset

7031	PLC axis control start acceleration	1

[Data type] Integer type

[Data range] 0~100

[Effective mode] Reset

4.18 Oblique axis control parameters (7100~7119)

	7#	6#	5#	4#	3#	2#	1#	0#
7100							SAXJ	SAXE

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

SAXE: Oblique axis control

0: Invalid

1: Valid

Note: Only the basic axes XYZ are supported. When the machine is of a non-orthogonal structure, enable this function.

SAXJ: Manual function of oblique axis control

0: Invalid, in the manual mode, the movement is controlled by an independent feed axis.

1: In the effective manual mode, the non-orthogonal machine is converted into an orthogonal structure for control

7110	Oblique axis number	1

[Data type] Integer type

[Data range] 1~3

[Effective mode] Reset

[Description] Set the non-orthogonal axis, 1 means X-axis, 2 means Y-axis, 3 means Z-axis

7111	Number of the orthogonal axis	1

[Data type] Integer type

[Data range] 1~3

[Effective mode] Reset

[Description] Set the angle of the tilting axis, -180~180, but the input within -105~-75, and 75~105 is not allowed. The linear axis is positive if anticlockwise.

7112	Angle of oblique axis	0.000

[Data type] Real number type

[Data range] -180~180; input is prohibited for -105~-75 and 75~105. Anticlockwise centering the linear axis is positive.

[Effective mode] Reset

[Description] Set oblique angle of the oblique axis

4.19 Normal direction control parameters (7120~7139)

7120	Normal axis number	0

[Data type] Integer type

[Data range] 1~8

[Effective mode] Reset

[Description] Select the feed axis as the normal control axis. The normal axis does not need command control, and automatically adjusts angle according to the path so as to run perpendicularly to the path. 1 to 8 represent the 1^{st} to 8^{th} axes respectively.

7121	Normal linkage length	0

[Data Type] Real number axis type
[Data unit] mm
[Data range] -999999.9999~999999.9999
[Effective mode] Reset
[Description] In the normal control, the normal axis operation will participate in the linkage length distance from the start point of the next block to achieve linkage

7122	Feed speed of the normal linkage axis	0

[Data Type] Real number axis type
[Data unit] mm
[Data range] 0~999999.9999
[Effective mode] Reset
[Description] It is the feed speed of the normal linkage axis during operation

7123	Maximum speed change of the normal axis	0

[Data Type] Real number axis type
[Data unit] mm
[Data range] 0~999999.9999
[Effective mode] Reset

7130	Tool normal vector at zero degrees	1

[Data Type] Real number axis type
[Data unit] mm
[Data range] -999999.9999~999999.9999
[Effective mode] Reset
[Description] When the normal axis is zero degrees, set its pointing direction.

7143	Maximum rapid traverse speed of the MPG simulation function	3000

[Data Type] Real number

[Data range] 0~1000000

[Effective mode] Reset

[Description] Limit the maximum rapid traverse speed under the MPG simulation function

7144	The acquisition mean buffer size of the MPG simulation function	24

[Data Type] Integer type

[Data range] 10~24

[Effective mode] Reset

[Description] Control the buffer size of the MPG simulation function to collect pulses for mean calculation, which is similar to the post-acceleration/deceleration function

7145	Equal division of the denominator of the override coefficient of MPG simulation function	100

[Data Type] Integer type

[Data range] 5~1000

[Effective mode] Reset

[Description] Limit the gradient of the MPG change, divide the denominator calculated by [7147] into equal parts, and if it is decreased, the jitter frequency when shaking the MPG at a non-highest speed may be reduced, but the jitter amplitude will be increased

7146	Number of processing cycles of the MPG simulation function	40

[Data Type] Integer type

[Data range] 10~100

[Effective mode] Reset

[Description] Setting this parameter can enlarge and reduce the collection interval of handwheel pulses. For example, if set to 40, the current handwheel pulse value will be collected after 40 bus cycles. If it is too large, this may cause hysteresis. The internal 0 pulse detection period is this parameter +1. If it is too small, this may result in a velocity-invariant gradient.

7147	Maximum speed of the MPG simulation test	350

[Data Type] Integer type

[Data range] 100~1000

[Effective mode] Reset

[Description] This parameter is used to calculate the denominator of the override coefficient of the MPG simulation function internally, and set it according to the appropriate hand crank speed. If it is too large, the hand crank may not reach the maximum speed.

7148	Number of cycles that the real-time interpolation point is delivered by the internal delay under the MPG trial cut function	6

[Data Type] Integer type

[Data range] 0~99

[Effective mode] Reset

[Description] This parameter specifies the number of delay cycles for internally issued interpolation points. If it is too small, this may lead to empty cycles. If it is too large, this may increase the delay time.

7150	Stir function enabled	6

[Data Type] Integer type

[Data range] 0~1

[Effective mode] Reset

7151	Stir bar movement smoothing filter time (ms)	6

[Data Type] Integer type

[Data range] 0~200

[Effective mode] Reset

7152	Normal vector movement smoothing filter time (ms)	6

[Data Type] Integer type

[Data range] 0~200

[Effective mode] Reset

7153	Maximum allowable distance of stirring normal movement (mm)	6

[Data type] Float
[Data range] 0~100
[Effective mode] Reset

7154	Stirring condition feedback coefficient	6

[Data type] Float
[Data range] 0~1000
[Effective mode] Reset

7155	Positive limit value of stirring adjustment	6

[Data type] Float
[Data range] -1000~1000
[Effective mode] Reset

7156	Negative limit value of stirring adjustment	6

[Data type] Float
[Data range] -1000~1000
[Effective mode] Reset

7157	Minimum range of stirring adjustment	6

[Data type] Float
[Data range] 0~100
[Effective mode] Reset

7158	Stirring adjustment proportional coefficient	6

[Data type] Float
[Data range] 0~100

[Effective mode] Reset

7159	Stirring adjustment direction	6

[Data Type] Integer type

[Data range] 0~3

[Effective mode] Reset

4.20 Abnormal load detection control parameters (7201~7229)

	7#	6#	5#	4#	3#	2#	1#	0#
7201								ABDW

[Data type] Bit axis type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

ABDW: Abnormal servo load detection function

0: Invalid, the servo axis load will not be detected

1: Valid, the servo axis load is detected, and the system gives the corresponding axis F signal in the PLC

	7#	6#	5#	4#	3#	2#	1#	0#
7202								SPMT

[Data type] Bit type

[Data range] 0 or 1

[Factory default] 0 0 0 0 0 0 0 0

[Effective mode] Reset

SPMT: Abnormal spindle load detection function

0: Invalid, there is no spindle load detection

1: Valid, the spindle load is detected. When the corresponding spindle exceeds the set value, the system will set PLC signals F90.1 and F90.2 to 1

7211	Abnormal servo load detection limit	100

[Data type] Integer type

[Data unit] %

[Data range] 0~500

[Effective mode] Reset

[Description] Set the load limit value. When the actual load exceeds this setting, if it exceeds the set value, F90.0, F184.0-F184.7 signals will be given in the system PLC

7212	Abnormal servo load detection limit at acceleration and deceleration	100

[Data type] Integer type

[Data unit] %

[Data range] 0~500

[Effective mode] Reset

[Description] Set the load limit value. When the actual load exceeds this setting, if it exceeds the set value, F90.0, F184.0-F184.7 signals will be given in the system PLC

7221	Maximum value of abnormal load detection alarm of the spindle	50

[Data type] Integer type

[Data unit] %

[Data range] 0~500

[Effective mode] Reset

[Description] Set the load limit value. When the actual load exceeds this setting, if it exceeds the set value, F90.1, F90.2 signals will be given in the system PLC

4.21 Parameters of polygon cutting function (7610~7629)

7610	Control axis number of the tool rotation axis for polygon cutting	4

[Data type] Integer type

[Data range] 0~8

[Effective mode] Reset

[Description] The set axis rotates when following the spindle according to the ratio set by the command

7620	Movement per revolution of the tool rotation axis for polygon cutting	360

[Data type] Real number type

[Data unit] mm

[Data range] 0~9999

[Effective mode] Reset

[Description] Set the movement per revolution of the slave axis, and it must be set as the rotation axis

7621	Maximum allowable speed of the tool rotation axis	3000

[Data type] Integer type

[Data unit] rpm

[Data range] 0~99999

[Effective mode] Reset

[Description] It is the maximum speed limit of the tool rotation axis

7622	Slave axis acceleration for polygon machining	5

[Data type] Integer type

[Data unit] r/s^2

[Data range] 0~100

[Effective mode] Reset

[Description] It is the acceleration of the slave axis when following

4.22 Robot control parameters (7800~7899)

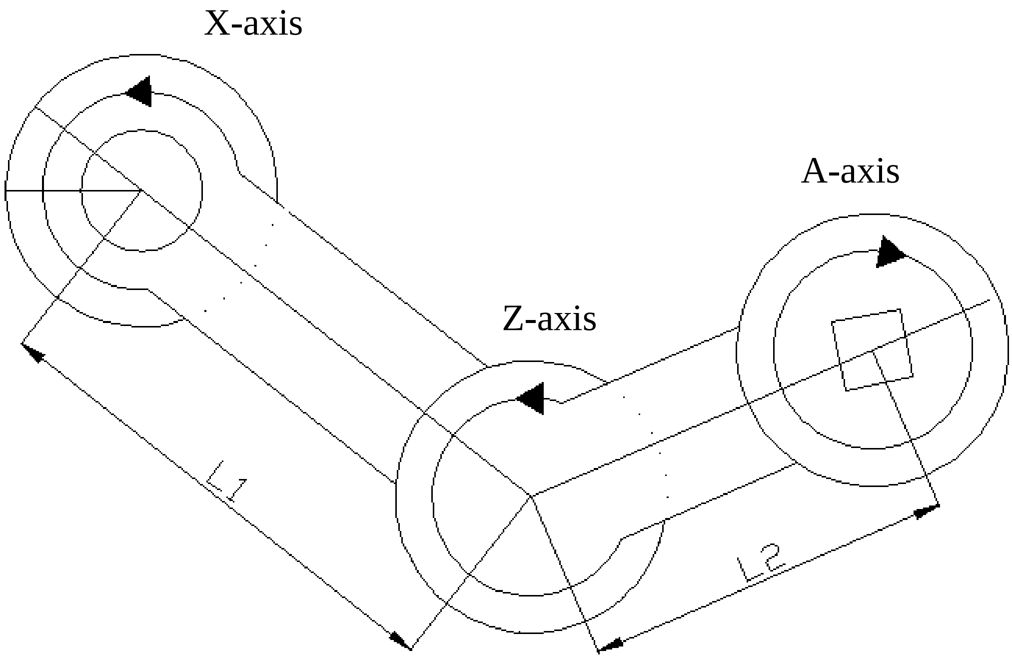
7800	Manual function of the robot is valid	0

[Data type] Integer type

[Data range] 0~1

[Effective mode] Reset

[Description] A mechanical arm with three joints is controlled by three rotation axes, and the positioning of the arm is controlled



7810	Length of the 1st arm of the robot	10

[Data type] Real number type

[Data unit] mm

[Data range] 0~99999.9999

[Effective mode] Reset

[Description] It is the distance L1 between the 1st rotation axis (driving its rotation axis to run) and the center line of the 2nd rotation axis

7811	Length of the 2nd arm of the robot	6

[Data type] Real number type

[Data unit] mm

[Data range] 0~99999.9999

[Effective mode] Reset

[Description] It is the distance L2 between the 2nd rotation axis (driving its rotation axis to run) and the center line of the 3rd rotation axis

7820	Vector from the 1st joint axis to the rotation axis of the large grinding wheel	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -9999.9999~9999.9999

[Effective mode] Reset

[Description] It is the vector from the 1st rotation axis to the axis center line of the swing head of the large grinding wheel

7830	Vector from the rotation axis of the large grinding wheel to the center of the large grinding wheel	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -9999.9999~9999.9999

[Effective mode] Reset

[Description] It is the vector from the swing head of the large grinding wheel to the center of the large grinding wheel

7840	Vector from the 1st joint axis to the rotation axis of the small grinding wheel	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -9999.9999~9999.9999

[Effective mode] Reset

[Description] It is the vector from the 1st rotation axis to the axis center line of the swing head of the small grinding wheel

7850	Vector from the rotation axis of the small grinding wheel to the center of the small grinding wheel	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -9999.9999~9999.9999

[Effective mode] Reset

[Description] It is the vector from the rotation axis of the small grinding wheel to the center of the small grinding wheel

4.23 Five-axis machining parameters (8000~8999)

8010	Machine structure type	12

[Data type] Integer type
[Data range] 0~21
[Effective mode] Reset

	Machine structure type
2	Tool rotation type
12	Work table rotation type
21	Hybrid type

8012	Axial direction of the 1st rotation axis	2

[Data type] Integer type
[Data range] 0~8
[Effective mode] Reset

	Axial direction of the 1st rotation axis
1	is the direction rotating around the X-axis
2	is the direction rotating around the Y-axis
3	is the direction rotating around the Z-axis

8016	Axial direction of the 2nd rotation axis	3

[Data type] Integer type
[Data range] 0~8
[Effective mode] Reset

	Axial direction of the 2nd rotation axis
1	is the direction rotating around the X-axis

Part III Parameters

2	is the direction rotating around the Y-axis
3	is the direction rotating around the Z-axis

8018	Rotation direction of the 1st rotation axis	1

[Data type] Bit type

[Data range] 0~1

[Effective mode] Reset

0: Negative direction

1: Positive direction

It is used to set the rotation direction of the 1st rotation axis when G53.1 is executed on a rotary table type machine tool

8019	Axial direction of tool axis	3

[Data type] Integer type

[Data range] 0~8

[Effective mode] Reset

	Axial direction of tool axis
1	is the direction rotating around the X-axis
2	is the direction rotating around the Y-axis
3	is the direction rotating around the Z-axis

8020	Rotary table oordinate value in the machine coordinate system	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -10000~10000

[Effective mode] Reset

[Description] When the rotation axis is at the machine coordinate 0, the rotary table center is located at the XY position of the machine Cartesian coordinate system, and the Z-axis coordinate is the machine coordinate when the spindle end face descends to the worktable surface

Note: It includes the coordinate parameters of X, Y and Z axes.

Part III Parameters

8021	Vector from the 1st rotation axis to the 2nd rotation axis	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -10000~10000

[Effective mode] Reset

[Description] The axis center line of the 1st rotation axis points to that of the 2nd rotation axis, and it is the vector along the XYZ direction

Note: It includes the coordinate parameters of X, Y and Z axes.

8022	Vector from tool axis to tool rotation axis	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -10000~10000

[Effective mode] Reset

[Description] The center line of the tool rotation axis points to its axis center line, and it is the vector along the XYZ direction

Note: It includes the coordinate parameters of X, Y and Z axes.

8023	Vector from the 2nd rotation axis to the 1st rotation axis of the tool	0

[Data Type] Real number axis type

[Data unit] mm

[Data range] -10000~10000

[Effective mode] Reset

[Description] Set when the spindle-tilting structure is used, the axis center line of the 2nd rotation axis points to that of the 1st rotation axis, and it is the vector along the XYZ direction

Note: It includes the coordinate parameters of X, Y and Z axes.

8030	Tilting angle when the 1st rotation axis is an tilting axis	0

Part III Parameters

[Data Type] Real number axis type

[Data unit] deg

[Data range] 0~360

[Effective mode] Reset

[Description] Set when the rotation axis is a non-orthogonal structure

8031	Tilting angle when the 2nd rotation axis is an tilting axis	0

[Data Type] Real number axis type

[Data unit] deg

[Data range] 0~360

[Effective mode] Reset

[Description] Set when the rotation axis is a non-orthogonal structure

8100	Rotation axis smoothing accuracy 1	0

[Data type] Real number type

[Data unit] deg

[Data range] 0~10

[Effective mode] Reset

[Description] The larger the setting of parameters 8100 and 8101, the higher the machining efficiency, but the worse the precision. It is recommended that these two parameters be set to the same value, and the recommended setting is 0.01~0.03.

When parameters 8100 and 8101 are both set to 0, the smoothing algorithm is disabled.

Note: When the smoothing algorithm or filtering algorithm is enabled, the interpolation period should be set to 4ms, that is, parameter 0811 should be set to 4.

8101	Rotation axis smoothing accuracy 2	0

[Data type] Real number type

[Data unit] deg

[Data range] 0~10

[Effective mode] Reset

8110	Tool nose point filter accuracy	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~2

[Effective mode] Reset

[Description] The larger the parameter setting is, the higher the machining efficiency will be, but the worse the precision will be. The recommended setting is 0.005~0.02.

8111	Rotation axis filter accuracy	0

[Data type] Real number type

[Data unit] deg

[Data range] 0~2

[Effective mode] Reset

[Description] The larger the parameter setting is, the higher the machining efficiency will be, but the worse the precision will be. The recommended setting is 0.005~0.03, and it is recommended to set as a value consistent with 8100.

8112	Maximum filter length	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~10

[Effective mode] Reset

[Description] The larger the parameter setting is, the easier the path is to be filtered. The recommended setting is 0.4~0.8

8113	Maximum filter angle	0

[Data type] Real number type

[Data unit] mm

[Data range] 0~10

[Effective mode] Reset

[Description] It is used to set the maximum angle that the filtering algorithm can continuously filter out. The larger the parameter setting is, the easier the path is to be filtered. The recommended setting is 3~7

8114	Maximum number of filter blocks	0

[Data type] Integer type

[Data unit] Segment

[Data range] 0~20

[Effective mode] Reset

[Description] It is used to set the maximum number of blocks that can be continuously filtered out by the filtering algorithm. The recommended setting is 10~20.

When 8114 is set to 0, the filtering algorithm is disabled

8115	RTCP maximum acceleration	1.0

[Data Type] Real type

[Data unit] m/s^2

[Data range] 0.1~100

[Effective mode] Reset

8116	RTCP speed link control coefficient	1.0

[Data Type] Real type

[Data unit] m/s^2

[Data range] 0.1~10

[Effective mode] Reset

8117	RTCP corner speed proportional control angle	0.0

[Data Type] Real type

[Data unit] degrees

[Data range] 0~180

[Effective mode] Reset

8118	RTCP corner speed proportional control coefficient	1

[Data Type]	Real type
[Data range]	0~1
[Effective mode]	Reset

Appendix

Appendix 1 System Alarm List

1.1 System alarms (PS alarms)

Alarm Number	PS0002	Alarm messages	Need to restart after modifying the parameters to continue the operation
Analysis	Appear after modifying some system parameters. For example, 200-206, 800, 811, 1000, 1004, 2170-2172, 2800, 2806.		
Handling Method	Need to restart to continue the operation.		
Alarm Number	PS0003	Alarm messages	Too many digits
Analysis	Program data input exceed the scope of system allowable value, for example: coordinate value X 999999.9999 is the maximum value in the machining program, and the system will give an alarm when this value is exceeded.		
Handling Method	Check the data in the program to change that with too long digit to the appropriate value.		
Alarm Number	PS0004	Alarm messages	Address not found
Analysis	Fail to enter the correct character address at the beginning of program block. Instead, enter number or illegal character.		
Handling Method	Check the modifying program of the appropriate program block.		
Alarm Number	PS0005	Alarm messages	No data after address
Analysis	No corresponding data is written after the address/command in the program, for example, command G, X, Y, Z, M appear separately.		
Handling Method	Check the program addresses/commands and complete the data with commands that omit to write data.		
Alarm Number	PS0006	Alarm messages	Illegal use of minus sign
Analysis	A minus sign is entered or multiple minus signs are entered where a minus sign cannot be used.		
Handling Method	Modify the program		
Alarm Number	PS0007	Alarm messages	Illegal use of decimal point

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Analysis	There are extra decimal points in the program or decimal points are used where they cannot be used.		
Handling Method	Check the program to remove the extra decimal point.		
Alarm Number	PS0009	Alarm messages	Enter illegal character address
Analysis	There are unusable character addresses in the program.		
Handling Method	Check the program and modify the appropriate address.		
Alarm Number	PS0010	Alarm messages	Incorrect G-code
Analysis	G-code that the system does not have or that cannot be used is assigned in the program.		
Handling Method	Check the program to change the wrong G-code to be a correct one.		
Alarm Number	PS0011	Alarm messages	No feed speed command
Analysis	Feed speed is not specified in the cutting feed or is improper.		
Handling Method	Modify the program		
Alarm Number	PS0012	Alarm messages	Address P is repeatedly used, with program modified
Analysis	Two or more addresses P appear in the same program block.		
Handling Method	Separate the commands that can be used for address P into different program blocks.		
Alarm Number	PS0013	Alarm messages	Tool compensation method cannot specify unidirectional positioning
Analysis	There is also unidirectional positioning command G60 in the program block for establishing the tool compensation.		
Handling Method	Modify the program, and G60 cannot be written in the same line with the tool compensation command.		
Alarm Number	PS0014	Alarm messages	G10 command format error
Analysis	Online modification of system parameter (G10), programming format error.		
Handling Method	Modify the program to correct the G10 format.		
Alarm Number	PS0015	Alarm messages	Too many axes commanded
Analysis	Axis that does not exist or is not set by the system is specified in the program.		

Handling Method	Check program, delete redundant axis commands or check system parameter 1020 (whether the system parameter 800 is set correctly), and check whether the corresponding axes name is correct.		
Alarm Number	PS0016	Alarm messages	G10 does not allow the modification of such parameter
Analysis	The parameters that can be modified through G10 are: 1, 130, 1020-1021, 1031-1053, 1605-1642, 1801-1930, 1933-2034, 2112, 2113, 2600-2653. An alarm will be given if other parameters are specified.		
Handling Method	Modify the program to delete parameter numbers other than those that can be modified by G10 command.		
Alarm Number	PS0018	Alarm messages	Wrong plane selection when commanding planar circular arc in length compensation
Analysis	When the length compensation is established in the program, the plane where the arc path is located is incorrectly selected.		
Handling Method	Modify the program to select the correct plane to use the circular arc command.		
Alarm Number	PS0019	Alarm messages	Too many linkage movement axes commanded
Analysis	The number of linkage movement axes commanded in the same program exceeds the limit.		
Handling Method	Modify the program		
Alarm Number	PS0020	Alarm messages	Out of radius tolerance
Analysis	In circular interpolation, the distance from the start point to the end point cannot form a circular arc at the given radius R or the distance from the beginning to the arc center is different from that from the end point to the circular arc center.		
Handling Method	Modify the program		
Alarm Number	PS0021	Alarm messages	Illegal plane axis commanded
Analysis	Axis not in the (G17 G18 G19) plane is specified in the circular interpolation.		
Handling Method	Modify the program		
Alarm Number	PS0022	Alarm messages	No arc radius
Analysis	The program does not specify a arc radius where the arc radius command is required.		
Handling Method	Add the arc radius command to the program.		

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Alarm Number	PS0024	Alarm messages	Input data out of range assigned by the system
Analysis	The data entered by G10 is out of system range.		
Handling Method	Modify the program		
Alarm Number	PS0025	Alarm messages	The pitch compensation number is illegal or does not exist or the pitch compensation value is not specified
Analysis	When using G10 to enter pitch compensation, the specified pitch compensation number does not exist or is illegal, and the pitch compensation value is not specified.		
Handling Method	Modify the program		
Alarm Number	PS0026	Alarm messages	G51 cannot be in the same block with other commands
Analysis	G51 is not allowed to be in the same block with G10 and G65.		
Handling Method	Modify the program, and write it line by line.		
Alarm Number	PS0027	Alarm messages	The parameter number modified by G10 is illegal or does not exist
Analysis	A parameter that does not exist in the system or an incorrect parameter number is specified in G10.		
Handling Method	Modify the program		
Alarm Number	PS0028	Alarm messages	Illegal plane selection
Analysis	Plane switching is not possible in fixed cycle modal.		
Handling Method	To modify the program, please cancel the fixed cycle, then switch planes or modify # 2000.0 parameter.		
Alarm Number	PS0029	Alarm messages	Illegal offset value
Analysis	The compensation value specified by H is either too large or does not exist.		
Handling Method	Modify the program		
Alarm Number	PS0030	Alarm messages	Illegal compensation number
Analysis	The compensation number assigned by D/H code is too large or does not exist. In addition, the value assigned by the additional workpiece coordinate system number assigned by P code exceeds the value assigned by the system.		

Handling Method	Modify the program		
Alarm Number	PS0031	Alarm messages	Illegal P commanded in G10
Analysis	The data specified by address P in G10 command is incorrect.		
Handling Method	Modify the program to check whether the relevant data number to be modified online is correct.		
Alarm Number	PS0032	Alarm messages	Illegal compensation value in G10
Analysis	When the offset value is set by G10 or written by the system variable, the offset value exceeds the range assigned by the system.		
Handling Method	Modify the program		
Alarm Number	PS0033	Alarm messages	Tool compensation does not find the inter-block point
Analysis	In tool compensation, the end point coordinate of the previous program block is not on-line in the next one.		
Handling Method	Modify the program or check the tool compensation value.		
Alarm Number	PS0034	Alarm messages	Cannot lift tool or cancel tool compensation in circular arc command
Analysis	Cannot establish or cancel tool compensation in circular arc command.		
Handling Method	Modify the program		
Alarm Number	PS0036	Alarm messages	Tool compensation mode cannot command G31 and G37
Analysis	G31 and G37 commands are not allowed in tool compensation.		
Handling Method	Check whether there are G31 and G37 commands in the program of tool compensation, and modify the program.		
Alarm Number	PS0037	Alarm messages	Switching plane in tool compensation
Analysis	Switching plane (G17 G18 G19) is not allowed in tool compensation.		
Handling Method	Check whether the program in the tool compensation switches planes, and modify the program.		
Alarm Number	PS0038	Alarm messages	There is interference in the circular arc program block
Analysis	Overcutting occurs in the tool radius compensation method because the circular arc start point or endpoint is the same as the circular arc center.		

Handling Method	Modify the program		
Alarm Number	PS0039	Alarm messages	The arc end point is not on the circular arc after the tool compensation
Analysis	The arc command is after the tool compensation, and #1810 parameter determines whether an alarm is given if the end point is not on the circular arc.		
Handling Method	Modify the program		
Alarm Number	PS0040	Alarm messages	The tool compensation is changed in circular interpolation
Analysis	It is not allowed to change the radius compensation in the tool radius compensation mode.		
Handling Method	Check whether there is D value in the program that modifies the compensation.		
Alarm Number	PS0041	Alarm messages	There is interference in CRC
Analysis	Overcutting occurs in the tool radius compensation mode.		
Handling Method	Modify the program		
Alarm Number	PS0042	Alarm messages	Commanding G45-G48 is not allowed in the tool compensation
Analysis	Command G45-G48 is used in tool compensation.		
Handling Method	Modify the program to delete G45-G48 command.		
Alarm Number	PS0043	Alarm messages	Radius value out-of-tolerance
Analysis	#1810 parameter determines whether an alarm is given if the end point is not on the arc.		
Handling Method	Modify the program		
Alarm Number	PS0044	Alarm messages	Commanding G27-G30 G53 is not allowed in the fixed cycle
Analysis	There are G27-G30 G53 commands in the fixed cycle.		
Handling Method	Modify the program		
Alarm Number	PS0045	Alarm messages	Address Q is not found in the fixed cycle
Analysis	In the fixed cycle G73/G83, no cutting-in (Q) is specified each time.		
Handling Method	Modify the program		

Alarm Number	PS0046	Alarm messages	Illegal homing command
Analysis	In the 2nd, 3rd and 4th reference point returning commands, commands other than P2, P3, and P4 are given.		
Handling Method	Modify the program		
Alarm Number	PS0047	Alarm messages	G10 and the fixed cycle cannot be used at the same time
Analysis	G10 command is used in the fixed cycle.		
Handling Method	G10 command in the fixed cycle is deleted or the fixed cycle must be cancelled before G10 is executed.		
Alarm Number	PS0048	Alarm messages	Metric-imperial conversion command format is not correct
Analysis	Metric-imperial conversion can only be switched at the program header. Switching during program execution or subprogram is not allowed.		
Handling Method	Modify the program		
Alarm Number	PS0051	Alarm messages	Moving error after CHF/CNR
Analysis	There is no fillet condition or the amount of movement is uncertain.		
Handling Method	Modify the program		
Alarm Number	PS0053	Alarm messages	This condition cannot be determined or does not exist in the transfer type determination
Analysis	The four types (L_L, L_C, C_L, C_C) assigned by the system cannot be determined.		
Handling Method	Modify the program		
Alarm Number	PS0054	Alarm messages	After the tool compensation is established, there is no relevant plane movement command in the continuous 8-block program
Analysis	There is no movement command in the relevant plane that is continuously specified for more than 8 blocks in tool radius compensation.		
Handling Method	Modify the program		
Alarm Number	PS0055	Alarm messages	The number of movement commands is less than 2 from the establishment to the cancellation of the tool compensation

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Analysis	After establishing tool compensation, the tool compensation is cancelled due to the specified movement command less than two blocks.		
Handling Method	Modify the program		
Alarm Number	PS0059	Alarm messages	Program number not found
Analysis	The specified program number is not found in the external program number retrieval or external workpiece number retrieval. Either the specified program is edited in the background or no non-modal macro program calls the program in memory.		
Handling Method	Check program number and external sequence number.		
Alarm Number	PS0063	Alarm messages	The S-command is zero or illegal
Analysis	S-code command value exceeds the range assigned by the system.		
Handling Method	Check the program.		
Alarm Number	PS0064	Alarm messages	Illegal M-code command
Analysis	The assigned M-code is out of range or too many M-codes are assigned in the same block.		
Handling Method	Modify the program		
Alarm Number	PS0065	Alarm messages	Program block is too long
Analysis	Program block exceeds 32 units at maximum.		
Handling Method	Modify the program		
Alarm Number	PS0066	Alarm messages	A unit string is too long
Analysis	The number of unit characters exceeds the maximum number of characters.		
Handling Method	Modify the program		
Alarm Number	PS0067	Alarm messages	Illegal sequence number
Analysis	N sequence number is out of system range.		
Handling Method	Modify the program		
Alarm Number	PS0068	Alarm messages	P/X dwell time is illegal or times out

Analysis	Dwell time is out of system range.		
Handling Method	Modify the program		
Alarm Number	PS0069	Alarm messages	Incompatible NC command
Analysis	Coordinate values conflict.		
Handling Method	Check the program, and modify the coordinate value.		
Alarm Number	PS0070	Alarm messages	Insufficient memory capacity
Analysis	The system storage capacity is full or the copied program files exceed the remaining capacity of the system.		
Handling Method	Delete unnecessary program files or reduce the number of program files.		
Alarm Number	PS0071	Alarm messages	Data not found
Analysis	No addresses to be searched is found. Or the specified program is not found in the program retrieval.		
Handling Method	Check data.		
Alarm Number	PS0072	Alarm messages	Program call error or M99 jump error, and modify the code
Analysis	M99 is used under commands or DNC that call multiple subprograms in the same block.		
Handling Method	Modify the program		
Alarm Number	PS0073	Alarm messages	Program number already in use
Analysis	There is program name that needs to be created in the program storage directory.		
Handling Method	Change program name.		
Alarm Number	PS0074	Alarm messages	Illegal program number
Analysis	Program number initial is not 'O' or exceeds the maximum range.		
Handling Method	Modify the program		
Alarm Number	PS0075	Alarm messages	Operation fails, without authority
Analysis	Insufficient authority to modify system parameters. Please enter password.		

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Handling Method	Enter the password		
Alarm Number	PS0076	Alarm messages	Address P is not defined or illegal
Analysis	Address P is lacked in the program block of M98, G65 and G66.		
Handling Method	Modify the program		
Alarm Number	PS0077	Alarm messages	Subprogram nesting error
Analysis	Subprogram calling nest exceeds 8 loops.		
Handling Method	Modify the program		
Alarm Number	PS0078	Alarm messages	No corresponding program number or sequence number is found
Analysis	The program number and sequence number specified by address P are not found in the program block of M98, M99, G65, or G66. The sequence number specified by GOTO statement is not found or the called program is edited in background editing.		
Handling Method	Modify the program or terminate background editing.		
Alarm Number	PS0079	Alarm messages	Lathe and milling machine cannot be switched directly
Analysis	Lathe and milling machine can be switched only when the system is in a reset state.		
Handling Method	Modify the program		
Alarm Number	PS0080	Alarm messages	The automatic measurement start position of the tool is in the deceleration position
Analysis	The start position of the tool measurement is incorrect.		
Handling Method	Modify the automatic measurement start position of the tool in the program.		
Alarm Number	PS0081	Alarm messages	No compensation number found in G37
Analysis	Tool compensation number is not specified prior to execution of G37 command.		
Handling Method	Modify the program		
Alarm Number	PS0082	Alarm messages	Commanding H code is not allowed in G37
Analysis	H code and G37 command cannot be specified on the same line.		

Handling Method	Modify the program		
Alarm Number	PS0083	Alarm messages	Illegal axis command in G37
Analysis	In automatic tool length measurement, an invalid axis is specified or the command is an incremental value.		
Handling Method	Modify the program		
Alarm Number	PS0084	Alarm messages	G37 without arrival signal
Analysis	In the automatic tool compensation function, the measurement position arrival signal is not output within the range assigned by the parameter.		
Handling Method	Perform the correct setting and operation.		
Alarm Number	PS0085	Alarm messages	Communication error
Analysis	The setting or input/output device of input data bits or baud rate is incorrect.		
Handling Method	Check setting of communication software or line		
Alarm Number	PS0086	Alarm messages	The second storage travel detection boundary assigned by G22 is incorrect
Analysis	The negative limit value is greater than the positive limit value in the second travel detection.		
Handling Method	Modify the program		
Alarm Number	PS0087	Alarm messages	Spiral or conical interpolation command is incorrect
Analysis	L or Q or H parameter in interpolation command is incorrect.		
Handling Method	Check the program and modify the appropriate parameter value.		
Alarm Number	PS0090	Alarm messages	Illegal G107 command
Analysis	The condition to create or cancel cylindrical interpolation is incorrect.		
Handling Method	Modify the program		
Alarm Number	PS0091	Alarm messages	Code that is not allowed is assigned in G107
Analysis	Code that is not allowed is commanded in cylindrical interpolation mode.		

	Please refer to the "Limitations and precautions" section for G07.1 command in the Programming and Operation Manual for details about available G-codes.		
Handling Method	Modify the program		
Alarm Number	PS0092	Alarm messages	G107 does not end normally or the tool compensation is not cancelled normally
Analysis	G107 cylindrical interpolation does not end normally.		
Handling Method	Modify the program		
Alarm Number	PS0093	Alarm messages	Fixed cycle command cannot be specified under G05
Analysis	Fixed cycle command is used in the program that G05 command takes effect.		
Handling Method	Modify the program		
Alarm Number	PS0094	Alarm messages	Another program call is not allowed in G66 modal
Analysis	Another subprogram call is not allowed in G66 modal.		
Handling Method	Modify the program		
Alarm Number	PS0095	Alarm messages	The polygon turning tool axis needs to be set to the rotation axis
Analysis	The polygon turning tool axis needs to be set to the rotation axis.		
Handling Method	The axis number set by parameter 7610 must be set to 1 in parameter 1023.1.		
Alarm Number	PS0096	Alarm messages	The polygon cutting command is incorrect
Analysis	In the polygon turning mode, G51.2 is repeatedly commanded.		
Handling Method	Modify the program		
Alarm Number	PS0097	Alarm messages	G51.2 has no P/Q or command value is out of range
Analysis	There is no P/Q command or command value is out of range in G52.1.		
Handling Method	Both P and Q are commanded in G51.2, and it is ensured that the spindle command speed*Q/P is less than parameter #7621		
Alarm Number	PS0100	Alarm messages	The positioning spindle address and other axis movement commands are in the same program block
Analysis	The positioning spindle address set by the parameter cannot be in the same program block with other axis movement addresses.		

Handling Method	Modify the program		
Alarm Number	PS0101	Alarm messages	The specified data is out of valid range
Analysis	The relevant data is out of range assigned by the system.		
Handling Method	Modify the program		
Alarm Number	PS0102	Alarm messages	The withdrawal length at the end of thread is greater than the thread machining length of the long axis
Analysis	The withdrawal length at the end is greater than the thread machining length.		
Handling Method	Modify the program		
Alarm Number	PS0103	Alarm messages	Illegal thread command
Analysis	The number of imperial thread teeth is 0 or too large.		
Handling Method	Modify the program		
Alarm Number	PS0104	Alarm messages	There is interference at the start point of the program
Analysis	There is interference in the machining path.		
Handling Method	Modify the program		
Alarm Number	PS0105	Alarm messages	The fixed cycle specifies the same contour end point as the start point
Analysis	Fixed cycles G90, G92, G94 cannot have the same contour end point as the start point.		
Handling Method	Modify the program		
Alarm Number	PS0106	Alarm messages	R specified by fixed cycle does not constitute enclosure with the end point and start point
Analysis	The programming path does not form enclosure.		
Handling Method	Modify the program		
Alarm Number	PS0107	Alarm messages	Direct drawing dimension programming command format is incorrect
Analysis	Graphic dimension programming format is incorrect.		
Handling Method	Modify the program		

Alarm Number	PS0108	Alarm messages	Illegal condition in polar coordinate interpolation
Analysis	The condition is incorrect when polar coordinate interpolation starts or is cancelled:		
	1) Commands G12.1 and G13.1 are not specified in a separate program block.		
	2) G12.1/G13.1 is not commanded in tool nose radius compensation cancellation mode (G40).		
	3) G-code restricted by G12.1/G13.1 is used.		
	4) Plane selection command is executed in G12.1 mode.		
	5) Parameters No.5460 and No.5461 are defined incorrectly.		
	6) T command is executed in polar coordinate interpolation mode and must be issued before polar coordinate interpolation begins.		
Handling Method	Check the above conditions and modify the program or parameter value.		
Alarm Number	PS0109	Alarm messages	G161 command format error
Analysis	G161 format or parameter is incorrect.		
Handling Method	Modify format or parameter value.		
Alarm Number	PS0111	Alarm messages	Operational data overflow
Analysis	The results of the calculation are out of range allowed by the system.		
Handling Method	Modify the program		
Alarm Number	PS0112	Alarm messages	Divided by zero
Analysis	The specified divisor is zero (including tan 90°).		
Handling Method	Modify the program		
Alarm Number	PS0113	Alarm messages	Incorrect macro command
Analysis	Function commands that cannot be used are specified in the user macro program.		
Handling Method	Modify the program		
Alarm Number	PS0114	Alarm messages	Macro program expression format error
Analysis	Macro program expression format is incorrect.		
Handling Method	Modify the program		

Alarm Number	PS0115	Alarm messages	Illegal variable number is specified
Analysis	The macro variable 3000 assignment expression is out of range.		
Handling Method	Modify the program		
Alarm Number	PS0116	Alarm messages	There are no operands in the macro program expression
Analysis	Valid operands are required to be filled in macro program expression.		
Handling Method	Modify the program		
Alarm Number	PS0118	Alarm messages	Macro program bracket nesting is incorrect
Analysis	The bracket nesting in macro program exceeds the upper limit.		
Handling Method	Modify the program		
Alarm Number	PS0119	Alarm messages	Illegal macro variable number
Analysis	Value that cannot be used as variable number is used in the user macro program.		
Handling Method	Modify the program		
Alarm Number	PS0123	Alarm messages	Macro command is used in DNC
Analysis	There is macro command in the program that performs DNC machining.		
Handling Method	Modify the program		
Alarm Number	PS0124	Alarm messages	DO-END is not corresponded one to one
Analysis	In the macro program statement, DO-END is not corresponded one to one.		
Handling Method	Modify the program		
Alarm Number	PS0126	Alarm messages	Number of illegal cycles
Analysis	The number of cycles after DO-END is incorrect.		
Handling Method	Modify the program		
Alarm Number	PS0127	Alarm messages	NC command and macro program command are in the same block
Analysis	NC command and macro program command statement coexist.		

Handling Method	Modify the program		
Alarm Number	PS0128	Alarm messages	Illegal macro program sequence number
Analysis	The sequence number in the branch command is out of range assigned by the system or not retrieved.		
Handling Method	Modify the program		
Alarm Number	PS0129	Alarm messages	Macroprogram jump command cannot go with other commands
Analysis	The macro program jump command and other commands are in the same program block.		
Handling Method	Modify the program		
Alarm Number	PS0135	Alarm messages	Illegal angle command
Analysis	The indexing angle of the indexing worktable is not a multiple of the angle unit.		
Handling Method	Modify the program		
Alarm Number	PS0136	Alarm messages	Illegal axis command
Analysis	In the indexing of indexing worktable, the other axis is commanded together with B-axis.		
Handling Method	Modify the program		
Alarm Number	PS0140	Alarm messages	Incorrect program block address is specified in multiple cycles
Analysis	The starting program block number is greater than the ending program block number or there is no specified program block number.		
Handling Method	Modify the program		
Alarm Number	PS0141	Alarm messages	Incorrect G (or M) code is specified in multiple cycles
Analysis	G-code that is not allowed is specified in multiple cycles.		
Handling Method	Modify the program		
Alarm Number	PS0142	Alarm messages	Too many program blocks are specified in multiple cycles
Analysis	The number of program blocks specified in the multiple cycles is out of the range specified by the system.		

Handling Method	Modify the program		
Alarm Number	PS0143	Alarm messages	Coordinate monotonicity in multiple cycles is incorrect
Analysis	X or Z monotonicity (unidirectional increase or decrease) in multiple cycles is incorrect.		
Handling Method	Modify the program		
Alarm Number	PS0144	Alarm messages	The first program block format of multiple cycles is incorrect
Analysis	Illegal code is specified in the starting program block of multiple cycles.		
Handling Method	Modify the program		
Alarm Number	PS0145	Alarm messages	Code format in multiple cycles is incorrect
Analysis	The machining path enters an abnormal state in multiple cycles.		
Handling Method	Modify the program		
Alarm Number	PS0146	Alarm messages	Machining path shape incorrect
Analysis	The machining path shape is incorrect in multiple cycles.		
Handling Method	Modify the program		
Alarm Number	PS0147	Alarm messages	The specified circular arc cannot be roughed
Analysis	Circular arc command is not allowed in rough machining.		
Handling Method	Modify the program		
Alarm Number	PS0148	Alarm messages	P/Q value is not specified (or specified as 0)
Analysis	Specified P/Q is illegal.		
Handling Method	Modify the program		
Alarm Number	PS0149	Alarm messages	The tool retraction amount is greater than infeed amount
Analysis	The tool retraction amount is greater than infeed amount.		
Handling Method	Modify the program		

Alarm Number	PS0150	Alarm messages	Illegal tool group number
Analysis	No tool number given or illegal tool number obtained.		
Handling Method	Check whether the tool given by the program is correct.		
Alarm Number	PS0154	Alarm messages	G51.1, G51, G68 cannot be in the same block
Analysis	G51.1, G51, G68 cannot be in the same program block.		
Handling Method	Modify the program		
Alarm Number	PS0155	Alarm messages	G51 can only take P parameter in G110-G137 modal
Analysis	G51 command can only take P parameter in G110-G137 special fixed cycle modal.		
Handling Method	Modify the program		
Alarm Number	PS0156	Alarm messages	(null)
Analysis			
Handling Method			
Alarm Number	PS0157	Alarm messages	The plane vector of the characteristic coordinate system is 0
Analysis	The plane vector of the characteristic coordinate system is 0.		
Handling Method	Modify the program		
Alarm Number	PS0158	Alarm messages	Machine type is not supported
Analysis	Machine type is not supported.		
Handling Method	Modify parameter 8010.		
Alarm Number	PS0160	Alarm messages	Level specification is incorrect
Analysis	Level for NURBS interpolation is incorrect.		
Handling Method	Modify P value.		
Alarm Number	PS0161	Alarm messages	Node has not been specified
Analysis	NURBS interpolation does not specify node.		

Handling Method	Modify the program		
Alarm Number	PS0162	Alarm messages	Node specification is incorrect
Analysis	Node range specified by NURBS interpolation is incorrect.		
Handling Method	Modify the program		
Alarm Number	PS0163	Alarm messages	Too many axes specified
Analysis	Extra axes are specified in the NURBS interpolation.		
Handling Method	Modify the program		
Alarm Number	PS0164	Alarm messages	The interpolation method that cannot be used simultaneously in NURBS interpolation method is specified
Analysis	The interpolation method that cannot be used simultaneously is specified in NURBS interpolation.		
Handling Method	Modify the program		
Alarm Number	PS0165	Alarm messages	G68.2 not found
Analysis	When specifing G53.1, it is found that it is not G68.2, G68.3, G68.4 modals.		
Handling Method	Modify the program		
Alarm Number	PS0166	Alarm messages	E, K in G124/G125 are undefined or 0
Analysis	The number of holes E on side 1, 3 and that of holes K on side 2, 4 in G124/G125 are undefined or 0.		
Handling Method	Modify the program		
Alarm Number	PS0167	Alarm messages	The program code in the same block is unreasonable. Please write it in blocks
Analysis	Program codes that cannot coexist is used in the same program block.		
Handling Method	Modify the program		
Alarm Number	PS0170	Alarm messages	Fixed cycle drilling G73-G89 needs to be defined
Analysis	No fixed cycle drilling method G73-G89 is defined in G120-G125 continuous drilling cycles.		

Handling Method	Fixed cycle drilling method G73-G89 is added in G120-G125 continuous drilling cycles.		
Alarm Number	PS0171	Alarm messages	I is not defined or I is 0
Analysis	"I" is undefined or 0 in G110-G137 special fixed cycle.		
Handling Method	Modify the program to add I or make I not 0.		
Alarm Number	PS0172	Alarm messages	J is undefined or 0
Analysis	J is undefined or 0 in G110-G137 special fixed cycle.		
Handling Method	Modify the program to add J or make J not 0.		
Alarm Number	PS0173	Alarm messages	W is too small or undefined
Analysis	W is undefined or 0 in the rough milling cycle.		
Handling Method	Modify the program to add W or make W not 0.		
Alarm Number	PS0174	Alarm messages	Q is too small or undefined
Analysis	Q is undefined or 0 in the rough milling cycle.		
Handling Method	Modify the program to add Q or make Q not 0.		
Alarm Number	PS0175	Alarm messages	L is too small or undefined
Analysis	L is undefined or too small in the G110-G137 special fixed cycle and G126 plane milling.		
Handling Method	Modify the program to add L or increase the value of L.		
Alarm Number	PS0176	Alarm messages	V is too small or undefined
Analysis	V is undefined or 0 in the rough milling cycle.		
Handling Method	Modify the program to add V or make V not 0.		
Alarm Number	PS0178	Alarm messages	I and J are too small or tool radius is too large
Analysis	I and J are too small or tool radius is too big in G110-G137 special fixed cycle.		
Handling Method	Modify the program so that I and J increase or tool is changed.		

Alarm Number	PS0179	Alarm messages	L is too big
Analysis	L is too big in rough milling cycle.		
Handling Method	Modify the program to reduce L.		
Alarm Number	PS0180	Alarm messages	U is smaller than D
Analysis	U is greater than D in the rectangular rough milling cycle.		
Handling Method	Modify the program so that U is smaller than or equal to D.		
Alarm Number	PS0181	Alarm messages	The number of holes in special fixed cycle is zero or does not exist
Analysis	The number of holes is zero or does not exist in G120-G125 continuous drilling cycle.		
Handling Method	Modify the program to add the number of holes parameter or make it not 0.		
Alarm Number	PS0183	Alarm messages	Special fixed cycle can only be performed in G17 plane
Analysis	G110-G137 special fixed cycle and G120-G125 continuous drilling cycle can only be performed in G17 plane.		
Handling Method	Modify the program to G17 plane.		
Alarm Number	PS0185	Alarm messages	Corner radius U is too big or I and J are too small
Analysis	U is too big or both I and J are too small in G130-G137 rectangular milling groove cycle.		
Handling Method	Modify the program so that U decreases or I and J increase.		
Alarm Number	PS0186	Alarm messages	U value is less than tool radius
Analysis	U value is less than tool radius in rectangle inner precision milling cycle.		
Handling Method	Modify the program so that U increases or tool is changed.		
Alarm Number	PS0187	Alarm messages	I and J are too small or L is too big
Analysis	I and J are too small or L is too big in G110-G137 special fixed cycle.		
Handling Method	Modify the program so that I and J increase or L decreases.		
Alarm Number	PS0189	Alarm messages	Special fixed cycle cannot specify G68G51G16G51.1

Appendix

Analysis	Specification of G68 G51 G16 G51.1 is not allowed in special fixed cycle.		
Handling Method	Modify the program		
Alarm Number	PS0200	Alarm messages	Algorithm protection error 0
Analysis	Forward-looking structure NC code is full.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0201	Alarm messages	Algorithm protection error 1
Analysis	Greater than the maximum speed change in a cycle. The amount of speed change exceeds the set value of parameter 1501.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0202	Alarm messages	Algorithm protection error 2
Analysis	Greater than the speed of the last cycle in the acceleration phase.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0203	Alarm messages	Algorithm protection error 3
Analysis	Greater than the speed of the first cycle in the deceleration phase.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0204	Alarm messages	Machine structure parameter setting error
Analysis	Such machine mechanism does not exist or is temporarily not supported by the system		
Handling Method	Please refer to 5-axis machining parameter of the instruction, and fill in the machine mechanism parameters		
Alarm Number	PS0207	Alarm messages	Algorithm protection error 7
Analysis	Greater than program block length.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0210	Alarm messages	Algorithm protection error 10
Analysis	The number of adjusted acceleration cycles is greater than that of original acceleration cycles.		

Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0211	Alarm messages	Algorithm protection error 11
Analysis	The number of adjusted deceleration cycles is greater than that of original deceleration cycles.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0212	Alarm messages	Algorithm protection error 12
Analysis	Total number of cycles after adjustment ≤ 0.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0215	Alarm messages	Algorithm protection error 15
Analysis	Greater than joining speed		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0216	Alarm messages	Algorithm protection error 16
Analysis	Greater than the maximum allowable speed.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0217	Alarm messages	Algorithm protection error 17
Analysis	Greater than the block header speed		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0218	Alarm messages	Algorithm protection error 18
Analysis	Calculation error.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0219	Alarm messages	Algorithm protection error 19
Analysis	In the exit phase, the condition is not met.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		

Alarm Number	PS0221	Alarm messages	G-code transmission error
Analysis	System protective alarm.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0222	Alarm messages	Transmission plane error
Analysis	System protective alarm.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0224	Alarm messages	Algorithm protection error 24
Analysis	Maximum acceleration error.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0225	Alarm messages	Algorithm protection error 25
Analysis	Total interpolation cycle error.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0226	Alarm messages	No reference point return
Analysis	This alarm is given when running the program because the system zero is lost in the machine with the stop homing after shut-down or there is an emergency stop and servo alarm.		
Handling Method	Reference point return again.		
Alarm Number	PS0230	Alarm messages	Rigid tapping VPO signal is invalid
Analysis	In the rigid tapping process, the spindle servo position mode is cancelled.		
Handling Method	Check spindle servo.		
Alarm Number	PS0231	Alarm messages	Machine lock cancelled
Analysis	In the machine lock state, the program is run or the axis is moved, and then the machine lock is cancelled.		
Handling Method	The machine with block homing needs to home, while that without stop homing needs to be directly reset.		
Alarm Number	PS0232	Alarm messages	Emergency stop alarm

Analysis	In case of emergency, the emergency stop button is pressed to prohibit the machine from running.		
Handling Method	Release the emergency stop button after troubleshooting.		
Alarm Number	PS0233	Alarm messages	Performing positioning error
Analysis	System protective alarm.		
Handling Method	Rerun after reset cancellation alarm or contact support personnel.		
Alarm Number	PS0234	Alarm messages	Decoding and interpolation communication error
Analysis	System protective alarm.		
Handling Method	Rerun after reset cancellation alarm or contact support personnel.		
Alarm Number	PS0235	Alarm messages	Algorithm protection error 35
Analysis	The number of Nurbs blocks exceeds the maximum limit.		
Handling Method	Rerun after reset cancellation alarm or contact support personnel.		
Alarm Number	PS0236	Alarm messages	The tapping spindle speed is zero
Analysis	Spindle speed is not set before tapping.		
Handling Method	Check whether the spindle speed is set in the program.		
Alarm Number	PS0237	Alarm messages	Algorithm protection error 37
Analysis	Nurbs interpolation calculation error.		
Handling Method	Rerun after reset cancellation alarm or contact support personnel.		
Alarm Number	PS0238	Alarm messages	G27 reference point return detection error
Analysis	Reference point return detection position is not at the reference point position.		
Handling Method	Check whether the program command position is consistent with the reference point position.		
Alarm Number	PS0239	Alarm messages	Running too long, out of range of system counter
Analysis	System protective alarm.		
Handling Method	Rerun after reset cancellation alarm or contact support personnel.		
Alarm Number	PS0240	Alarm messages	Second travel detection forbidden area

Analysis	The current position of the system indicates the second travel detection forbidden area.		
Handling Method	Check whether the program commands entry into the second travel detection forbidden area.		
Alarm Number	PS0241	Alarm messages	Third travel detection forbidden area
Analysis	The current position of the system indicates the third travel detection forbidden area.		
Handling Method	Check whether the program commands entry into the third travel detection forbidden area.		
Alarm Number	PS0243	Alarm messages	Spindle speed is zero
Analysis	The spindle speed is not commanded in per rotation feed modal.		
Handling Method	Check whether the spindle speed is set in the program.		
Alarm Number	PS0244	Alarm messages	Performing illegal operation in G88 boring
Analysis	In G88 modal, there is no operating mode returning to the original after switching to operating mode.		
Handling Method	Operating again after returning to the original operating mode.		
Alarm Number	PS0245	Alarm messages	Arithmetic protection error 45
Analysis	A speed less than 0 is interpolated.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0246	Alarm messages	Algorithm protection error 46
Analysis	A remaining time less than 0 is interpolated.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0247	Alarm messages	Algorithm protection error 47
Analysis	A distance less than 0 is interpolated.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0248	Alarm messages	Algorithm protection error 48
Analysis	The interpolation distance is inconsistent with the remaining distance.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0249	Alarm messages	Algorithm protection error 49

Analysis	Interpolation exceeds the linkage speed.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0250	Alarm messages	Algorithm protection error 50
Analysis	The actual interpolation position is greater than the interpolation distance.		
Handling Method	Rerun after reset cancellation alarm; or contact support personnel.		
Alarm Number	PS0252	Alarm messages	The thread cutting speed is greater than the maximum allowable speed
Analysis	The resultant speed of thread turning is greater than the set value of parameter #1224[maximum cutting feed resultant speed].		
Handling Method	Modify the program to reduce thread pitch or spindle speed; or raise the set value of parameter #1224.		
Alarm Number	PS0253	Alarm messages	Thread cutting spindle speed is zero
Analysis	The thread machining is not allowed when the spindle is not rotating.		
Handling Method	Modify the program to command spindle rotation before thread cutting.		
Alarm Number	PS0254	Alarm messages	The deviation of the thread cutting spindle speed is too large
Analysis	During thread cutting, the deviation between the actual speed of the spindle and the commanded speed is too large, and the thread machining is not allowed.		
Handling Method	Check whether the spindle parameters are set correctly, and reduce the deviation between the actual spindle speed and the commanded speed		
	The following specific processing methods can be added:		
	(1) When the spindle has a transmission ratio, check the following parameters:		
	#5359:2 [Spindle feedback angle takes the second code disc]		
	#5000.4 ASFS: 0 [Whether the spindle feedback speed considers the gear ratio 0: Yes/1: No].		
	(2) When the spindle has no transmission ratio, check the following parameters:		
	Check whether the gear ratio setting parameter is 1 (#5160~#5168)		
	Check whether parameter #5108 [Pulses per encoder revolution] is set correctly, and confirm whether the angle of diagnosis #206 is within the range of 0~360 degrees.		
Alarm Number	PS0255	Alarm messages	The fluctuation of the thread cutting spindle speed is too large
Analysis	During thread cutting, the actual speed of the spindle fluctuates too much, and the thread machining is not allowed.		
Handling Method	Adjust the spindle parameters to reduce the spindle fluctuation.		
Alarm Number	PS0256	Alarm messages	The thread cutting cannot detect a starting point

Analysis	During thread cutting, the starting point cannot be detected, and the thread processing is not allowed.		
Handling Method	Check the one revolution signal of the spindle.		
Alarm Number	PS0257	Alarm messages	Varying pitch could not be switched as dry running under processing
Analysis	Varying pitch could not be switched as dry running under processing		
Handling Method	Rerun after reset cancellation alarm		
Alarm Number	PS0270	Alarm messages	Wrong parameters setting for the shape parameter of the chuck
Analysis	An alarm will be given when the length of the chuck jaw is less than or equal to the clamping length or the radius of the chuck jaw is less than or equal to the clamping height difference.		
Handling Method	Modify the parameters to ensure that #1102 is greater than #1104 and #1103 is greater than #1105.		
Alarm Number	PS0271	Alarm messages	Wrong parameters setting for the shape parameter of the tailstock
Analysis	The diameter (2) of the tailstock is smaller than or equal to its aperture (3), with an alarm given.		
Handling Method	Modify the parameters to ensure that #116 is greater than #1117.		
Alarm Number	PS0272	Alarm messages	Overlapped position of the chuck and the nose
Analysis	The position of the chuck is greater than that of the tailstock, causing the chuck to overlap with the top position.		
Handling Method	Modify the parameters to ensure that #1107 is smaller than or equal to #1118.		
Alarm Number	PS0278	Alarm messages	Maximum speed of super spindle
Analysis	In rigid tapping, the maximum speed set by the spindle speed over-parameter (#2140~#2143).		
Handling Method	Reduce the spindle speed during tapping or modify the parameter value (#2140~#2143).		
Alarm Number	PS0279	Alarm messages	The positioning spindle cannot be in the same block with other movement commands
Analysis	In the spindle positioning, the other spindles cannot have the movement command at the same time.		
Handling Method	Spindle positioning and other axis movement commands are separated into two blocks.		
Alarm Number	PS0280	Alarm messages	Waiting M-code mismatched
Analysis	Waiting M-codes specified by the two channels are not equal.		
Handling Method	Modify the program so that the waiting M-codes specified by the two channels are between parameters #920 and #921 and equal.		

Alarm Number	PS0300.0	Alarm messages	Error in initiated communication alarm
Analysis	Initialization communication alarm error. Handling method: The setting of parameters 221-228 is not consistent with the actual connection or has a connection error, and there is a hardware port problem		
Handling Method	Set parameters correctly; replace hardware.		
Alarm Number	PS0300.1	Alarm messages	Error in initiated communication alarm
Analysis	A communication alarm error occurred during normal communication.		
Handling Method	Handling method: Check the connection and improve the anti-interference capability		
Alarm Number	PS0301	Alarm messages	After the communication becomes normal, the slave station has a C1D error alarm
Analysis	Sub-station alarm. Please refer to the GR drive manual		
Handling Method	Power off and then restart after solving the slave station alarm.		
Alarm Number	PS0311.10	Alarm messages	Error in system communication figuration parameter
Analysis	Error in detection code of communication parameter read initially.		
Handling Method	Error in detection code of communication parameter read initially. Restart or replace hardware.		
Alarm Number	PS0311.2	Alarm messages	Error in system communication figuration parameter
Analysis	There is an error in the communication parameter data, and an alarm is generated for any error in the communication cycle/number of slave stations/number of servers/number of spindles/number of I/O. Modify parameters.		
Handling Method	Modify parameter 221-228		
Alarm Number	PS0312.1	Alarm messages	Communication validation error
Analysis	Error in detection code of data communication of parameter from interface to control, hardware failure		
Handling Method	Replace mainboard if failure still occurs after restart.		
Alarm Number	PS0312.2	Alarm messages	Communication validation error
Analysis	Error in detection code of data communication of parameter from interface to control, hardware failure		

Handling Method	Replace the main board		
Alarm Number	PS0313	Alarm messages	Error in reading real time data initially.
Analysis	There is an error in reading real time data/core data initially. Restart when such error appears after the first upgrade of system. It is a hardware failure.		
Handling Method	Replace mainboard if failure still occurs after restart.		

1.2 Servo and position control alarm (PV alarm)

Alarms prior to PV0~109 are drive alarms. Please refer to GR manual for more details

Alarm Number	PV110	Sub-alarm signal		Alarm messages	Servo speed command is abnormal.
Analysis	PID regulation speed command exceeds the allowable set value, and the diagnosis 102 displays the maximum command speed value.				
Solutions	1. Confirm whether the position gain setting parameter 4009 is too big. 2. Confirm whether parameter 4254 is set correctly. 3. Confirm whether the command of position loop and bit 5 and 6 of 4003 in feedback direction are correct.				
Alarm Number	PV112	Sub-alarm signal		Alarm messages	Servo axis does not exist
Analysis	An alarm is given when invalid servo axis moves, and diagnosis 133 displays whether the servo axis is valid.				
Solutions	1. Set 4000#0 to 1 to ignore this alarm. 2. Confirm whether parameter 225/226 is set correctly.				
Alarm Number	PV113	Sub-alarm signal	Axis Name	Alarm messages	Coordinate update handshake timeout
Analysis	An error occurs in the system's internal data interaction and reply.				
Solutions	Power off and restart.				
Alarm Number	PV114	Sub-alarm signal		Alarm messages	Synchronous mode command is illegal
Analysis	1. Shield the slave axis under synchronous control. 2. Change the synchronous control mode in the movement process. 3. Move the slave axis in manual, MPG and return-to-zero mode. 4. PLC axis control and synchronous axis control are selected at the same time.				
Solutions	Operate correctly				
Alarm Number	PV115	Sub-alarm signal		Alarm messages	Synchronization error for positional deviation is too large
Analysis	The difference between the master and slave position deviations controlled synchronously is too large. Parameter 4023 is the set allowable value and is invalid when being set to 0. Diagnosis 141 displays the actual deviation error value.				

Solutions	Correctly set parameters and solve mechanical problems.				
Alarm Number	PV116	Sub-alarm signal	2	Alarm messages	Synchronization error of machine coordinate is too large
Analysis	The difference between master and slave machine coordinates controlled synchronously is too large. Parameter 4022 is the set allowable value and is invalid when being set to 0. Diagnosis 140 displays the actual deviation error value.				
Solutions	Correctly set parameters and solve mechanical problems.				
Alarm Number	PV119	Sub-alarm signal		Alarm messages	Synchronous torque difference limit alarm
Analysis	The difference between master and slave torques controlled synchronously is too large. Parameter 4025 is the set allowable value and is invalid when being set to 0. Diagnosis 142 displays the actual error value.				
Solutions	Correctly set parameters and solve mechanical problems.				
Alarm Number	PV120	Sub-alarm signal		Alarm messages	The axis control command of NC competes with that of PLC
Analysis	Temporarily ineffective.				
Solutions					
Alarm Number	PV121	Sub-alarm signal		Alarm messages	No change to PLC control axis
Analysis	An alarm will be given when it is switched to NC axis in PLC axis control operation.				
Solutions	Operate correctly				
Alarm Number	PV122	Sub-alarm signal	January 2	Alarm messages	Servo not returning to zero
Analysis	When 4001#APZ is zero, it will give an alarm upon the PLC axis control motion command.				
Solutions	Manually return to zero first.				
Alarm Number	PV123	Sub-alarm signal		Alarm messages	System position command is illegal
Analysis	An alarm will be given when the system command position cycle difference is greater than the value set by 4112 parameter. Diagnosis 128 displays the maximum command difference.				
Solutions	Power off and restart.				
Alarm Number	PV124	Sub-alarm signal		Alarm messages	Increment raster axis not reference point return error
Analysis	An alarm will be given when the axis moves without manually homing after increment raster control setting is valid.				
Solutions	Manually return to zero first.				
Alarm Number	PV125	Sub-alarm signal		Alarm messages	This raster scale equipment does not exist
Analysis	Set the 200 cycle length parameter to 16.				

Solutions	Set parameters correctly.				
Alarm Number	PV126	Sub-alarm signal		Alarm messages	The difference between the grating coordinate and the encoder coordinate exceeds the allowable value
Analysis	Parameter 4115 is the allowable setting value. When it is set to 0, the alarm is ignored (for safety reasons, it is generally not set to 0); the diagnosis 145 is the coordinate value of the feedback grating, the diagnosis 146 is the difference of the coordinate values of grating and code disk, and the diagnosis 147 is the original grating feedback value.				
Solutions	Set parameters correctly and solve mechanical problems.				
Alarm Number	PV128	Sub-alarm signal		Alarm messages	System servo data error, and reset zero
Analysis	An alarm will be given when single-turn/multi-turn zero offset value is greater than or equal to the set value. Diagnosis 115/116 is a multi-turn/single-turn value, and diagnosis 151/152 is a current multi-turn/single-turn offset value.				
Solutions	Reset 4001#APZ machine zero resolution.				
Alarm Number	PV129	Sub-alarm signal		Alarm messages	Axis running alarm when servo is disconnected
Analysis	In the case of disconnected servo axis, an alarm will be given for axis operation. Diagnosis 16 shows whether the servo axis is disconnected.				
Solutions	Operate correctly				
Alarm Number	PV131	Sub-alarm signal		Alarm messages	Motion position out-of-tolerance
Analysis	When the position difference between the command and the feedback exceeds the maximum value set by parameter 4112, appropriately increase the value of parameter #4112; the alarm under abnormal conditions needs to observe the diagnostic parameters so as to make a comprehensive judgment, which may be caused by the unreasonable setting of other parameters.				
Solutions	Set parameters correctly and solve mechanical problems.				
Alarm Number	PV132	Sub-alarm signal		Alarm messages	The static position is out of tolerance, and the emergency stop can clear the alarm
Analysis	When the position difference between the command and the feedback exceeds the maximum value set by parameter 4111, appropriately increase the value of parameter #4111; the alarm under abnormal conditions needs to observe the diagnostic parameters so as to make a comprehensive judgment, which may be caused by the unreasonable setting of other parameters.				
Solutions	Set parameters correctly and solve mechanical problems.				
Alarm Number	PV133	Sub-alarm signal		Alarm messages	Torque deviation is too large under servo torque control
Analysis	The torque deviation is too large under servo torque control.				

Appendix

Solutions	Set parameters correctly and solve mechanical problems.				
Alarm Number	PV134	Sub-alarm signal		Alarm messages	The current homing position of the increment raster is illegal
Analysis	The position of return to zero is incorrect.				
Solutions	Return to zero away from block				
Alarm Number	PV135	Sub-alarm signal		Alarm messages	Servo feedback position is illegal
Analysis	The encoder data feedback is abnormal, resulting in excessive error in two adjacent cycles.				
Solutions	Replace hardware.				
Alarm Number	PV0140	Sub-alarm signal		Alarm messages	Homing is abnormal
Analysis	The n^{th} axis cannot be returned to the exact position during homing.				
	Enter the n^{th} axis pitch parameter correctly or adjust reference point return block position.				
Solutions	Set parameters correctly.				
Alarm Number	PV0141	Sub-alarm signal		Alarm messages	Positive soft limits
Analysis	The machine coordinate exceeds or equals to the set value of the n^{th} axis soft limit in system parameter #1081. Move the n^{th} axis in the reverse direction away from the position set by parameter #1081.				
Solutions	Move the n^{th} axis in the reverse direction away from the position set by parameter #1081.				
Alarm Number	PV0142	Sub-alarm signal		Alarm messages	Negative soft limits
Analysis	The machine coordinate exceeds or equals to the set value of the n^{th} axis soft limit in system parameter #1081.				
Solutions	Move the n^{th} axis in the forward direction away from the position set by parameter #1081.				
Alarm Number	PV0143	Sub-alarm signal		Alarm messages	Forward hard over-travel
Analysis	The n^{th} axis forward limit switch is pressed to the limit block.				
Solutions	The n^{th} axis moves in the reverse direction away from the limit block position.				
Alarm Number	PV0144	Sub-alarm signal		Alarm messages	Reverse hard over-travel
Analysis	The nth axis reverse limit switch is pressed to the limit block.				
Solutions	The n^{th} axis moves in the forward direction away from the limit block position				

1.3 Spindle alarm (PD alarm)

Alarms prior to PD0~109 are drive alarms. Please refer to the GR manual for more details.

Alarm Number	PD110	Sub-alarm signal		Alarm messages	Spindle closed loop out-of-tolerance alarm
Analysis	Under analog spindle closed loop function and rigid tapping, the difference between command and feedback position exceeds the tapping difference set.				
Solutions	Correct the allowable value of static and dynamic out-of-tolerance of rigid tapping and check whether the setting parameters of spindle closed loop are appropriate.				
Alarm Number	PD111	Sub-alarm signal		Alarm messages	Spindle servo alarm
Analysis	It occurs when the spindle alarm function is valid and the spindle gives an alarm.				
Solutions	Identify the cause of the spindle alarm or whether the spindle alarm level parameters are appropriately.				
Alarm Number	PD112	Sub-alarm signal		Alarm messages	Spindle speed is abnormal
Analysis	When the spindle speed fluctuation check function is valid, the spindle speed fluctuation range exceeds the set value.				
Solutions	Check whether the set speed fluctuation detection parameters are appropriate and identify the cause of the spindle speed fluctuation.				
Alarm Number	PD113	Sub-alarm signal		Alarm messages	Broad allowable range of rigid tapping synchronization error is exceeded
Analysis	Under the valid analog spindle closed loop and rigid tapping, the synchronization error between spindle and tapping shaft exceeds the set allowable range.				
Solutions	Correct the synchronization error setting range or identify whether the setting parameters for the spindle and tapping shaft are appropriate.				

Appendix 2 Servo Drive Unit and Servo Motor Comparison Table

Motor comparison table of servo drive unit

Motor Code	Motor Model	Remark	Motor Code	Motor Model	Remark
101	60SJTR-MZ2003E(A4I)		146	130SJT-M075D(A4I)	
102	60SJTR-MZ2005E(A4I)		148	130SJT-M100B(A4I)	
104	80SJT-M024C(A4I)		150	130SJT-M100D(A4I)	
106	80SJT-M024E(A4I)		152	130SJT-M150B(A4I)	
108	80SJT-M032C(A4I)		154	130SJT-M150D(A4I)	
110	80SJTA-M032E(A4I)		156	130SJT-M050E(A4I)	
112	80SJTA-M024C(A4I)		158	130SJT-M060E(A4I)	
114	80SJTA-M024E(A4I)		160	130SJT-M075E(A4I)	
116	80SJTA-M032C(A4I)		162	130SJTE-M150D(A4I)	
118	80SJTA-M032E(A4I)		166	175SJT-M120E(A4I)	
120	110SJT-M020E(A4I)		168	175SJT-M150DA4I)	
122	110SJT-M040D(A4I)		170	175SJT-M180B(A4I)	
124	110SJT-M040E(A4I)		172	175SJT-M180D(A4I)	
126	110SJT-M060D(A4I)		174	175SJT-M220B(A4I)	
128	110SJT-M060E(A4I)		176	175SJT-M220D(A4I)	
140	130SJT-M040D(A4I)		178	175SJT-M300B(A4I)	
142	130SJT-M050D(A4I)		180	175SJT-M300D(A4I)	
144	130SJT-M060D(A4I)		182	175SJT-M380B(A4I)	
1200	130SJTG-M040GH(A4I)		1216	175SJTG-M220EH(A4I)	
1202	130SJTG-M050GH(A4I)		1218	175SJTG-M300EH(A4I)	
1204	130SJTG-M060GH(A4I)		1220	175SJTG-M380EH(A4I)	
1206	130SJTG-M075GH(A4I)		1222	175SJTG-M380BH(A4I)	
1208	130SJTG-M100GH(A4I)		1224	175SJTG-M380DH(A4I)	
1210	175SJTG-M120EH(A4I)		1226	175SJTG-M500BH(A4I)	
1212	175SJTG-M150EH(A4I)		1228	175SJTG-M500DH(A4I)	
1214	175SJTG-M180EH(A4I)				

Note: 1. When configuring A4II encoder motor, +100 is added before the motor model code corresponding to A4I; when configuring A6 encoder, +3000 is based on the A4II motor code; when configuring A7 encoder, the A4II motor code is +3000. On the basis of +4000, when configuring A9II encoder; on the basis of A4II motor code +5000, for example: 130SJTE-M150D (A4I) motor code is 162, then 130SJTE-M150D (A4II) is 262, 130SJTE-M150D (A6) It is 3262, 130SJTE-M150D (A7) is 4262, and 130SJTE-M150D (A9II) is 5262. This method is suitable for most

Appendix

motors, and some new motor codes should refer to the relevant servo drive manuals.

2. This method is for reference only, and the final correct motor code should refer to the list in the GR series manual.