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KBS/MG Series AC Servo Drive
User's Manual

Preface

- This Manual is the user manual for K/iK series products.

- To use this series of servo drivers correctly, please carefully read this Manual before use and keep this Manual properly for future reference. If this product is purchased for your customer, please send this product to the final user together with this Manual.

☆ Warm tips:

◇ For the user who uses this product for the first time, please carefully read this Manual. If there is any question regarding the function or performance of this product, please contact our technical support staff for help in order to use this product correctly.

◇ We have tried our best to improve the contents of this manual. However, if you find any problem in this Manual, please contact our technical support staff in time for us to make timely corrections.

◇ As we will constantly improve our servo driver products, we may make changes to the materials without prior notice.

Safety Precautions

Before product storage, installation, wiring, operation, check or maintenance, users must be familiar with and observe the following important notes to ensure safety during use of the product.

1. Electric Shock Injury Warning

Warning
When the servo driver is powered on, the machine casing should not be opened so as to avoid electric shock.
When the casing is opened, the servo driver should not be powered on so as to avoid electric shock resulting from exposed high voltage wire.
In maintenance of the driver, wait for at least five minutes after cutting off the power, and detect both ends of the high-voltage capacitor using a voltmeter. The maintaining operation is allowed only when it is confirmed that the safe voltage range is reached.
Power on only after reliable installation of the driver.
Servo driver and servo motor must be reliably grounded.
Do not touch the driver with wet hands for fear of electric shock.
Wrong voltage or power supply polarity may cause an explosion or operational accidents.
Ensure that the wire is properly insulated to avoid squeezing the wire and electric shock.

2. Warning of Damage to Equipment

Warning
Do not directly connect power to the U, V or W output ends of the driver for fear of damaging the driver.
The servo motor and servo driver should be directly connected. Do not connect the U, V or W output ends of the driver to any capacitive element (e.g. noise suppression filter, pulse interference limiter, etc.) for fear of improper work of the driver.
Connect the input end of the driver to a compliant power supply as required.
Please verify the correctness and reliability of the cable connections before energizing.
Please purchase and use motor as required, or damage to the driver or motor may occur.
The rated torque of the servo motor should be higher than the effective continuous load torque.
The ratio between the load inertia and servo motor inertia should be less than the

recommended value.

3. Fire Warring

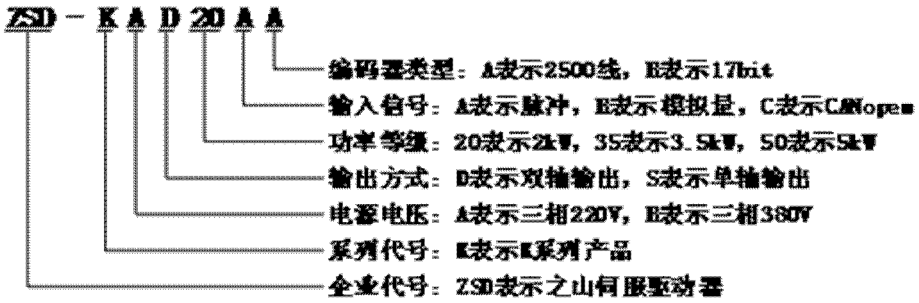
 Warning

Contents

Chapter I Function Overview

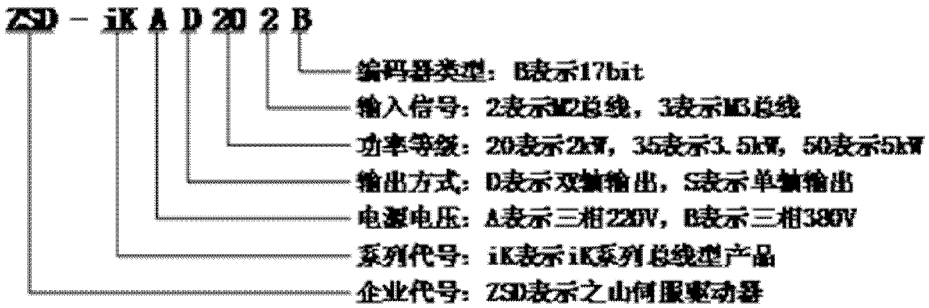
1.1 Description of Servo Driver Models

Naming rule of K series servo driver:



编码器类型：A 表示 2500 线，B 表示 17bit	Encoder type: A for 2500-line, B for 17 bit
输入信号：A 表示脉冲，B 表示模拟量，C 表示 CANopen	Input signal: A for pulse, B for analog quantity and C for CANopen
功率等级：20 表示 2kW，35 表示 3.5kW，50 表示 5kW	Power level: 20 for 2kW, 35 for 3.5kW and 50 for 5kW
输出方式：D 表示双轴输出，S 表示单轴输出	Output mode: D for dual axis output and S for single axis output
电源电压：A 表示三相 220V，B 表示三相 380V	Voltage: A for three-phase 220 V, and B for three-phase 380 V
系列代号：K 表示 K 系列产品	Series code: K for K series products
企业代号：MGD 表示之山伺服驱动器	Enterprise code: MGD for Zhishan Servo Driver

Naming rule of iK series bus servo driver:

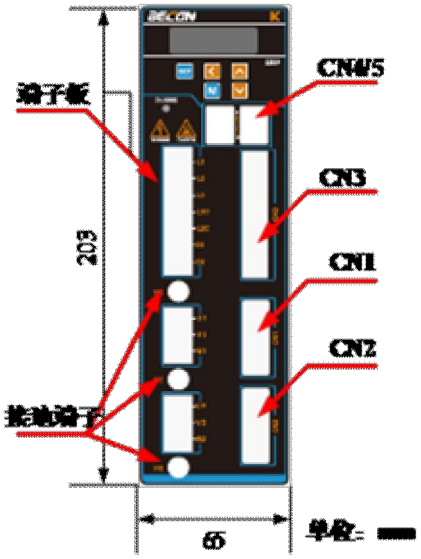


编码器类型：B 表示 17bit	Encoder: B for 17 bit
输入信号：2 表示 M2 总线，3 表示 M3 总线	Input signal: 2 for M2 bus, and 3 for M3 bus
功率等级：20 表示 2kW，35 表示 3.5kW，50 表示 5kW	Power level: 20 for 2kW, 35 for 3.5kW and 50 for 5kW
输出方式：D 表示双轴输出，S 表示单轴输出	Output mode: D for dual axis output and S for single axis output

电源电压：A 表示三相 220V，B 表示三相 380V	Voltage: A for three-phase 220 V, and B for three-phase 380 V
系列代号：iK 表示 iK 系列总线型产品	Series code: iK for iK series bus products
企业代号：MGD 表示之山伺服驱动器	Enterprise code: MGD for Zhishan Servo Driver

Note: 3.5kW and 5kW products are single axis products

1.2 External Dimension



端子板	Terminal board
接地端子	Earthing Terminal
单位：mm	Unit: mm

1.3 Basic Functions

Control mode		Position control, JOG running, speed contact, etc.
Encoder feedback		2500-line incremental standard and 17 bit incremental encoders
Use conditions	**Ambient/storage temperature**	Ambient temperature: 0~+50℃; storage temperature: -20~+85℃
	Ambient/storage humidity	Under 90%RH (no freezing or condensation)
	Vibration/impact resistance strength	4.9m/s^2/19.6m/s^2
Analog speed command input	**Command voltage**	DC±10V
	Input impedance	Appx. 20KΩ
Analog torque command input	**Command voltage**	DC±10V
	Input impedance	Appx. 20KΩ
IO input signal	**Point**	8 points
	Function (distributable)	Servo ON (/S-ON), P action (/P-CON), positive-side over travel disabled (P-OT), negative-side over travel disabled (N-OT), alarm reset (/ALM-RST), positive-side torque limit (/P-CL), negative-side torque limit (/N-CL), position deviation clear (/CLR), internal set speed switch, etc. Distribution of above signals and change of positive/negative logics are available
IO output	**Point**	6 points

Signal	**Function (distributable)**	Servo alarm (ALM), position complete (/COIN), velocity compliance detection (/V-CMP), servo motor rotation detection (/TGON), servo ready (/S-RDY), torque limit detection (/CLT), breaker (/BK), encoder zero point output (PGC) Distribution of above signals and change of positive/negative logics are available
Encoder divided frequency output		A-phase, B-phase and C-phase: linear drive output; divided pulse count: can be set freely
RS-485 communication	**Communication protocol**	MODBUS
	1:N communication	N = 127 stations at maximum
	Axial address setting	Set by parameters
CAN communication	**Communication protocol**	CANOpen (DS301 + DS402 guild regulations)
	1:N communication	N = 127 stations at maximum
	Axial address setting	Set by parameters
Display function		CHARGE indicator, 7-segment digital tube 5 bit
Regeneration processing		Built-in or external regeneration resistor (optional)
Overtravel (OT) prevention function		Dynamic breaker (DB) stop, deceleration stop or free running stop during P-OT or N-OT input action
Protection functions		Overcurrent, overvoltage, undervoltage, overload, overspeed, regeneration failure, encoder feedback error, etc.
Monitoring functions		Rotation speed, current position, command pulse accumulation, positional deviation, motor current, operating status, input and output terminal signal, etc.
Auxiliary functions		Gain adjustment, alarm record, JOG running, origin search, inertia detection, etc.
Intelligent function		Built-in gain auto tuning function
Applicable load inertia		Less than 5 times of the motor inertia
Position control	**Feed-forward compensation**	0~100% (set unit: 1%)
	Input pulse type	Sign + pulse sequence, CW+CCW pulse sequence, 90 ° phase difference two-phase pulse (A-phase + B-phase)
	Input pulse type	Linear drive and open connector supported
	Maximum input pulse frequency	Linear drive Sign + pulse sequence, CW+CCW pulse sequence: 500Kpps 90 ° phase difference two-phase pulse (A-phase + B-phase): 500Kpps Open connector Sign + pulse sequence, CW+CCW pulse sequence: 200Kpps 90 ° phase difference two-phase pulse (A-phase + B-phase): 200Kpps

Chapter II Installation and Dimension

2.1 Servo Driver

K series servo drivers are base-mounted and improper installation may give rise to failures. Please install the servo driver properly by following the instructions below.

2.1.1 Storage Condition

The servo driver should be kept in a place with an ambient temperature of [-20~+85]℃ when not used.

2.1.2 Installation Site

■ Temperature: 0～55°C;
■ Ambient humidity: not higher than 90% RH (no condensation);
■ Sea level not higher than 1000 m;
■ Maximum vibration: 4.9m/s²;
■ Maximum Impact: 19.6m/s²;
■ Other installation precautions:
· Installed in a control cabinet

Attention should be paid to the size of the control cabinet, the placement mode of servo driver and cooling mode, in order to ensure that the ambient temperature for the servo driver is under 55℃. Please refer to description in Section 1.2.2 for operation details;

· Installed near heat source

The radiation of the heat source and temperature rise caused by convection should be under control, in order to ensure that the ambient temperature for the servo driver is under 55℃;

·Installed near vibration source

A vibration isolation device should be installed to avoid vibration passing to the servo driver;

· Installed in a place exposed to corrosive air

Necessary measures should be taken to prevent the servo driver from exposing to corrosive air. Corrosive air may not immediately affect servo driver but will obviously cause the failure of electronic components and relevant elements of the contactor;

· Other occasions

Servo driver should not be put in occasions of high temperature, high humidity, condensation dripping, oil splashing, dust, scrap iron or radiation;

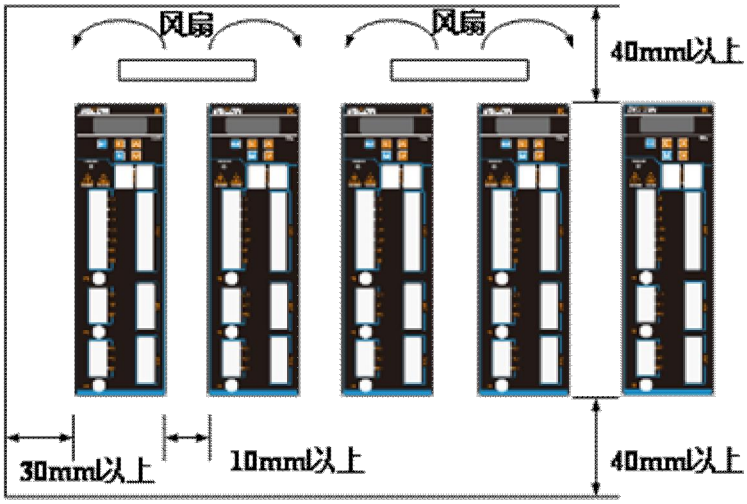
Note: when cutting off the power to store the servo driver, please put the driver in a place with the following environmental conditions: -20~85℃, 90% RH below (no condensation)

2.1.3 Installation Direction

The direction of installation should be vertical to the mounting face and two mounting holes should be used to reliably fix the servo driver on the installation base. If required, a fan should be installed to compulsorily cool the servo driver.

2.1.4 Installation of Several Servo Drivers

If more than one servo driver should be installed in a control cabinet in parallel, the space indicated below should be followed for installation and heat dissipation.



风扇	Fan
风扇	Fan
40mm 以上	Above 40 mm
30mm 以上	Above 30 mm
10mm 以上	Above 10 mm
40mm 以上	Above 40 mm

■ Installation direction of servo driver

The front (wiring side) of the servo driver should face the operator and should be vertical to the mounting base.

■ Cooling

Adequate space should be reserved around the servo driver to ensure cooling through a fan or free convection.

■ Parallel installation

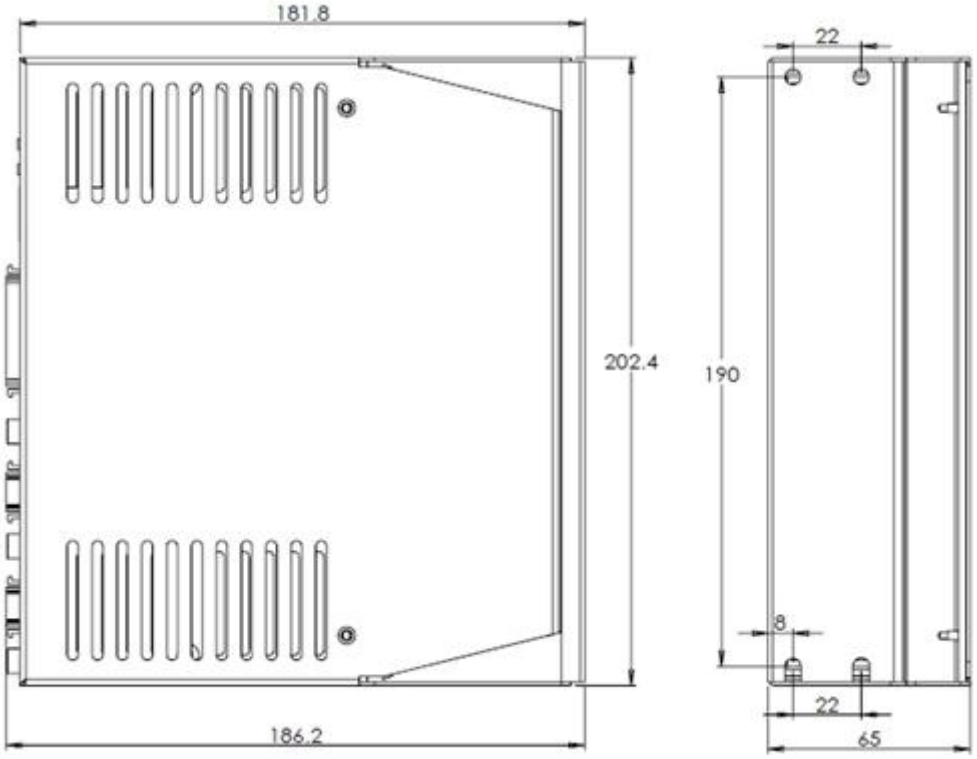
As shown above, a space of 10 mm should be reserved at both sides of the horizontal direction and a space of 50mm should be reserved at both sides of the vertical direction. The temperature inside the control cabinet should be kept even to avoid excess temperature in some parts of the servo driver. If necessary, a fan for compulsory cooling and convection should be installed above the servo driver.

■ Environmental condition for normal operation of servo driver

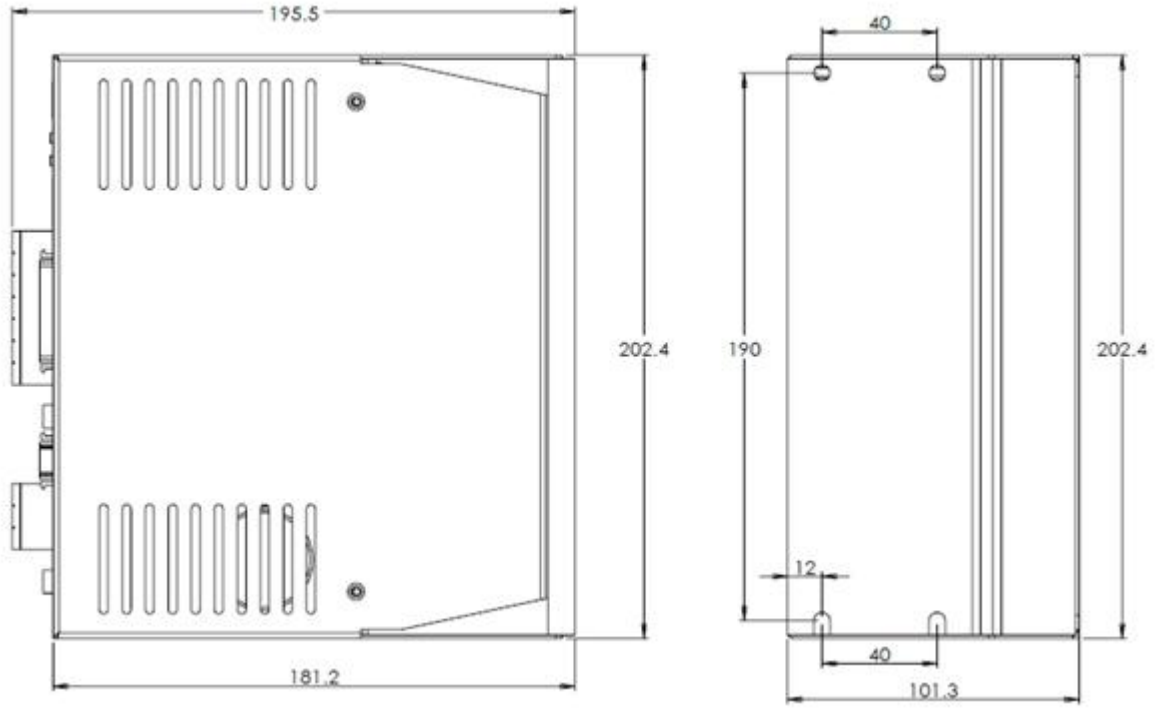
1. Temperature: 0~ 55℃
2. Humidity: below 90%RH (no condensation)
3. Vibration: below 4.9m/s^2
4. To ensure long-term stable use, it is recommended to use the servo driver under an environmental temperature condition of 45℃ and below.

2.1.5 Dimension Description

Dimension of 30A driver is shown below:



Dimension of 50A/75A driver is shown below:



2.2 Servo Motor

The servo motor can be installed in horizontal or vertical direction. The service life of the servo motor will be shortened significantly or unexpected accident may occur if any mechanical mismatch occurs during installation. Please follow the instructions below for correct installation.

Precautions before installation: Antirust agent should be applied at the motor axis end and should be wiped off using a soft cloth dipped in diluent before installation. When wiping off the antirust agent, attention should be paid to prevent the diluent from contacting other parts of the servo motor.

2.2.1 Storage Temperature

The servo motor should be kept in a place with an ambient temperature of [-20~+60]℃ when not used.

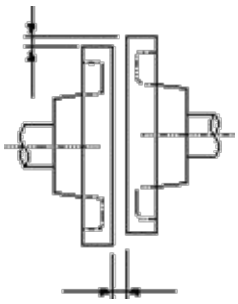
2.2.2 Direction

Servo motor should be installed indoor and the indoor space should meet the following environmental conditions.

- No corrosive, flammable or explosive air
- Good ventilation, little dust and dry environment
- Ambient temperature within 0~40℃
- Relative humidity within 26%~80%RH without condensation
- Easy for maintenance and cleaning

2.2.3 Installation Concentricity

Flexible coupling should be used as much as possible when connecting to machinery. In addition, axis of servo motor should be placed in a straight line with that of mechanical load. When installing servo motor, requirements for concentricity tolerance should be met as the following figure.



Measure at quartern of a circle to make sure that difference between max. value and min. value is lower than 0.03 mm. (rotating with coupling)

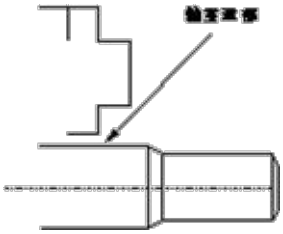
- **Mechanical vibration will be caused by large concentricity deviation and therefore will lead to damages to servo motor bearing.**
- **When installing coupling, axial percussion is prohibited, otherwise damages will be caused to encoder of servo motor easily.**

2.2.4 Installation Direction

Servo motors can be installed horizontally, vertically or in random direction.

2.2.5 Protection Measures against Water and Oil

When using in places containing water, oil or condensation, it is required to take special measures to motors as per protection requirements; however, motors with oil seals should be used since protection requirements for shaft penetrating portion should be satisfied when motors leaving factory. Shaft penetrating portion refers to interval between extension of motor end and end flange.



轴贯通部	Shaft penetrating portion

2.2.6 Cable Tension

Bending radius cannot be too small when connecting cables. It is also not suggested to exert too much tension in cables. Specially, diameter for core wire of signal line is usually very fine (0.2 or 0.3 mm), therefore too much tension cannot be exerted during wiring.

Chapter III Wiring

3.1 Wiring of Main Circuit

This section explains wiring examples of main circuit, functions of terminals in main circuit and power ON sequence.

Notes

· **Do not lead power lines and signal lines to the same pipe, nor bind them together. During wiring, power lines should be kept over 30 cm away from signal line.**
Otherwise, malfunction may be caused.

· **Multi-stranded wires and multi-core shielded wire should be used as signal lines and feedback wires for encoder (PG).**
As for wire length, command input wire should be 3m at most and 20 m at most for PG feedback wire.

· **High voltage may be maintained in the servo driver even the power is turned off. Do not touch power terminal within 5 minutes after power off.**
Inspection operation should be carried out when CHARGE indicator light is confirmed to be off.

· **Do not frequently turn on or off the power. If it is required to continuously turn on or off the power, frequency should be limited to 1 time/min below.**
Due to capacitance in power of servo unit, large charging current (charging for 0.2 s) will flow through when power is ON. Therefore, performance of components in main circuit within servo unit will be damaged if power is turned on/off frequently.

3.1.1 Descriptions of Terminals

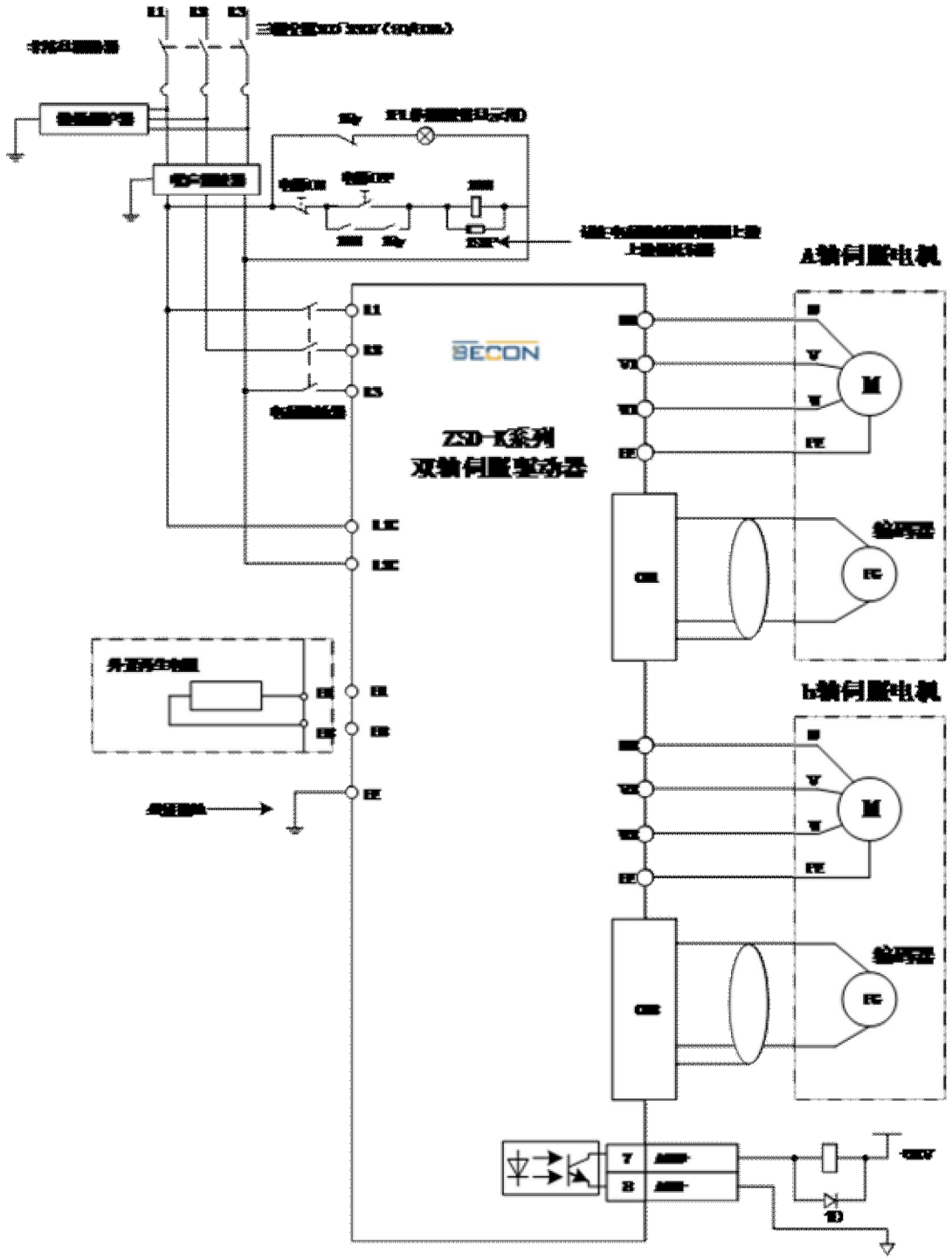
Other terminals and respective function and precaution for driver panel are as follows.

Terminal	Functions	Precautions for operation
U1, V1, W1	Terminal for A-axis motor power line	Connected to A-axis servo motor
U2, V2, W2	Terminal for b-axis motor power line	Connected to b-axis servo motor
L1, L2, L3	Input terminal of main circuit power	Three phase 200 - 230VAC (-15%~+10%) (50/60Hz)
L1C, L2C	Power input terminal of control loop	Single phase 200 - 230VAC (-15%~+10%) (50/60Hz)
B1, B2	Terminal for bleeder resistor	Resistor should be connected to B1 and B2 if external connection for bleeder resistor is required
PE	Earthing Terminal	Earthing measures should be carried out for connection of power earthing terminals and motor earthing terminals

Notes: A axis refers to U1, V1 and W1; b axis refers to U2, V2 and W2 in the instruction.

3.1.2 Typical Examples for Main Circuit Wiring

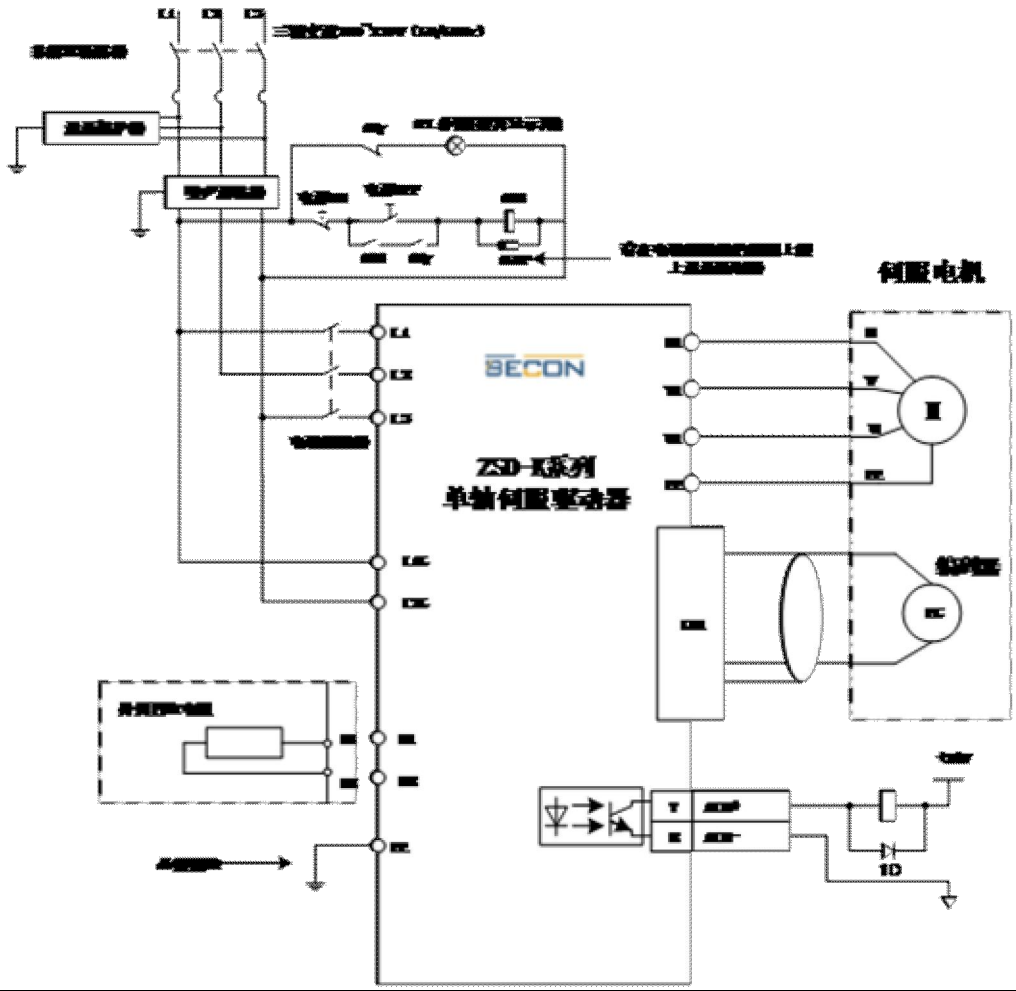
■ Three phase 220 V (double-axis drive)



非熔丝断路器	Non-fuse breaker
三相交流 200~230V（50/60Hz）	Three phase 200 - 230V/5060 Hz (50/60Hz)
浪涌保护器	Surge protection device
1PL(伺服报警显示用)	1PL (for display of servo alarm)
噪声滤波器	Noise filter

电源 ON	Power ON
电源 OFF	Power OFF
请在电磁接触器的线圈上接上浪涌抵制器	Connect surge protection device to coil of electromagnetic contactor
A 轴伺服电机	A-axis servo motor
电磁接触器	Electromagnetic contactor
MGD-K 系列双轴伺服驱动器	MGD-K Series Servo Drive (double-axis)
外置再生电阻	External regenerative resistor
必须接地	It must be grounded
编码器	Encoder
b 轴伺服电机	B-axis servo motor
编码器	Encoder

■ Three phase 220 V (single-axis drive)



非熔丝断路器	Non-fuse breaker
三相交流 200~230V（50/60Hz）	Three phase 200 - 230V/5060 Hz (50/60Hz)
浪涌保护器	Surge protection device
噪声滤波器	Noise filter
1PL(伺服报警显示用)	1PL (for display of servo alarm)
电源 ON	Power ON

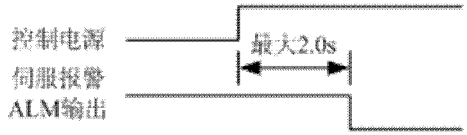
电源 OFF	Power OFF
请在电磁接触器的线圈上接上浪涌抵制器	Connect surge protection device to coil of electromagnetic contactor
电磁接触器	Electromagnetic contactor
外置再生电阻	External regenerative resistor
必须接地	It must be grounded
MGD-K 系列单轴伺服驱动器	MGD-K Series Servo Drive (single-axis)
伺服电机	Servo motor
编码器	Encoder

Notes: design of power ON sequence

The following items should be considered during design of power ON sequence.

1. Design of power ON sequence: power should be OFF after output of signals of "servo alarm". (Refer to the above circuit diagram.)

2. Press the POWER ON button for over 2 s. When control power of servo unit is ON, input 2s "servo alarm" signal (1Ry: OFF). It is required to be done during initial setting of servo driver.



控制电源	Control power
最大2.0s	2.0s at most
伺服报警	Servo alarm
ALM输出	ALM output

3. Power specification for used parts should match with input power.

3.2 Encoder Signal Wiring

Connecting cables between encoder and servo driver and their wiring pin No. vary with servo motors.

Signal of side encoder interface (CN1/CN2) for servo driver:

Terminal No.	Signal leads		Terminal No.	Signal leads	
	Incremental encoder	Bus encoder		Incremental encoder	Bus encoder
1	PA	—	8	PU	—
2	/PA	—	9	/PU	—
3	PB	—	10	PV	—
4	/PB	—	11	/PV	—
5	PC	E+	12	PW	SD+
6	/PC	E-	13	/PW	SD-
7	5V	5V	14	GND	GND

Housing	Shielded wire

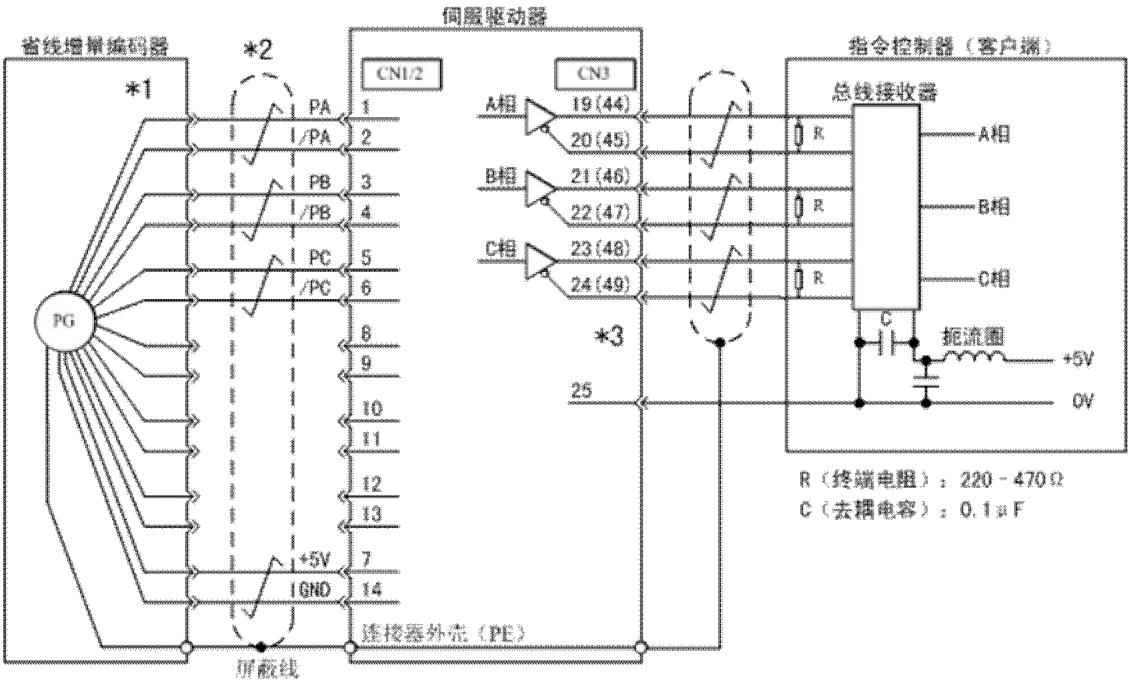
3.2.1 Connection with Encoder Interface (CN1/CN2) and Processing of Output Signal from CN3

In the figure: *1: connector wiring pin No. varies with used servo motor.

*2: refers to multi-stranded shielded wire.

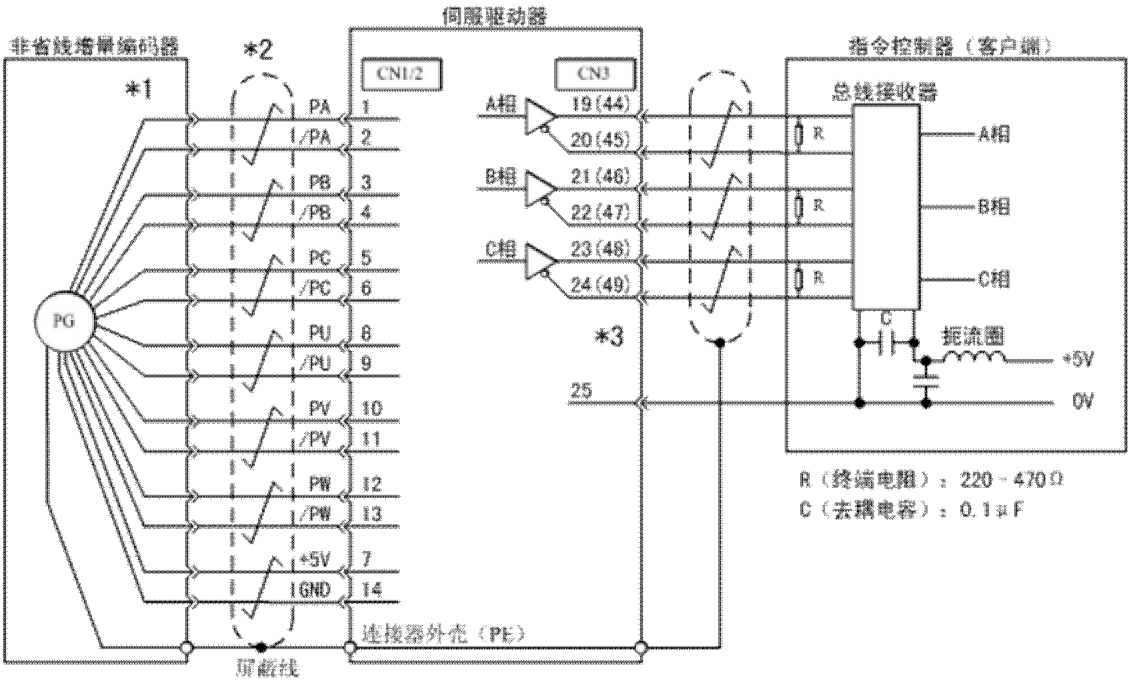
*3: connector wiring pin No. varies with used servo motor. 19 -25 is pin number for axis A of single-axis or double axis motor; 44 - 49 is pin number of axis b of double-axis motor.

(1) 2500 incremental wire-saving encoder



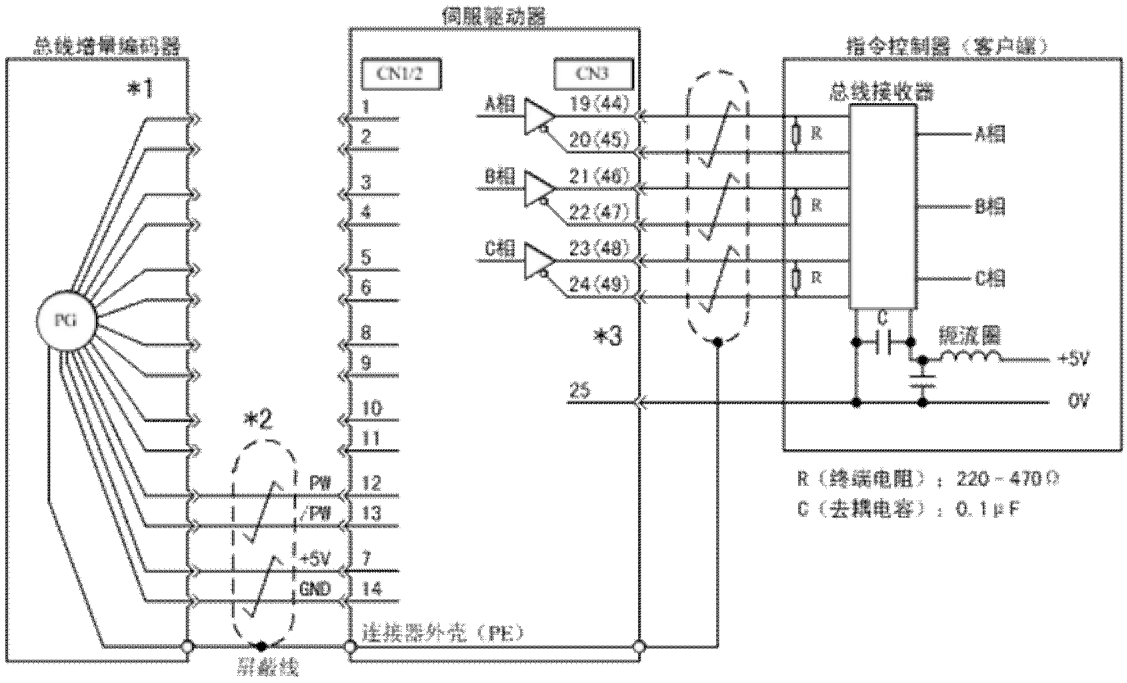
省线增量编码器	Wire-saving incremental encoder
伺服驱动器	Servo drive
A 相	Phase A
B 相	Phase B
C 相	Phase C
指令控制器（客户端）	Command controller (Client)
总线接收器	Bus receiver
A 相	Phase A
B 相	Phase B
C 相	Phase C
扼流圈	Choke
R（终端电阻）：220–470Ω	R (terminal resistance): 220 - 470Ω
C（去耦电容）：0.1μF	C (decoupling capacitor): 0.1μF
连接器外壳（PE）	Connector housing (PE)
屏蔽线	Shielded wire

(2) 2500 incremental standard encoder



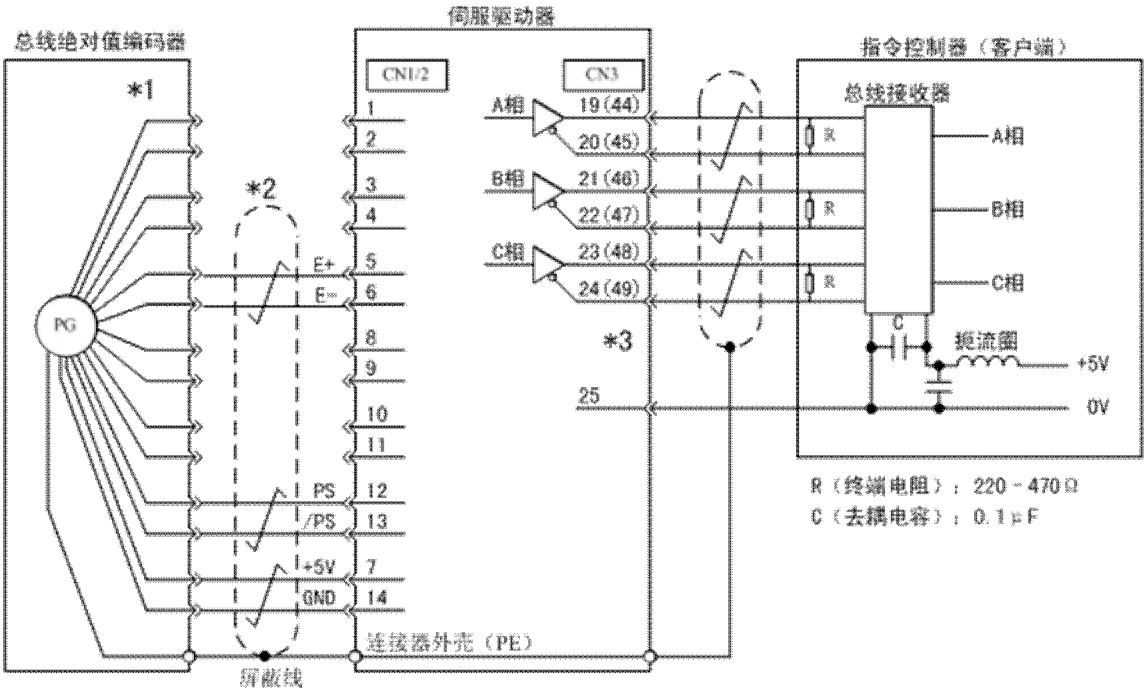
非省线增量编码器	Non-wire-saving incremental encoder
伺服驱动器	Servo drive
A 相	Phase A
B 相	Phase B
C 相	Phase C
指令控制器（客户端）	Command controller (Client)
总线接收器	Bus receiver
A 相	Phase A
B 相	Phase B
C 相	Phase C
扼流圈	Choke
R（终端电阻）：220–470Ω	R (terminal resistance): 220 - 470Ω
C（去耦电容）：0.1μF	C (decoupling capacitor): 0.1μF
连接器外壳（PE）	Connector housing (PE)
屏蔽线	Shielded wire

(3) Bus incremental encoder



总线增量编码器	Bus incremental encoder
伺服驱动器	Servo drive
A 相	Phase A
B 相	Phase B
C 相	Phase C
指令控制器（客户端）	Command controller (Client)
总线接收器	Bus receiver
A 相	Phase A
B 相	Phase B
C 相	Phase C
扼流圈	Choke
R（终端电阻）：220–470Ω	R (terminal resistance): 220 - 470Ω
C（去耦电容）：0.1μF	C (decoupling capacitor): 0.1μF
连接器外壳（PE）	Connector housing (PE)
屏蔽线	Shielded wire

(4) Bus absolute encoder

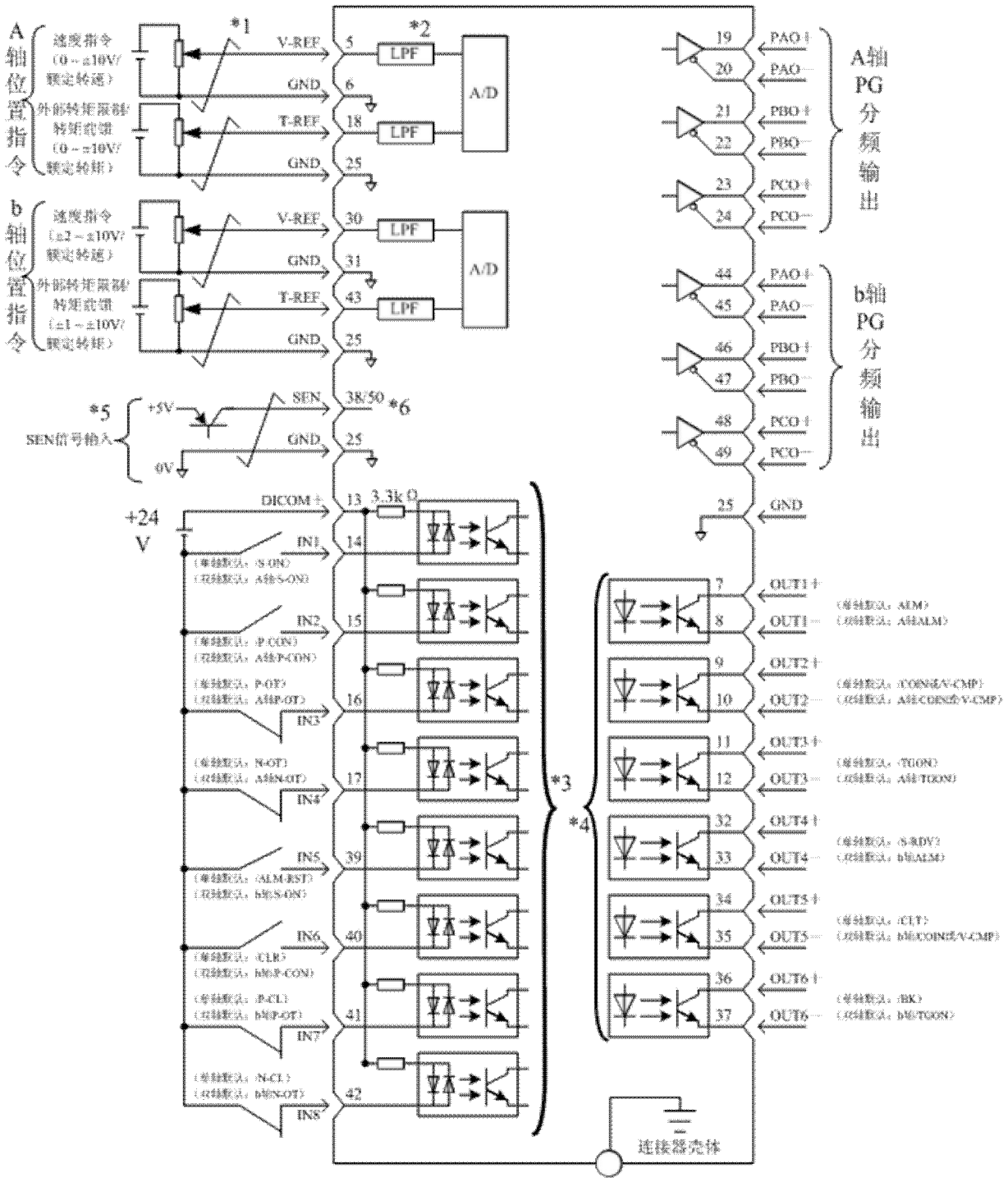


总线绝对值编码器	Bus absolute encoder
伺服驱动器	Servo drive
A 相	Phase A
B 相	Phase B
C 相	Phase C
指令控制器（客户端）	Command controller (Client)
总线接收器	Bus receiver
A 相	Phase A
B 相	Phase B
C 相	Phase C
扼流圈	Choke
R（终端电阻）：220–470Ω	R (terminal resistance): 220 - 470Ω
C（去耦电容）：0.1μF	C (decoupling capacitor): 0.1μF
连接器外壳（PE）	Connector housing (PE)
屏蔽线	Shielded wire

3.3 Input/Output Signal Wiring

3.3.1 Velocity/Torque Control Mode

Pin-out for signal wiring of single-axis driver should be subject to A-axis wiring pin-out. The b-axis pin-out will not be connected.



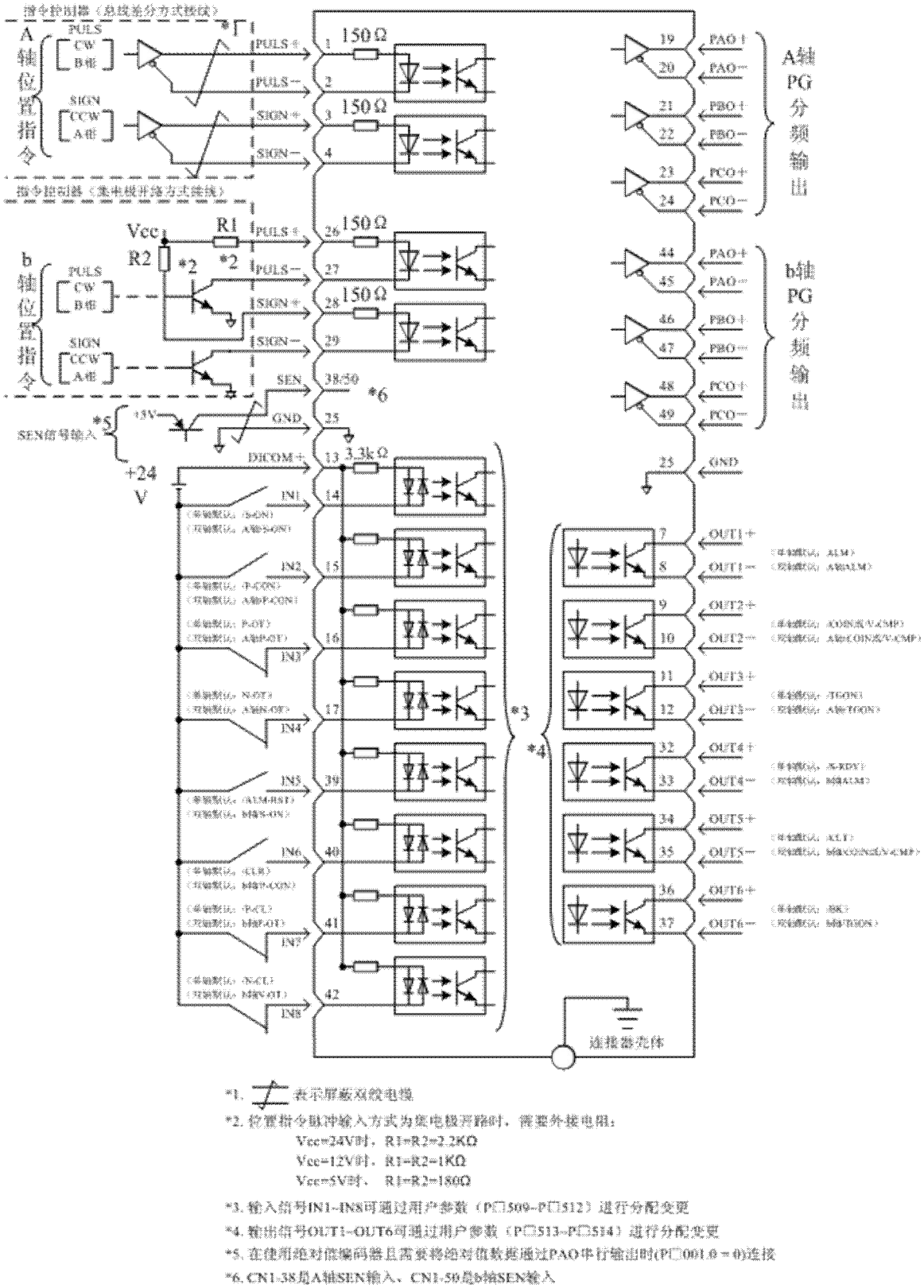
*1. 表示屏蔽双绞电缆
*2. 一次滤波时，时间参数为47us
*3. 输入信号IN1~IN8可通过用户参数（P□509~P□512）进行分配变更
*4. 输出信号OUT1~OUT6可通过用户参数（P□513~P□514）进行分配变更
*5. 在使用绝对值编码器且需要将绝对值数据通过PAO串行输出时(P□001.0＝0)连接
*6. CN1-38是A轴SEN输入，CN1-50是b轴SEN输入

A轴位置指令	A-axis position command
速度指令（0～±10V/额定转速）	Speed command (0 - ±10V/rated rotation speed)

外部转矩限制/转矩前馈（0～±10V/额定转矩）	External torque limitation/torque feed-forward (0 - ±10V/rated torque)
b轴位置指令	b-axis position command
速度指令（±2～±10V/额定转速）	Speed command (2 - ±10V/rated rotation speed)
外部转矩限制/转矩前馈（±1～±10V/额定转矩）	External torque limitation/torque feed-forward (±1 - ±10V/rated torque)
SEN信号输入	SEN signal input
（单轴默认：/S-ON）	(Single-axis default: /S-ON)
（双轴默认：A轴/S-ON）	(Double-axis default: A-axis/S-ON)
（单轴默认：/P-CON）	(Single-axis default: /P-CON)
（双轴默认：A轴/P-CON）	(Double-axis default: A-axis/P-ON)
（单轴默认：P-OT）	(Single-axis default: P-OT)
（双轴默认：A轴P-OT）	(Double-axis default: A-axis P-ON)
（单轴默认：N-OT）	(Single-axis default: N-OT)
（双轴默认：A轴N-OT）	(Double-axis default: A-axis N-ON)
（单轴默认：/ALM-RST）	(Single-axis default: /ALM-RST)
（双轴默认：b轴/S-ON）	(Double-axis default: b-axis/S-ON)
（单轴默认：/CLR）	(Single-axis default: /CLR)
（双轴默认：b轴/P-CON）	(Double-axis default: b-axis/P-ON)
（单轴默认：/P-CL）	(Single-axis default: /P-CL)
（双轴默认：b轴P-OT）	(Double-axis default: b-axis P-OT)
（单轴默认：/N-CL）	(Single-axis default: /N-CL)
（双轴默认：b轴N-OT）	(Double-axis default: b-axis N-OT)
A轴PG分频输出	A-axis PG frequency dividing output
b轴PG分频输出	b-axis PG frequency dividing output
（单轴默认：ALM）	(Single-axis default: ALM)
（双轴默认：A轴ALM）	(Double-axis default: A-axis ALM)
（单轴默认：/COIN或/V-CMP）	(Single-axis default: /COIN or /V-CMP)
（双轴默认：A轴/COIN或/V-CMP）	(Double-axis default: A-axis/COIN or /V-CMP)
（单轴默认：/TGON）	(Single-axis default: /TGON)
（双轴默认：A轴/TGON）	(Double-axis default: A-axis/TGON)
（单轴默认：/S-RDY）	(Single-axis default: /S-RDY)
（双轴默认：b轴ALM）	(Double-axis default: b-axis ALM)
（单轴默认：/CLT）	(Single-axis default: /CLT)
（双轴默认：b轴/COIN或/V-CMP）	(Double-axis default: b-axis/COIN or /V-CMP)
（单轴默认：/BK）	(Single-axis default: /BK)
（双轴默认：b轴/TGON）	(Double-axis default: b-axis/TGON)
连接器壳体	Connector shell
表示屏蔽双绞电缆	Refers to shielded twisted pair cable
*2. 一次滤波时，时间参数为47us	*2. Time parameter is 47 us for first filtering
*3. 输入信号IN1~IN8可通过用户参数	*3. Distribution change can be done by user

（P□509~P□512）进行分配变更	parameter (P□509 - P□512) when inputting IN1 - IN8 signals
*4. 输出信号OUT1~OUT6可通过用户参数（P□513~P□514）进行分配变更	*4. Distribution change can be done by user parameter (P□513 - P□514) when outputting OUT1 - OUT6 signals
*5. 在使用绝对值编码器且需要将绝对值数据通过PAO串行输出时(P□001.0 = 0)连接	*5. With absolute encoder, connect to it when serial output is required for absolute data via PAO (P□001.0 = 0)
*6. CN1-38是A轴SEN输入，CN1-50是b轴SEN输入	*6. CN1-38 is A-axis SEN input and CN1-50 is b-axis SEN input

3.3.2 Position Control Mode



Pin-out for signal wiring of single-axis driver should be subject to A-axis wiring pin-out. The b-axis pin-out will not be connected.

指令控制器（总线差分方式接线）	Command controller (connected by bus differential mode)
A轴位置指令	A-axis position command
PULSCWB相	PULSCWB phase
SIGNCCWA相	SIGNCCWA phase
指令控制器（集电极开路方式接线）	Command controller (connected by open collector mode)
b轴位置指令	b-axis position command
PULSCWB相	PULSCWB phase
SIGNCCWA相	SIGNCCWA phase
SEN信号输入	SEN signal input
（单轴默认：/S-ON）	(Single-axis default: /S-ON)
（双轴默认：A轴/S-ON）	(Double-axis default: A-axis/S-ON)
（单轴默认：/P-CON）	(Single-axis default: /P-CON)
（双轴默认：A轴/P-CON）	(Double-axis default: A-axis/P-ON)
（单轴默认：P-OT）	(Single-axis default: P-OT)
（双轴默认：A轴P-OT）	(Double-axis default: A-axis P-ON)
（单轴默认：N-OT）	(Single-axis default: N-OT)
（双轴默认：A轴N-OT）	(Double-axis default: A-axis N-ON)
（单轴默认：/ALM-RST）	(Single-axis default: /ALM-RST)
（双轴默认：b轴/S-ON）	(Double-axis default: b-axis/S-ON)
（单轴默认：/CLR）	(Single-axis default: /CLR)
（双轴默认：b轴/P-CON）	(Double-axis default: b-axis/P-ON)
（单轴默认：/P-CL）	(Single-axis default: /P-CL)
（双轴默认：b轴P-OT）	(Double-axis default: b-axis P-OT)
（单轴默认：/N-CL）	(Single-axis default: /N-CL)
（双轴默认：b轴N-OT）	(Double-axis default: b-axis N-OT)
A轴PG分频输出	A-axis PG frequency dividing output
b轴PG分频输出	b-axis PG frequency dividing output
（单轴默认：ALM）	(Single-axis default: ALM)
（双轴默认：A轴ALM）	(Double-axis default: A-axis ALM)
（单轴默认：/COIN或/V-CMP）	(Single-axis default: /COIN or /V-CMP)
（双轴默认：A轴/COIN或/V-CMP）	(Double-axis default: A-axis/COIN or /V-CMP)
（单轴默认：/TGON）	(Single-axis default: /TGON)
（双轴默认：A轴/TGON）	(Double-axis default: A-axis/TGON)
（单轴默认：/S-RDY）	(Single-axis default: /S-RDY)
（双轴默认：b轴ALM）	(Double-axis default: b-axis ALM)
（单轴默认：/CLT）	(Single-axis default: /CLT)
（双轴默认：b轴/COIN或/V-CMP）	(Double-axis default: b-axis/COIN or /V-CMP)
（单轴默认：/BK）（双轴默认：b轴/TGON）	(Single-axis default: /BK) (Double-axis

	default: b-axis/TGON)
连接器壳体	Connector shell
表示屏蔽双绞电缆	Refers to shielded twisted pair cable
*2. 位置指令脉冲输入方式为集电极开路时，需要外接电阻：	*2. When open collector is used as the input mode for position command pulse, external resistor should be connected:
Vcc=24V时，R1=R2=2.2KΩ	Vcc=24V, R1=R2=2.2KΩ
Vcc=12V时，R1=R2=1KΩ	Vcc=12V, R1=R2=1KΩ
Vcc=5V时，R1=R2=180Ω	Vcc=5V, R1=R2=180Ω
*3. 输入信号IN1~IN8可通过用户参数（P□509~P□512）进行分配变更	*3. Distribution change can be done by user parameter (P□509 - P□512) when inputting IN1 - IN8 signals
*4. 输出信号OUT1~OUT6可通过用户参数（P□513~P□514）进行分配变更	*4. Distribution change can be done by user parameter (P□513 - P□514) when outputting OUT1 - OUT6 signals
*5. 在使用绝对值编码器且需要将绝对值数据通过PAO串行输出时(P□001.0 = 0)连接	*5. With absolute encoder, connect to it when serial output is required for absolute data via PAO (P□001.0 = 0)
*6. CN1-38是A轴SEN输入，CN1-50是b轴SEN输入	*6. CN1-38 is A-axis SEN input and CN1-50 is b-axis SEN input

3.3.3 Signals and Their Functions for Input/Output Connector (CN3)

Terminal No.	Name	Functions		Terminal No.	Name	Functions	
		Single-axis driver	Double-axis driver			Single-axis driver	Double-axis driver
1	APULS+	Command pulse input	A-axis command pulse input	26	BPULS+	Reserved	b-axis command pulse input
2	APULS-			27	BPULS-		
3	ASIGN+	Command sign input	A-axis command sign input	28	BSIGN+	Reserved	b-axis command sign input
4	ASIGN-			29	BSIGN-		
5	AV-REF	Speed command input	A-axis speed command input	30	BV-REF	Reserved	b-axis speed command input
6	GND	Signal ground	Signal ground	31	GND	Signal ground	Signal ground
7	OUT1+	Output port 1, which can be reallocated (Factory setting: ALM)	Output port 1, which can be reallocated (Factory setting: A-axis ALM)	32	OUT4+	Output port 4, which can be reallocated (Factory setting: /S-RDY)	Output port 4, which can be reallocated (Factory setting: b-axis ALM)
8	OUT1-			33	OUT4-		
9	OUT2+	Output port 2, which can be reallocated (Factory setting: /COIN)	Output port 2, which can be reallocated (Factory setting: A-axis/COIN)	34	OUT5+	Output port 5, which can be reallocated (Factory setting: /CLT)	Output port 5, which can be reallocated (Factory setting: b-axis/COIN)
10	OUT2-			35	OUT5-		
11	OUT3+	Output port 3, which can be reallocated (Factory setting: /TGON)	Output port 3, which can be reallocated (Factory setting: A-axis/TGON)	36	OUT6+	Output port 6, which can be reallocated (Factory setting: /BK)	Output port 6, which can be reallocated (Factory setting: b-axis/TGON)
12	OUT3-			37	OUT6-		
13	DICOM	Common port of input signal	Common port of input signal	38	SEN	SEN signal input	A-axis SEN signal input
14	IN1	Input port 1, which can be reallocated (Factory setting: /S-ON)	Input port 1, which can be reallocated (Factory setting: A-axis/S-ON)	39	IN5	Input port 5, which can be reallocated (Factory setting: /ALM-RST)	Input port 5, which can be reallocated (Factory setting: b-axis/S-ON)
15	IN2	Input port 2, which can be reallocated (Factory setting: /P-CON)	Input port 2, which can be reallocated (Factory setting: A-axis/P-CON)	40	IN6	Input port 6, which can be reallocated (Factory setting: /CLR)	Input port 6, which can be reallocated (Factory setting: b-axis/P-CON)
16	IN3	Input port 3, which can be reallocated (Factory setting: POT)	Input port 3, which can be reallocated (Factory setting: A-axis	41	IN7	Input port 7, which can be reallocated (Factory setting: /PCL)	Input port 7, which can be reallocated (Factory setting: b-axis

			POT)				POT)
17	IN4	Input port 4, which can be reallocated (Factory setting: NOT)	Input port 4, which can be reallocated (Factory setting: A-axis NOT)	42	IN8	Input port 8, which can be reallocated (Factory setting: /NCL)	Input port 8, which can be reallocated (Factory setting: b-axis NOT)
18	AT-REF	Torque command input	A-axis torque command input	43	BV-REF	Reserved	b-axis torque command input
19	APAO+	Phase A of PG frequency dividing output	Phase A of A-axis PG frequency dividing output	44	BPAO+	Reserved	Phase A of b-axis PG frequency dividing output
20	APAO-			45	BPAO-		
21	APBO+	Phase B of PG frequency dividing output	Phase B of A-axis PG frequency dividing output	46	BPBO+	Reserved	Phase B of b-axis PG frequency dividing output
22	APBO-			47	BPBO-		
23	APCO+	Phase C of PG frequency dividing output	Phase C of A-axis PG frequency dividing output	48	BPCO+	Reserved	Phase C of b-axis PG frequency dividing output
24	APCO-			49	BPCO-		
25	GND	Signal ground	Signal ground	50	BSEN	Reserved	b-axis SEN signal input

Note:

1. Do not use any idle terminal.
2. Connect the shielded wires for input/output signal cables to connector shells.
3. The following input/output signals can change function distribution by setting user parameters

Output: OUT1, OUT2, OUT3, OUT4, OUT5, OUT6

The said output ports can change into ALM, /COIN, /TGON, /S-RDY, /CLT, /BK, /PGC of A axis or B axis

Input: IN1, IN2, IN3, IN4, IN5, IN6, IN7, IN8

By parameters, the said input ports can change into such signals of A axis or B axis as /S-ON, /P-CON, POT, NOT, /ALM-RST, /CLR, /PCL, /NCL and /GSEL

3.3.4 Interface Circuit

Examples of connection of input/output signal of servo unit and its command controller are shown as below.

(1) Interfaces to command input circuit

(a) Analog input circuit

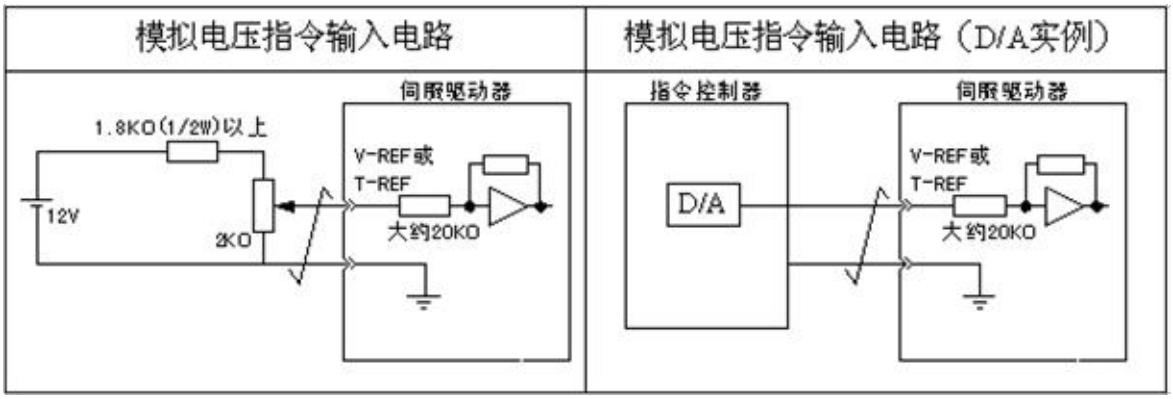
The following is to describe 5-6 (speed command input) terminals and 18-25 (torque command input) terminals of CN3 connector.

Analog signal is the signal of speed command or torque command. Input impedance is shown as below.

· Speed command input: appx. 20 KΩ

· Torque command input: appx. 20 KΩ

Maximum allowable voltage of input signal is ±12 V.



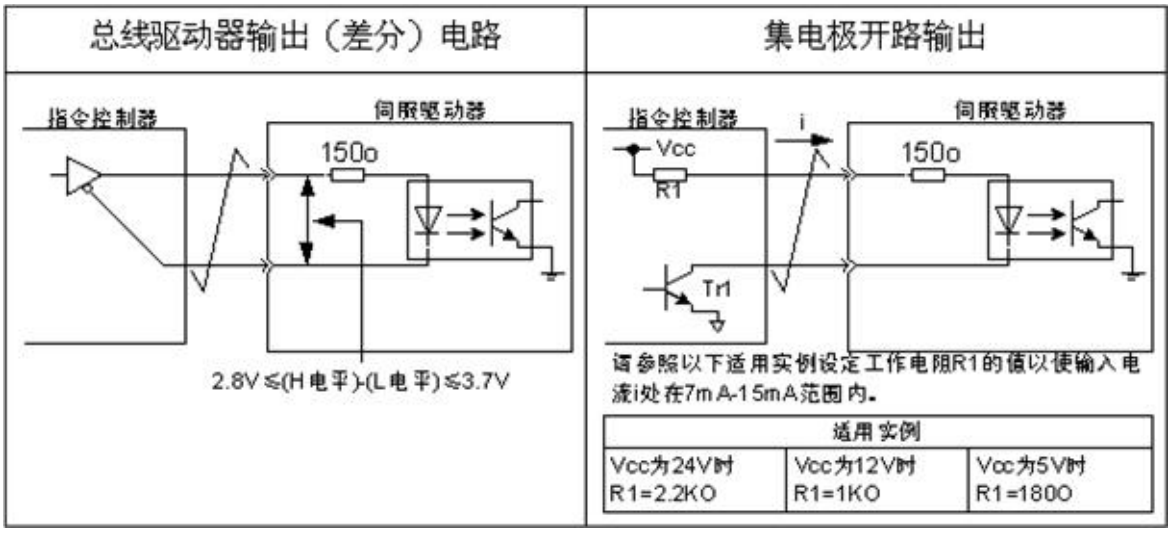
模拟电压指令输入电路	Analog voltage command input circuit
1.8KΩ(1/2W)以上	Above 1.8 KΩ (1/2W)

伺服驱动器	Servo drive
V-REF 或 T-REF	V-REF or T-REF
大约 20KΩ	Appx. 20 KΩ
模拟电压指令输入电路（D/A 实例）	Analog voltage command input circuit (D/A example)
指令控制器	Command controller
伺服驱动器	Servo drive
V-REF 或 T-REF	V-REF or T-REF
大约 20KΩ	Appx. 20 KΩ

(b) Position command input circuit

The following is to describe 1-2 (command pulse input) terminal and 3-4 (command sign input) terminal of CN3 connector.

Command pulse output circuit at the side of command controller can be optional between bus driver output and open-collector output, as classified as below.

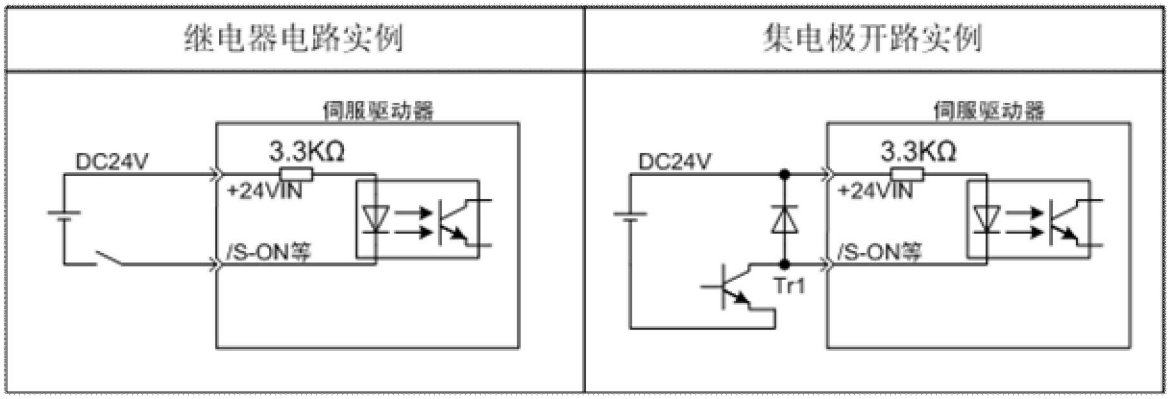


总线驱动器输出（差分）电路	Bus driver output (differential) circuit
指令控制器	Command controller
伺服驱动器	Servo drive
2.8V≤(H 电平)-(L 电平)≤3.7V	2.8V ≤ (H level) - (L level) ≤ 3.7V
指令控制器	Command controller
伺服驱动器	Servo drive
请参照以下适用实例设定工作电阻 R1 的值以使输入电流 i 处在 7mA-15mA 范围内。	Please refer to the following applicable examples for setting of the working resistance R1 to maintain current i within 7 mA - 15 mA.
适用实例	Applicable examples
Vcc 为 24V 时	Vcc on 24 V
R1=2.2KΩ	R1=2.2 KΩ
Vcc 为 12V 时	Vcc on 12 V
R1=1KΩ	R1=1 KΩ
Vcc 为 5V 时	Vcc on 5 V
R1=180Ω	R1=180 Ω

(2) Interfaces to sequence control input circuit

The following is to describe IN1 - IN8 terminals of CN3 connector.

Connect through the transistor circuit of relay or open connector. Please select relay for small current when using relay for connection. If otherwise, bad contact will occur.

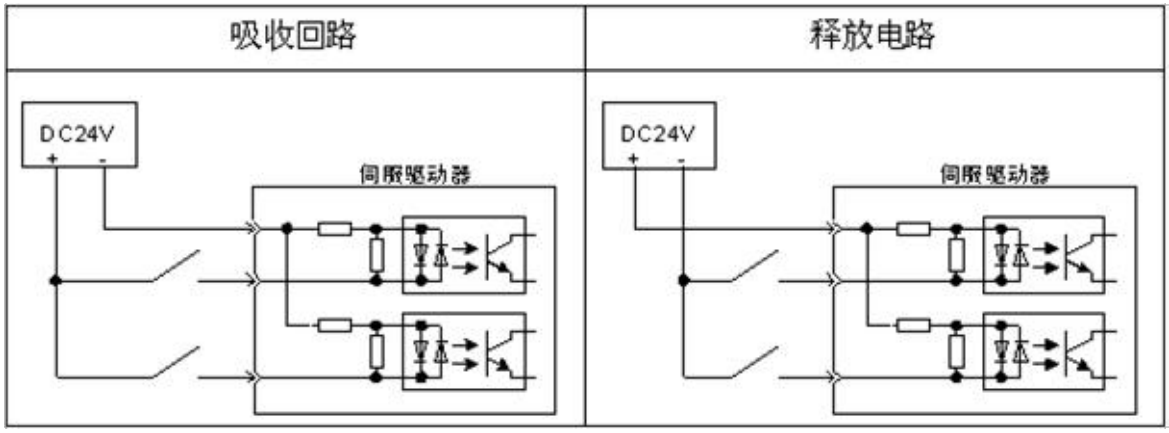


继电器电路实例	Example of relay circuit
伺服驱动器	Servo drive
/S-ON等	/S-ON, etc.
集电极开路实例	Example of open connector
伺服驱动器	Servo drive
/S-ON等	/S-ON, etc.

Note: For interface of SEN signal input circuit, please refer to Chapter "Usage of Absolute Value Encoder".

(3) Absorption circuit and release circuit

Use two-way photocoupler as input circuit of servo driver. Please select absorption circuit connection and release circuit connection according to the specification required for the machine.



吸收回路	Absorption circuit
伺服驱动器	Servo drive
释放电路	Release circuit
伺服驱动器	Servo drive

(4) Interfaces to output circuit

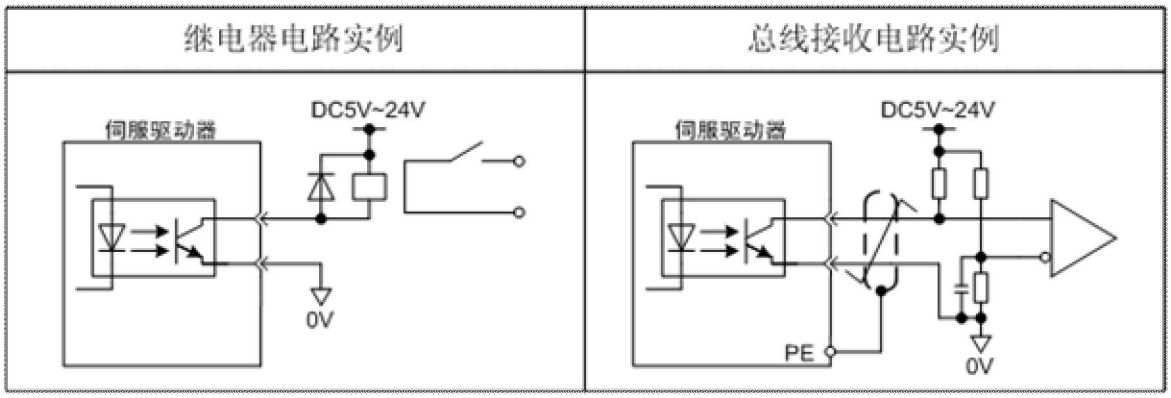
(a) Bus driver (differential) output circuit

The following is to describe 19-20 (A phase signal) terminals, 21-22 (B phase signal) terminals and 23-24 (C phase signal) terminals of CN3 connector.

Output signal (PAO/PAO, PBO/PBO), origin pulse signal (PCO/PCO) and S phase rotation quantity signal (PSO/PSO) that convert the 2 phases (A, B) of serial data for encoder are outputted by bus driver output circuit, which is generally used when servo unit forms position control system at the side of command controller through speed control. At the side of command controller, please use bus receiver circuit to receive.

(b) Photocoupler output circuit

Servo alarm (ALM), servo ready (/S - RDY) and other sequence signals are constituted by photocoupler output circuit and are connected through relay circuit or bus receiver circuit.



继电器电路实例	Example of relay circuit
伺服驱动器	Servo drive
总线接收电路实例	Example of bus receiving circuit
伺服驱动器	Servo drive

Note: maximum allowable voltage and current capacity of photocoupler output circuit are shown as below.

- Maximum voltage: DC 30 V
- Maximum current: DC 50 mA

3.4 Other wiring

3.4.1 Precautions

1. For command input and wiring leading to encoder, please use the specified cable. Please select the cable with shortest connection distance.
2. Use heavy wire (above 2.0 mm^2) whenever possible as grounding wire.

· Grounding superior to D type (with grounding resistance of below 100 Ω) is recommended.

· It must be one-point grounding.

· Please directly ground the servo motor when servo motor and machine are insulated from each other.

3. Do not blend or impose tension on the wire.

Core wire thickness of cable for signal is only 0.2 mm or 0.3 mm, so be careful when using it.

4. For radio frequency interference, please use noise filter.

· When it is used around residences or radio frequency interference is concerned, please insert noise filter at the input side of power wire.

· Since servo unit is industrial equipment, no countermeasure is taken against radio frequency interference.

To prevent misoperation due to noise, the following approaches are effective.

· Please locate command input equipment and noise filter close to servo unit where possible.

· Please be sure to install surge suppressor on the coils of relay, solenoid and electromagnetic contactor.

· Please separate power wire (high voltage circuit of power wire, servo motor wiring, etc.) and signal wire while wiring, with the interval kept above 30 cm. Do not put them into the same pipeline or bind them.

· Do not use the same power as electric welding machine, electrical discharge machine, etc. Even if so, please insert noise filter at the input side of power wire when there is high frequency generator around.

6. Use molded case circuit breaker (QF) or fuse to protect power wire.

· The servo driver is directly connected to industrial power wire. To protect servo system from cross electric shock accident, please be sure to use molded case circuit breaker (QF) or fuse.

7. There is no built-in grounding protection circuit in servo driver. To form a safer system, please configure residual-current circuit breaker for both overload and circuit protection, or residual-current circuit breaker with supporting molded case circuit breaker for special protection of ground wire.

3.4.2 Anti-interference Wiring

(1) Example of anti-interference wiring

"High speed switch element" is used for the main circuit of this servo driver, which may be subject to the influence of switch and noise because of switch element depending on the peripheral wiring and grounding processing of servo driver. Therefore, proper grounding and wiring process are necessary.

Microprocessor (CPU) is built in the servo driver, so "noise filter" is required to be configured in place to prevent as much external interference as possible.

(2) Proper grounding processing

(a) Grounding of motor framework

Please be sure to connect the motor frame terminal "FG" of servo motor to the grounding terminal "PE" of servo unit. In addition, grounding terminal "PE" must be grounded.

When servo motor is grounded via a machine, switch interference current will flow from the power part of servo unit through the stray capacitance of servo motor.

The above are precautions for such influence.

(b) When there is interference on command input wire

When there is interference on command input wire, please ground the OV wire (GND) of the input wire. When passing the main circuit wiring of motor through a metal conduit, please ground the conduit and its junction box.

Please conduct one-point grounding for the above grounding processing.

(3) Usage of noise filter

Use blocking noise filter to prevent interference from power wire. Besides, insert noise filter for power wire of peripheral devices as required.

■ Noise filter for brake power

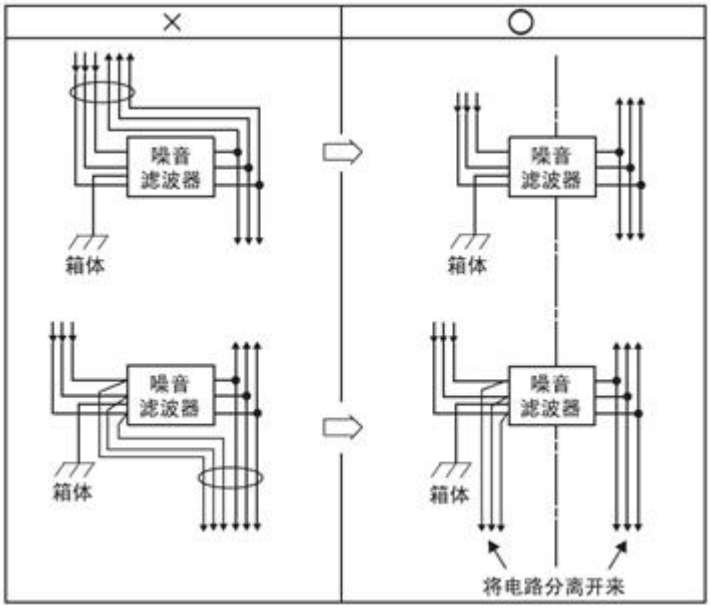
When using servo motor (below 400 W) with holding brake, please use the following noise filter at the power input of brake.

Model: FN2070-6/07 (manufactured by SCHAFFNER)

■ Precautions for operation of noise filter

When installing and wiring noise filter, please follow the following precautions. In case of misoperation, noise filter will be greatly less effective.

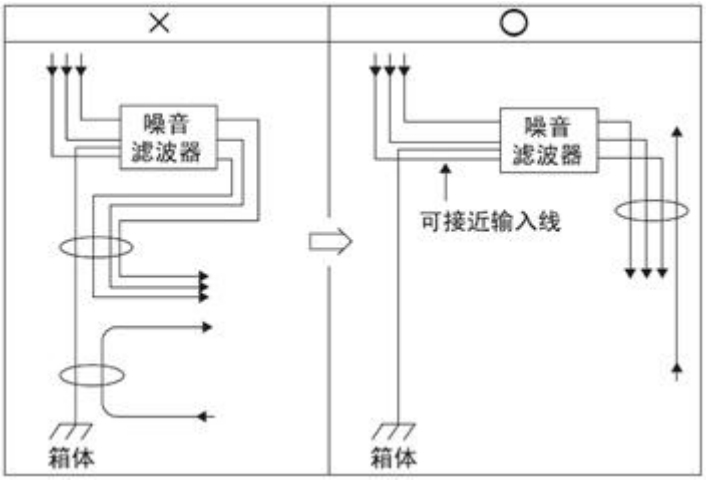
1. Please separate input wiring from output wiring and do not put them into the same pipeline or bind them together.



噪音滤波器	Noise filter
箱体	Box
噪音滤波器	Noise filter
箱体	Box
噪音滤波器	Noise filter
箱体	Box
噪音滤波器	Noise filter
箱体	Box
将电路分离开来	Separate the circuit

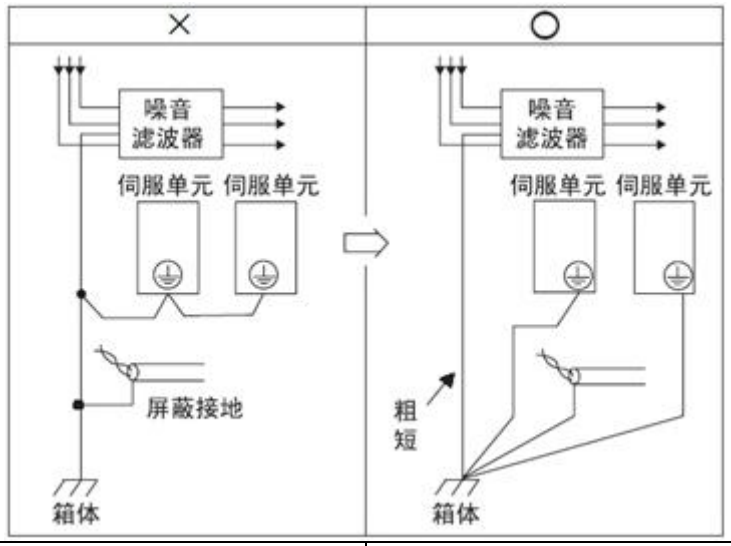
2. Separate the grounding wire of noise filter from its output wiring.

Please do not put the output wiring of noise filter and other signal wires and grounding wires into the same pipeline or bind them together.



噪音滤波器	Noise filter
箱体	Box
噪音滤波器	Noise filter
可接近输入线	Accessible input wire
箱体	Box

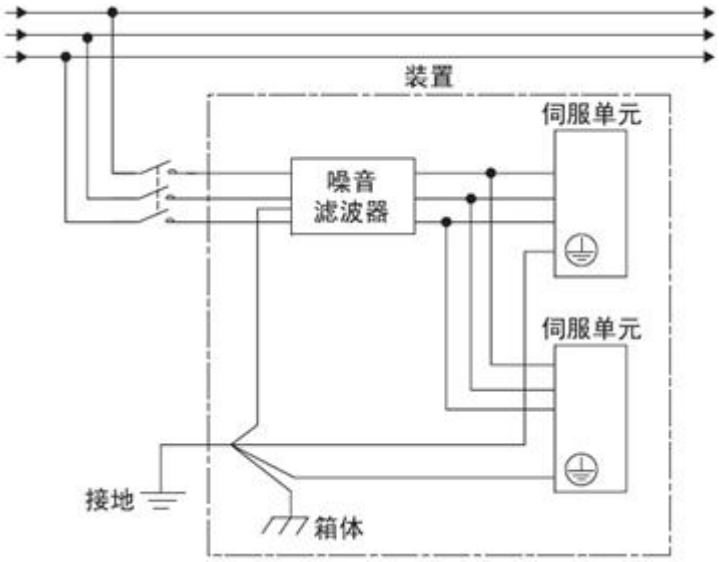
3. Connect the grounding wire of filter alone with grounding plate and do not connect other grounding wires.



噪音滤波器	Noise filter
伺服单元	Servo unit
伺服单元	Servo unit
屏蔽接地	Shielding grounding
箱体	Box
噪音滤波器	Noise filter
伺服单元	Servo unit
伺服单元	Servo unit
粗短	Heavy and short
箱体	Box

4. Processing of grounding wire of noise filter within a device

When there is a noise filter within a certain device, please connect the grounding wire of this filter and that of other machines to the bound grounding plate and then proceed to grounding.



装置	Device
噪音滤波器	Noise filter
伺服单元	Servo unit
伺服单元	Servo unit
接地	Grounding
箱体	Box

3.5 Wiring of Motor

3.5.1 Connector Terminal Wiring for Motor Encoder

(1) Incremental encoder socket (15-pin) of 60, 80, 90 motors, U+, U-, V+, V-, W+,W- default of wire-saving encoder.

Terminal No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Signals	PE	5V	GND	B+	Z-	U+	Z+	U-	A+	V+	W+	V-	A-	B-	W-

(2) Non-wire saving encoder socket (15-pin) of 110, 130, 180 motors, U+, U-, V+, V-, W+,W- default of wire-saving encoder.

Terminal No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Signals	PE	5V	GND	A+	B+	Z+	A-	B-	Z-	U+	V+	W+	U-	V-	W-

(3) Motor absolute encoder socket (7-pin):

Terminal No.	1	2	3	4	5	6	7
Signals	PE	E-	E+	SD-	GND	SD+	+5V

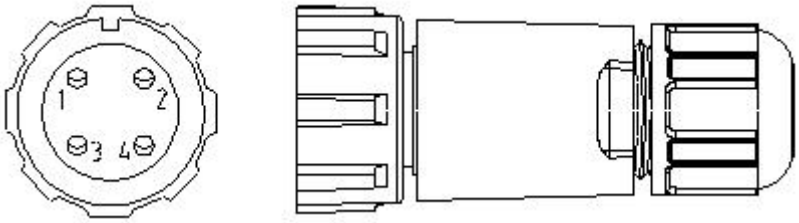
3.5.2 Connector Terminal Wiring for Motor Power Supply

(1) Power socket (4-pin AMP) of 60, 80, 90 motors:

Terminal pin NO.	1	2	3	4
Signal	U	V	W	PE

(2) Power socket (4 straight pin aviation type, as shown below) of 60, 80, 90 motors:

Terminal pin NO.	1	2	3	4
Signal	PE	U	V	W



(3) Power socket (4-pin) of 110, 130, 180 motors:

Terminal pin no.	1	2	3	4
Signal	PE	U	V	W

Chapter IV Panel Operation

4.1 Basic Operation

Through panel operator, such functions as switch of A-axis and b-axis display and operation, setting of various parameters, execution and status display of JOG running command can be achieved. The following is a list of key names and functions.

4.1.1 Key Names and Functions

Through panel, such functions as switch of A-axis and b-axis display and operation, setting of various parameters, execution and status display of JOG running command can be achieved. The following is a list of key names and functions.

Symbol	Name	Functions
	Function key	Basic function switch: status display, auxiliary function, parameter setting and monitoring Long press to switch between A-axis and b-axis display and operation
	UP	Press UP to increase set value Functioning as start key of positive rotation during JOG running in auxiliary function mode
	DOWN	Press DOWN to reduce set value Functioning as start key of negative rotation during JOG running in auxiliary function mode
	Shift key	Press the key to shift the selected bit (the decimal point of which flickers) one bit to the left
	SET	Press the key to display the setting and set value of parameters, and access parameter setting status and clear alarm

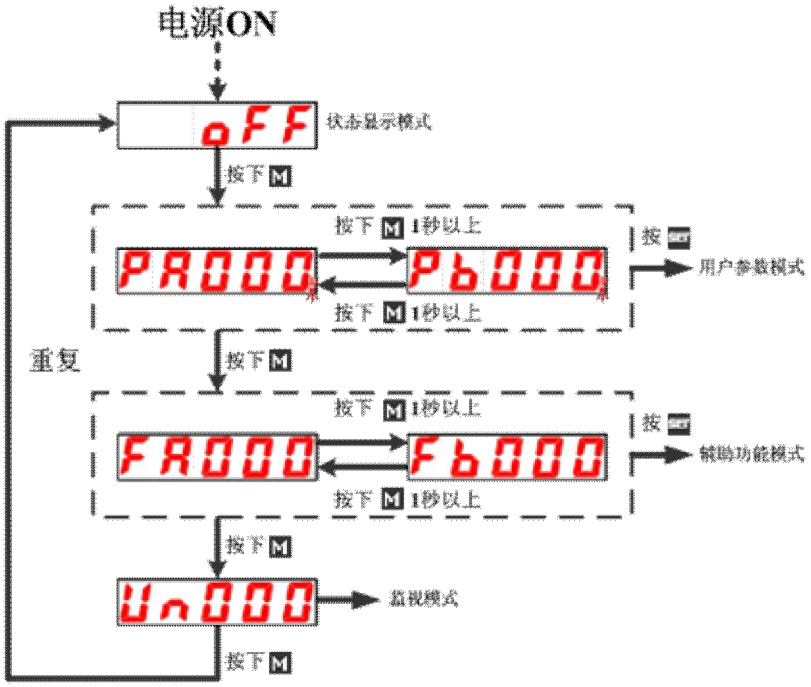
In the mode of status display, press SET to clear alarm, which can also be done by using alarm removal input signal/ALMRST.

Note: in case of alarm ringing, first eliminate alarm causes and then remove alarm.

4.1.2 Selection and Operation of Basic Mode

Through switching the basic modes of panel operator, such operations as running status display, parameter setting and command running can be done.

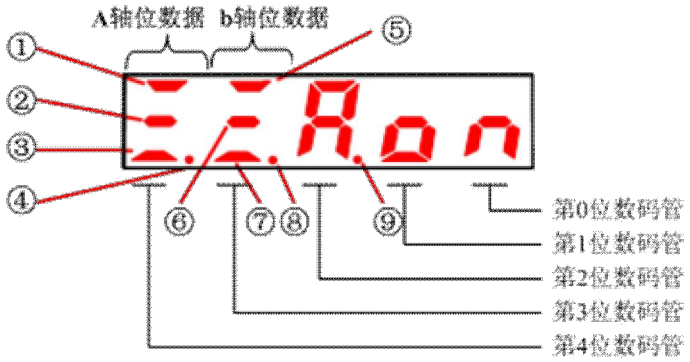
Basic modes include status display mode, parameter setting mode, monitoring mode and auxiliary function mode. After Key M is pressed, the modes switch in the order as shown in the following figure.



电源 ON	Power ON
状态显示模式	Status display mode
按下	Press
按下　1 秒以上	Press for over 1 s
按下　1 秒以上	Press for over 1 s
重复	Rep (s)
按下	Press
按下　1 秒以上	Press for over 1 s
按下　1 秒以上	Press for over 1 s
按下	Press
监视模式	Monitor Mode
按下	Press
按	Press
用户参数模式	User parameter mode
按	Press
辅助功能模式	Auxiliary function mode

4.1.3 Status Display

Distinguishing method of status display is shown as below:



A轴位数据	A-axis bit data
b轴位数据	b-axis bit data
第0位数码管	Bit 0 nixie tube
第1位数码管	Bit 1 nixie tube
第2位数码管	Bit 2 nixie tube
第3位数码管	Bit 3 nixie tube
第4位数码管	Bit 4 nixie tube

■ Display content of bit data

Item	Velocity/torque control mode		Position control mode	
	Bit data	**Display content**	**Bit data**	**Display content**
①	A axis Running	Light on while servo ON (power being supplied to motor)	A axis Running	Servo ON (power being supplied to motor)
②	A axis Same speed (/V-CMP)	Light on when gap between motor speed and command speed is lower than the specified value Specified value: PA503 (Factory default: 10 rpm)	A axis Positioning completed (/COIN)	Light on when offset of actual motor position and position command is lower than the specified value Specified value: PA500 (Factory default: 10 pulse)
③	A axis Rotation detection (/TGON)	Light on when motor speed is higher than the specified value Specified value: PA502 (Factory default: 20 rpm)	A axis On rotation detection (/TGON)	Light on when motor speed is higher than the specified value Specified value: PA502 (Factory default: 20 rpm)
④	A axis P-OT/N-OT	Servo on limit: Light on indicates P-OT status Light off indicates N-OT status Flickering indicates P-OT/N-OT status	A axis P-OT/N-OT	Servo on limit: Light on indicates P-OT status Light off indicates N-OT status Flickering indicates P-OT/N-OT status
⑤	B axis Running	Light on while servo ON (power being supplied to motor)	B axis Running	Light on while servo ON (power being supplied to motor)
⑥	B axis Same speed	Light on when gap between motor speed and command speed is lower	B axis Positioning	Light on when offset of actual motor position and position

	(/V-CMP)	than the specified value Specified value: PB503 (Factory default: 10 rpm)	completed (/COIN))	command is lower than the specified value Specified value: PA500 (Factory default: 10 pulse)
⑦	B axis Rotation detection (/TGON)	Light on when motor speed is higher than the specified value Specified value: PA502 (Factory default: 20 rpm)	B axis Rotation detection (/TGON)	Light on when motor speed is higher than the specified value Specified value: PA502 (Factory default: 20 rpm)
⑧	B axis P-OT/N-OT	Servo on limit: Light on indicates P-OT status Light off indicates N-OT status Flickering indicates P-OT/N-OT status	B axis P-OT/N-OT	Servo on limit: Light on indicates P-OT status Light off indicates N-OT status Flickering indicates P-OT/N-OT status
⑨	Main power supply Ready	Light on when main circuit power is normal Light off when main circuit power is cut off	Main power supply Ready	Light on when main circuit power is normal Light off when main circuit power is cut off

■ Display content of abbreviated signs

Abbreviated signs	Display content
	**A-axis and b-axis servos are OFF** (no power being supplied to A-axis and b-axis motors)
	**A-axis servo is ON** (power being supplied to A-axis motor)
	**b- axis servo is ON** (power being supplied to b-axis motor)
	**A-axis servo is P-OT/N-OT** (required to be judged depending on P-OT/N-OT bits in A-axis bit display)
	**b-axis servo is P-OT/N-OT** (required to be judged depending on positive and negative rotation in b-axis bit display)
	**A axis is on alarm status** displaying alarm number
	**b axis is on alarm status** displaying alarm number

4.2 Auxiliary Function Mode (F□□□□)

4.2.1 Execution Mode List of Auxiliary Functions

This part describes the application operation of digital operator for motor running and adjustment.

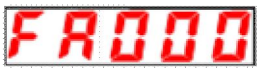
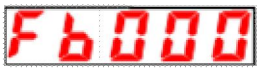
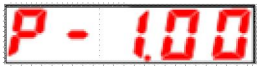
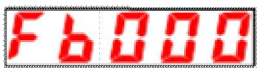
The following lists the user parameters of auxiliary function execution modes and their functions.

Auxiliary function NO.	Functions
F□000	Display of software version of servo
F□001	Position demonstration (effective only in position mode)
F□002	Jogging (JOG) mode running
F□003	Identification of load inertia percentage (compared to inertia of motor body)
F□004	User password authentication
F□005	Motor model confirmation
F□006	Manual adjustment of speed command offset
F□007	Manual adjustment of torque command offset
F□008	Automatic adjustment of (speed, torque) command offset
F□009	Removal of multi-coil information data of bus encoder
F□010	Removal of internal errors of bus encoder
F□011	Initialization of user parameter setting
F□012	Display of history alarm data

Note: in the list "□" displaying "A" indicates it is now in A-axis auxiliary function mode, and displaying "b" indicates it is now in b-axis auxiliary function mode.

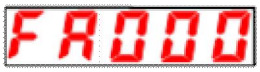
4.2.2 Display of Software Version of Servo

The following are operation steps for display of A-axis software version.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key and select auxiliary function mode to set the current mode as A-axis auxiliary function mode.	M	
2	Press M function key (for more than 1 second) and switch to auxiliary function mode of b axis, which will display Fb000.	M	
3	Press UP or DOWN and select the desired auxiliary function Fb000.	∧ ∨	
4	Press SET and A-1.00 is displayed, which indicates processor program version is V1.00.	SET	
5	Press Shift key and P-1.00 is displayed, which indicates FPGA program version is V1.00.	<	
6	Press SET to return to the display of Fb000.	SET	

4.2.3 Position Demonstration Operation

The following are operation steps for display of A axis position demonstration.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key (for more than 1 second) and switch to auxiliary function mode of A axis, which will display FA000.	M	
2	Press UP or DOWN and select the desired auxiliary function FA001.	∧ ∨	
3	Press SET and "2PCLr" is displayed and initiate position demonstration operation.	SET	
4	Press SET (for more than 1 second) until the display flickers “donE” to indicate position demonstration operation has been completed.	SET	
5	Press SET to return to the display of FA001.	SET	

4.2.4 Identification of Inertia Percentage

The following are operations steps for display of A-axis inertia percentage detected in normal mode (by turning 3 circles clockwise and another 3 circles counterclockwise).

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select parameter setting mode for A-axis. If PA127 is not displayed, press UP or DOWN to set.	M	
2	Press SET to display "H1341.", whose decimal point in bit 0 flickers.	SET	
3	Press shift key for three times and select Bit 3 of the displayed number, after which "H**1.**341" is displayed and the decimal point in Bit 3 flickers.	<	
4	Press UP and change the data to display "H2.341".	∧	
5	Press SET to return to the previous menu.	SET	
6	Press M function key and select the desired auxiliary function FA003.	M	
7	Press SET to display the operation interface "-JIn-" for display of inertia identification percentage.	SET	

8	Press M function key, initiate inertia identification operation by rotating motor 3 circles clockwise and another 3 circles counterclockwise, after which display flickers "donE".	M	
9	After detection, inertia percentage currently detected is displayed.	——	
10	Press SET to return to the display of Fb000.	SET	

4.2.5 Confirmation of Motor Model

It is the function for confirming the model, capacity and encoder model of servo motor being controlled by servo driver.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select A-axis auxiliary function mode. If FA005 is not displayed, press UP or DOWN to set.	M	
2	Press SET, and "A.0004" is displayed.	SET	
3	Press Shift key and "b.0220" is displayed.	<	
4	Press Shift key and "C.0010" is displayed.	<	
5	Press Shift key and "d.0020" is displayed.	<	
6	Press SET, and "A.0004" is displayed.	<	
7	Press SET to return to the display of Fb000.	SET	

4.2.6 Initialization of User Parameter Setup

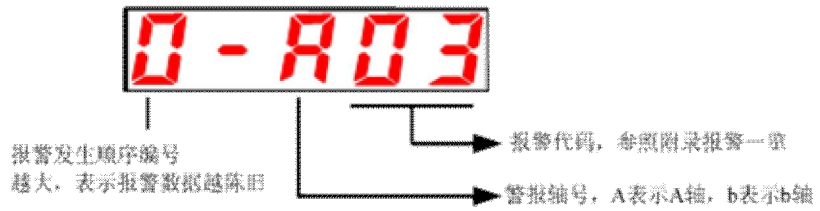
Operation steps to initialize A axis user parameter setup are as follows.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select auxiliary function mode for A axis. In case of failing to display FA011, press UP or DOWN to set.	∧ ∨	
2	Press SET to start parameter initialization.	SET	
3	Press SET (for more than 1 second) until the display flashes “donE” to indicate A axis user parameter has been initialized.	SET	

4	Press SET to return to the display of FA011.	SET	FA011

4.2.7 Displaying History Alarm Data

Ten previous alarms can be validated at most. The history alarm records can be deleted by a long press on SET. The history alarm data will not be deleted by alarm reset or servo power-off. Moreover, the alarm history data will not impact the operation.



报警发生顺序编号越大，表示报警数据越陈旧	The bigger the serial number stands for the older alarm data
报警代码，参照附录报警一览	See Alarm List for alarm codes
警报轴号，A 表示 A 轴，b 表示 b 轴	For alarm axis number, A stands for A axis while b stands for b axis

See "Abnormality Diagnosis and Treatment Methods" for alarm content.

1、 In case of continuous occurrence of the same alarm, the alarm history data will not update.

2、 The alarm history data displayed as “A--” or “b--” indicate zero alarm.

Validate the history alarm as per the following steps.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select auxiliary function mode for A axis. In case of failing to display FA012 press UP or DOWN to set.	∧ ∨	FA012
2	Press SET to display "0-A03" and the previous alarms.	SET	0-A03
3	Press UP to display the last history alarm (press DOWN to display the next new alarm).	<	1-A01
4	Press UP to display the alarms in order. * “A--” or “b--” indicates "Zero Alarm".	∧	2-A--
5	Press SET to return to the display of Fb012.	SET	FA012

4.3 Operation under User Parameter Mode (P□□□□)

Functions can be selected or adjusted by setting parameters. User parameters consist of "Parameter Setting" and "Function Selection". Parameter Setting functions to change the parameter data to be adjusted in a certain range and Function Selection works to select the functions distributed to bit numbers of penal operator.

4.3.1 User Parameter Setting

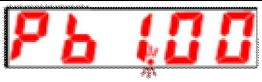
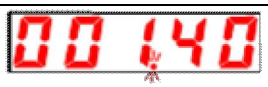
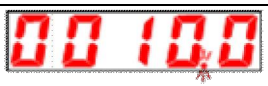
(1) Parameter setting

(a) Categories of “Parameter Setting”

See "List of User Parameters".

(b) Example to change "Parameter Setting"

The Parameter Setting based user parameters specify data by numerical values directly. The range of change is validated by List of User Parameters. For example: the operation steps to change b axis user parameter Pb100 (Speed loop gain) from "40" to "100" are shown as follows.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select parameter setting mode	M	
2	Press M function key (for more than 1 second). Pb000 is displayed and the decimal point in Bit 0 flashes	M	
3	Press shift key twice and select Bit 2 of the displayed number. Pb0.00 is displayed and the decimal point in Bit 2 flashes	<	
4	Press UP to change the data and Pb1.00 is displayed	^	
5	Press SET to display current Pb100 data	SET	
6	Press shift key for four times and select Bit 2 of the displayed number. 000.40 is displayed and the decimal point in Bit 2 flashes	<	
7	Press UP to change the data and 001.40 is displayed	^	
8	Press shift key for four times and select Bit 1 of the displayed number. 0014.0 is displayed and the decimal point in Bit 2 flashes	<	
9	Press DOWN to change the data and 001.00 is displayed	v	
10	Press SET to return to the display of Pb1.00. The content of b axis speed loop gain, Pb100, changes from "40" to "100"	SET	

(2) Function selection

(a) Categories of "Function Selection"

Also See "List of User Parameters".

(b) Example to change "Function Selection"

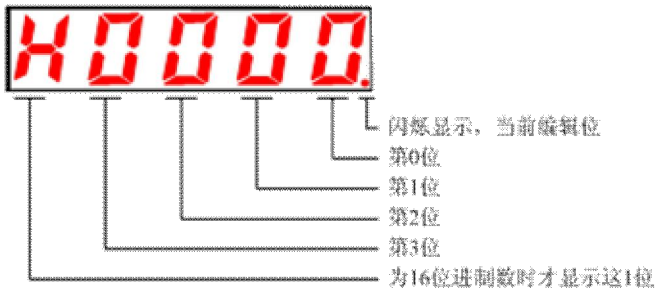
Example: the operation steps to change the control method (PA000.1) of basic switch PA000 for A axis function selection from speed to position are listed as follows.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key (for more than 1 second) and PA0.00 is displayed	M	PA0.00
2	Press SET to display current PA000 data. The decimal point in Bit 0 flashes	SET	H0000.
3	Press shift key and select Bit 1 of the displayed number. H000.0 is displayed and the decimal point in Bit 1 flashes	<	H000.0
4	Press UP to change the data and H001.0 is displayed	∧	H001.0
5	Press SET to return to the display of PA0.00 and the control approach for A axis has changed to position control	SET	PA0.00

(c) User parametric representation of the Manual

The user parameters for function selection are represented with hexadecimal system and every bit of the set value has respective meaning.

User parameters for function selection in the Manual are represented as follows.



闪烁显示，当前编辑位	The flashing bit is the one to be edited
第 0 位	Bit 0
第 1 位	Bit 1
第 2 位	Bit 2
第 3 位	Bit 3
为 16 位进制数时才显示这 1 位	This bit is only displayed for hexadecimal number

PA000.0 or A.Hxxx□ stands for the set value "0-bit data" of A axis user parameter "PA000".
PA000.1 or A.Hxx□x stands for the set value "1-bit data" of A axis user parameter "PA000".
PA000.2 or A.Hx□xx stands for the set value "2-bit data" of A axis user parameter "PA000".
PA000.3 or A.H□xxx stands for the set value "3-bit data" of A axis user parameter "PA000".
Pb000.0 or b.Hxxx□ stands for the set value "0-bit data" of b axis user parameter "Pb000".
Pb000.1 or b.Hxx□x stands for the set value "1-bit data" of b axis user parameter "Pb000".

Pb000.2 or b.Hx□xx stands for the set value "2-bit data" of b axis user parameter "Pb000".
Pb000.3 or b.H□xxx stands for the set value "3-bit data" of b axis user parameter "Pb000".

4.3.2 Signal Distribution of Input Circuit

Input signals are distributed to the pins of input connector based on the user parameter setup. (Distribution list is shown as follows.)

(1) Factory setting

The default distribution is indicated in bold as follows.

(a) Factory settings of single-axis driver

PA509 = H.4321 PA510 = H.8765 PA511 = H.0000 PA512 = H.0000

(b) Factory settings of double-axis driver

PA509 = H.4321 PA510 = H.0000 PA511 = H.0000 PA512 = H.0000

Pb509 = H.8765 Pb510 = H.0000 Pb511 = H.0000 Pb512 = H.0000

(2) Distribution change

User parameters are set based on the relation between use signal and input connector pin. Moreover, when user parameters changes, the servo unit should be subject to "Power Off" → "Power Restart" to make the user parameter take effect.

(a) List of input circuit signal distribution of single-axis driver:

Signal	Input signal	CN3 Pin no.								No connection required	
User parameter distribution		14 (IN1)	15 (IN2)	16 (IN3)	17 (IN4)	39 (IN5)	40 (IN6)	41 (IN7)	42 (IN8)	Always invalid	Always valid
Servo ON PA509.0 = H.xxx□	/S-ON	1	2	3	4	5	6	7	8	0	9
Proportional action command PA509.1 = H.xx□x	/P-CON	1	2	3	4	5	6	7	8	0	9
Positive-side over travel disabled PA509.2 = H.x□xx	POT	1	2	3	4	5	6	7	8	0	9
Negative over travel disabled PA509.3 = H.□xxx	NOT	1	2	3	4	5	6	7	8	0	9
Alarm reset PA510.0 = H.xxx□	/ALM-RST	1	2	3	4	5	6	7	8	0	9
Deviation counter reset PA510.1 = H.xx□x	/CLR	1	2	3	4	5	6	7	8	0	9
Positive-side external torque limit PA510.2 = H.x□xx	/PCL	1	2	3	4	5	6	7	8	0	9
Negative side external limit PA510.3 = H.□xxx	/NCL	1	2	3	4	5	6	7	8	0	9
Gain switch PA511.0 = H.xxx□	/G-SEL	1	2	3	4	5	6	7	8	0	9
Select internal position setting PA511.1 = H.xx□x	/POS0	1	2	3	4	5	6	7	8	0	9
Select internal position setting PA511.2 = H.x□xx	/POS1	1	2	3	4	5	6	7	8	0	9
Select internal position setting PA511.3 = H.□xxx	/POS2	1	2	3	4	5	6	7	8	0	9
Reference point switch PA512.0 = H.xxx□	/HOME-REF	1	2	3	4	5	6	7	8	0	9
Allow position start PA512.1 = H.xx□x	/POS-START	1	2	3	4	5	6	7	8	0	9
Position change step PA512.2 = H.x□xx	/POS-STEP	1	2	3	4	5	6	7	8	0	9
Homing start PA512.3 = H.□xxx	/START-HOME	1	2	3	4	5	6	7	8	0	9

Note: when multiple signals are distributed to the same input circuit, the input signal level will influence all the distributed signals.

(b) List of input circuit signal distribution of double axis driver:

Signal User parameter distribution	Input signal	CN3 Pin no.								No connection required	
		14 (IN1)	15 (IN2)	16 (IN3)	17 (IN4)	39 (IN5)	40 (IN6)	41 (IN7)	42 (IN8)	Always invalid	Always valid
Servo ON PA509.0 = H.xxx□	/S-ON	1	2	3	4	5	6	7	8	0	9
Proportional action command PA509.1 = H.xx□x	/P-CON	1	2	3	4	5	6	7	8	0	9
Positive-side over travel disabled PA509.2 = H.x□xx	POT	1	2	3	4	5	6	7	8	0	9
Negative over travel disabled PA509.3 = H.□xxx	NOT	1	2	3	4	5	6	7	8	0	9
Servo ON Pb509.0 = H.xxx□	/S-ON	1	2	3	4	5	6	7	8	0	9
Proportional action command Pb509.1 = H.xx□x	/P-CON	1	2	3	4	5	6	7	8	0	9
Positive-side over travel disabled Pb509.2 = H.x□xx	POT	1	2	3	4	5	6	7	8	0	9
Negative over travel disabled Pb509.3 = H.□xxx	NOT	1	2	3	4	5	6	7	8	0	9
Alarm reset P□510.0 = H.xxx□	/ALM-RST	1	2	3	4	5	6	7	8	0	9
Positive-side external torque limit P□510.2 = H.x□xx	/PCL	1	2	3	4	5	6	7	8	0	9
Negative side external limit P□510.3 = H.□xxx	/NCL	1	2	3	4	5	6	7	8	0	9
Gain switch P□511.0 = H.xxx□	/G-SEL	1	2	3	4	5	6	7	8	0	9
Select internal position setting P□511.1 = H.xx□x	/POS0	1	2	3	4	5	6	7	8	0	9
Select internal position setting P□511.2 = H.x□xx	/POS1	1	2	3	4	5	6	7	8	0	9
Select internal position setting P□511.3 = H.□xxx	/POS2	1	2	3	4	5	6	7	8	0	9
Reference point switch P□512.0 = H.xxx□	/HOME-REF	1	2	3	4	5	6	7	8	0	9
Allow position start P□512.1 = H.xx□x	/POS-START	1	2	3	4	5	6	7	8	0	9
Position change step P□512.2 = H.x□xx	/POS-STEP	1	2	3	4	5	6	7	8	0	9
Homing start P□512.3 = H.□xxx	/START-HOME	1	2	3	4	5	6	7	8	0	9

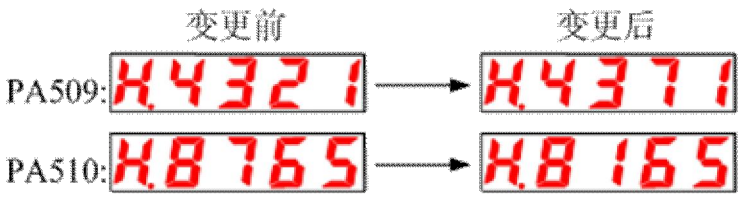
Note:

1. When multiple signals are distributed to the same input circuit, the input signal level will influence all the distributed signals.

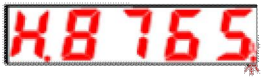
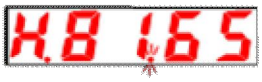
2. The "□" of P□510、P□511、P□512 can be either "A" or "b".

(3) Example of input signal distribution

The steps to change the servo NO (/S-ON) distributed by single-axis driver to CN3-14and the positive-side external torque limit (/PCL) distributed by single-axis driver to CN3-41 are listed as follows.



变更前	Before change
变更后	After change

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select parameter setting mode. In case of failing to display PA509, press UP or DOWN to set.	M	
2	Press SET to display current PA509 data. (Distribute /S-ON to CN3-14.)	SET	
3	Press shift key and select Bit 1 of the displayed number. H.432.1 is displayed and the decimal point in Bit 1 flashes.	<	
4	Press UP or DOWN to set current bit as "7".	^ v	
5	Press SET to return to the display of PA509.	SET	
6	Press UP or DOWN to set PA510.	^ v	
7	Press SET to display current PA510 data. (Distribute /PCL to CN3-14.)	SET	
8	Press shift key twice and select Bit 2 of the displayed number. H.87.54 is displayed and the decimal point in Bit 2 flashes.	<	
9	Press UP or DOWN to set current bit as "1".	^ v	
10	Press SET to return to the display of PA510 and distribute /S-ON to IN7 (CN3-41) and /PCL to IN1 (CN3-14).	SET	

(4) Polarity reversal setting of input port active level

Single/double-axis driver can set active level parameters of input port signals (PA519 and PA520) to reverse IN1-IN7 active level polarity.

Note:

1. When signals of Servo ON, Positive Over Travel Disabled and Negative Over Travel Disabled are used under "Polarity Negative Over Travel" setting, in case of any abnormality caused by signal line-off, no action will be made to safe direction. If such setup has to be made, validation on action and safety must be performed.

2. The reversal parameters of input port active level of double-axis driver are PA519, PA520, Pb519 and Pb520 with other setting invalid.

4.3.3 Signal Distribution of Output Circuit

(1) Factory setting

(a) Factory settings of single-axis driver:

PA513 = H.4321 PA514 = H.0065 PA521 = H.0000 PA522 = H.0000

(b) Factory settings of double-axis driver:

PA513 = H.0321 PA514 = H.0000 Pb513 = H.0654 Pb514 = H.0000

(2) Distribution change

The output circuits for sequence signals as follows can be used for function distribution. Moreover, when user parameters change, the servo unit should be subject to "Power Off" → "Power Restart" to make the user parameter take effect. The default distribution is indicated in the following gray box.

(a) List of output circuit signal distribution of single-axis driver:

CN3 Pin no.		7/(8)		9/(10)		11/(12)		32/(33)		34/(35)		36/(37)	
		OUT1		OUT2		OUT3		OUT4		OUT5		OUT6	
User parameter distribution		Polarity setting of signal output											
		PA521=H.xxx□		PA521=H.xx□x		PA521=H.x□xx		PA521=H.□xxx		PA522=H.xxx□		PA522=H.xx□x	
		0	1	0	1	0	1	0	1	0	1	0	1
Servo alarm (ALM) PA513.0=H.xxx□	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Positioning completed/same-speed detection (/COIN or /V-CMP) PA513.1=H.xx□x	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Motor rotation detection (/TGON) PA513.2=H.x□xx	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Servo ready (/S-RDY) PA513.3=H.□xxx	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Torque limit detection (/CLT) PA514.0=H.xxx□	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Brake (/BK) PA514.1=H.xx□x	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Encoder origin pulse	0	Invalid											

(/PGC) PA514.2=H.x□xx	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H

Note:

1、 When ALM signals and other signals are distributed to the same output circuit, the output circuit only output ALM signals.

2、 When PGC signals and other signals rather than ALM are distributed to the same output circuit, the output circuit only output PGC signals.

3、 Multiple signals (except for ALM and /PGC) distributed to the same output circuit will be output through OR circuit.

(b) List of output circuit signal distribution of double-axis driver:

CN3 Pin no.		7/(8)		9/(10)		11/(12)		32/(33)		34/(35)		36/(37)	
		OUT1		OUT2		OUT3		OUT4		OUT5		OUT6	
User parameter distribution		Polarity setting of signal output											
		PA521=H.xxx□		PA521=H.xx□x		PA521=H.x□xx		PA521=H.□xxx		PA522=H.xxx□		PA522=H.xx□x	
		0	1	0	1	0	1	0	1	0	1	0	1
Servo alarm (ALM) PA513.0=H.xxx□	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Positioning completed/same-speed detection (/COIN or /V-CMP) PA513.1=H.xx□x	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Motor rotation detection (/TGON) PA513.2=H.x□xx	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Servo alarm (ALM) Pb513.0=H.xxx□	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Positioning completed/same-speed detection (/COIN or /V-CMP) Pb513.1=H.xx□x	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Motor rotation detection (/TGON) Pb513.2=H.x□xx	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Servo ready (/S-RDY) P□513.3=H.□xxx	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Torque limit detection (/CLT) P□514.0=H.xxx□	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Brake (/BK) P□514.1=H.xx□x	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H
Encoder origin pulse (/PGC) P□514.2=H.x□xx	0	Invalid											
	1	L	H										
	2			L	H								
	3					L	H						
	4							L	H				
	5									L	H		
	6											L	H

Note:

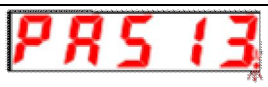
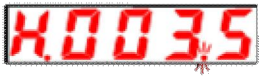
1、 When ALM signals and other signals are distributed to the same output circuit, the output circuit only output ALM signals.

2、 When PGC signals and other signals rather than ALM are distributed to the same output circuit, the output circuit only output PGC signals.

3、 Multiple signals (except for ALM and /PGC) distributed to the same output circuit will be output through OR circuit.

(3) Example of output signal distribution

Steps to invalidate the default setting to distribute rotation detection (/TGON) to CN3-11(12) and replace CN3-11(12) with Brake Signal Distribution.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select parameter setting mode. In case of failing to display PA513, press UP or DOWN to set.	M	
2	Press SET to display current PA513 data. (Distribute /TGON to CN3-11(12).)	SET	
3	Press shift key twice and select Bit 2 of the displayed number. H.43.21 is displayed and the decimal point in Bit 2 flashes.	<	
4	Press UP or DOWN to set current bit as "0".	∧ ∨	
5	Press SET to return to the display of PA513.	SET	
6	Press UP or DOWN to set PA514.	∧ ∨	
7	Press SET to display current PA514 data. (Distribute /BK to CN3-36(37).	SET	
8	Press shift key and select Bit 1 of the displayed number. H.006.1 is displayed and the decimal point in Bit 5 flashes.	<	
9	Press UP or DOWN to set current bit as "3". (Distribute TGON to CN3-11(12)	∧ ∨	
10	Press SET to return to the display of PA514 and distribute /TGON to OUT3:CN3-11(12).	SET	

4.4 Operation under Monitoring Mode (Un□□□)

Under monitoring mode, the command value input to A axis or b axis servo driver, status of input/output signals and servo internal status can be monitored. Even though the servo motor is running, the monitoring mode can be changed.

4.4.1 List of Monitoring Mode

(1) Content displayed under monitoring mode

Monitor number	Display content	Unit
Un000	Motor speed	1r/min
Un001	Rotation angle (electric angle)	1deg
Un002	Input command pulse speed (only valid under position control mode)	1 KHz
Un003	Busbar voltage	1 V
Un004	Speed command value of analogue input	1r/min
Un005	Torque command percentage of analogue input (relative rated torque)	1 %
Un006	Internal torque command (relative rated torque or given motor currency)	1% or 0.1A
Un007	Input port signal monitoring	—
Un008	Output port signal monitoring	—
Un009	Encoder signal monitoring (only valid for incremental encoder)	—
Un010	Input command pulse counter (32-bit decimal display, only valid under position control mode)	1-command pulse
Un011	Feedback pulse counter (four-octave frequency data of encoder pulse, 32-bit decimal display)	1-command pulse
Un012	Position offset counter (only valid under position control mode)	1-command pulse
Un013	Accumulative load rate (when rated torque is set as 100%)	1 %
Un014	Ratio of moment of inertia (the ratio of load moment inertia to motor moment inertia)	1 %
Un015	Actual encoder angle (32-bit decimal display)	1-command pulse
Un016	Display rounds of encoder (only valid for turns of encoder)	1 circle

(2) Monitor display for input/output signals for sequence

Monitor display for input/output signals for sequence

(a) Monitor display of input signal status

Display the input/output status of the signals distributed to input/output terminals.

When input/output is OFF (open circuit), the upper display segment (LED) will be on.

When input/output is ON (short circuit), the lower display segment (LED) will be on.

上：OFF（H 电平）	Upper: OFF (H Level)
下：ON（L 电平）	Lower: ON (L Level)
熄：当前显示为 A 轴状态	Light-off: A axis status is displayed

亮：当前显示为 b 轴状态	Light-on: b axis status is displayed
显示 LED 号码	LED number is displayed

Validate the relation between input terminals and input signals according to "7.3.2 Signal Distribution of Input Circuit".

Monitor number	LED number is displayed	Name of input terminal	Factory settings	
			Single-axis	Double-axis
Un007	1	IN1（CN3-14）	/S-ON	A axis /S-ON
	2	IN2（CN3-15）	/P-CON	A axis /P-CON
	3	IN3（CN3-16）	POT	A axis POT
	4	IN4（CN3-17）	NOT	A axis NOT
	5	IN5（CN3-39）	/ALM-RST	b axis /S-ON
	6	IN6（CN3-40）	/CLR	b axis /P-CON
	7	IN7（CN3-41）	/PCL	b axis POT
	8	IN8（CN3-42）	/NCL	b axis NOT

(b) Monitor display of output signal status

Display the status of the output signals distributed to output terminals.

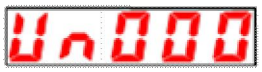
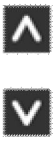
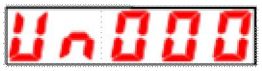
When output is OFF (open circuit), the upper display segment (LED) will be on.

When output is ON (short circuit), the lower display segment (LED) will be on.

Monitor number	LED number is displayed	Name of input terminal	Factory settings	
			Single-axis	Double-axis
Un008	1	OUT1 (CN3-7,-8)	ALM	A axis ALM
	2	OUT2 (CN3-9,-10)	/COIN or /V-CMP	A axis/COIN or /V-CMP
	3	OUT3 (CN3-11,-12)	/TGON	A axis/TGON
	4	OUT4 (CN3-32,-33)	/S-RDY	b axis ALM
	5	OUT5 (CN3-34,-35)	/CLT	b axis/COIN or /V-CMP
	6	OUT6 (CN3-36,-37)	/BK	b axis/TGON
Un009 (Only valid for incremental encoder)	1	PW (CN□-12,-13)	□ axis encoder W-phase (□ represents for 1 or 2)	
	2	PV (CN□-10,-11)	□ axis encoder V-phase	
	3	PU (CN□-8,-9)	□ axis encoder U-phase	
	4	UVW off line detection signal	□ axis UVW off line detection	
	5	PC (CN□-5,-6)	□ axis encoder C-phase	
	6	PB (CN□-3,-4)	□ axis encoder B-phase	
	7	PA (CN□-1,-2)	□ axis encoder A-phase	
	8	ABC off line detection signal	□ axis UVW off line detection	

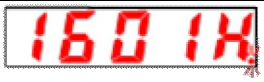
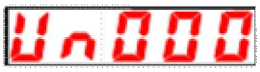
(3) Use of monitoring mode

Operation steps to display b axis Un000 data are listed as follows (when A axis and b axis servo motor rotate at 1000 and 1500 r/min respectively)

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M mode key to select monitoring mode		
2	Press UP or DOWN and select the desired monitor number Un000		
3	Press SET to display Un000. The decimal point of current Bit 0 is off, so A axis Un000 is displayed		
4	Press UP or Down, the decimal point of current Bit 0 is on, so b axis Un000 is displayed		
5	Press SET to return to the display of monitor number.		

(4) **Monitor display of actual angle of command pulse, feedback pulse counter and encoder**

Operation steps to display b axis Un010 data are as follows.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select A axis monitoring mode. In case of failing to display Un010, press UP or DOWN to set.	M	
2	Press SET to display Un010. The decimal point of current Bit 0 is off, so low 16-bit of A axis Un010 is displayed.	SET	
3	Press UP or Down, the decimal point of current Bit 0 is on, so low 16-bit of b axis Un010 is displayed.	∧ ∨	
4	Press Shift key, the decimal point of current Bit 0 is on, so high 16-bit of b axis Un010 is displayed.	<	
5	Press SET to return to the display of monitor number.	SET	

Chapter V Operation

5.1 Test Run

Perform test run after wiring.

5.1.1 Test Run for Servo Motor Unit

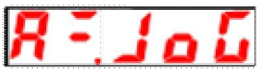
Notes
• Disconnect the servo motor and machinery and only fix the servo motor unit. To avoid accident, based on the instruction, test run is performed on a servo motor under unloaded status (where the servo motor unit connects with no coupling or belt).

Validate whether the power, motor main circuit and encoder cables are wired correctly. Usually, wiring mistake will cause the servo motor fail to rotate smoothly in test run. Please validate again.

When the wiring is validated as correct, perform test run for servo motor units based on the following serial number in order.

- Jogging (JOG) and mode running (F□002)

The following are operation steps for display of axis A JOG operation.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key (for more than 1 second) and switch to auxiliary function mode of axis A.	M	
2	Press M function key to select auxiliary function mode for A axis. In case of failing to display FA002, press UP or DOWN to set.	∧ ∨	
3	Press SET to start JOG operation.	SET	
4	Press M function key to turn the servo ON (the motor is powered on).	M	
5	Press UP (turn anti-clockwise/ positive) or DOWN (turn clockwise/ negative) to run the motor.	∧ ∨	
6	Press M function key to turn the servo OFF (the motor is powered off).	M	
7	Press SET to return to the display of FA002.	SET	

P□304	微动（JOG）速度	速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起
	0 ~ 6000	1rpm	500	不需要
设定辅助功能“微动(JOG) 模式运行(Fn002)”的电机转速指令值。				

微动（JOG）速度	Jogging (JOG) speed
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
设定辅助功能“微动(JOG) 模式运行(Fn002)”的电机转速指令值。	Set the motor speed command value for auxiliary function "Jogging (JOG) Mode Running (Fn002)".

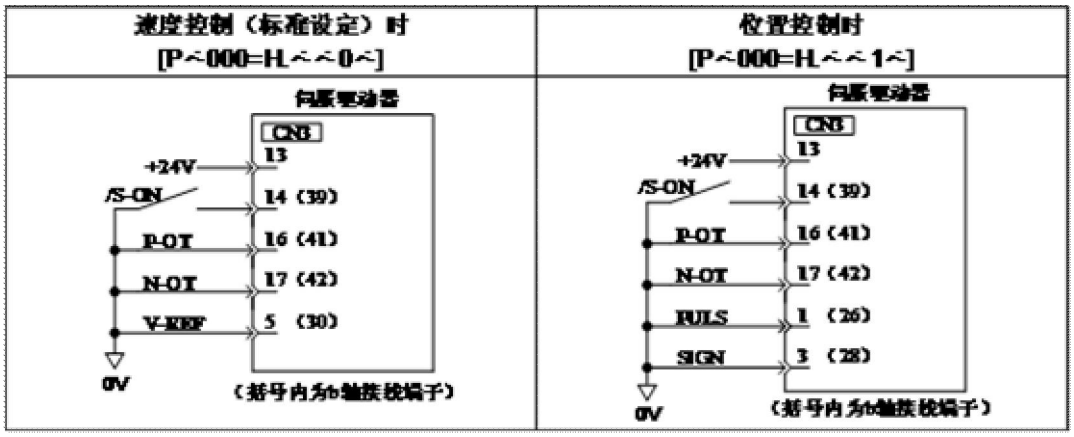
Pay attention, in the operation under jogging (JOG) mode, it is invalid to disable Positive Over Travel (P-OT) or Negative Over Travel (N-OT).

5.1.2 Test Run for Servo Motor Unit with Superior Command

This item is to validate whether the servo motor moving command input from command controller to servo unit and input/output signals are correctly set, whether the wiring and polarity between command controller and servo unit are correct and whether the movement setting of servo unit is correct. This is the final validation before connecting the servo motor to machinery.

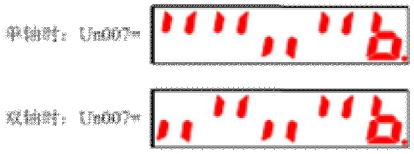
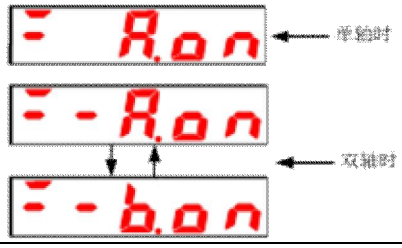
(1) Servo ON command based on superior command

The following external input signal circuits and air drop signal circuits must be configured.



速度控制（标准设定）时	Speed control (standard setting)
位置控制时	Position control
伺服驱动器	Servo drive
（括号内为 b 轴接线端子）	(b axis connection terminal in the bracket)
伺服驱动器	Servo drive
（括号内为 b 轴接线端子）	(b axis connection terminal in the bracket)

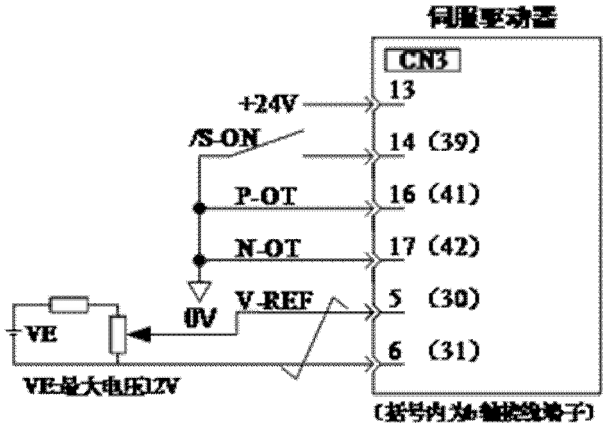
Step	Content	Verification methods and supplementary instruction
1	Form the input signal circuit required by servo ON. To turn the servo ON, the minimum required signal should be input. Please wire the input/output signal connector (CN3) in the circuit equivalent to the circuit shown in the preceding page, power it off and connect CN3 to servo unit.	Please set as follows. 1. Input servo On and input signal (/S-ON) 2. Input signals of Positive Over Travel (P-OT) and Negative Over Travel (N-OT) Turn On (L level) (positive over travel and negative over travel can be performed) 3. Do not input command (0V command or 0 pulse) If the external wiring is to be omitted, the input signal distribution function based on user parameters can be used to set the function of input terminal as “Always Valid”, “Always Invalid” without signal input. Please refer to “Signal Distribution of Input Circuit”. When absolute value encoder is used, if “Use Absolute Encoder as Incremental Encoder (Pn001=H.□□□2)” is set temporarily, wiring for SEN signals can be omitted.
2	Please power on to validate whether the panel operator displays content as follows. 	If the content is not displayed as shown in the left figure, the setting of the input signals is incorrect. Please validate the input signals with input signal monitor (Un007).

		 Turn the connected signal lines ON/Off to validate that the LED display of the digital operator changes as follows.
3	Input servo ON input signal (/S-ON) and validate that the display of panel operator is shown as follows. 	When any alarm appears, see "Abnormality Diagnosis and Treatment Methods" to eliminate the alarm. In case of interference in command voltage during speed control, "-" in the upper left part of the panel operator will flash. When the servo is ON, the servo motor might run at dead slow speed. For such occasion, please refer to "Other Wiring" to take corresponding measures.

单轴时	For single-axis
双轴时	For double-axis
单轴时：Un007=	For single-axis: Un007=
双轴时：Un007=	For double-axis: Un007=
单轴时	For single-axis
双轴时	For double-axis

(2) Operation steps under speed control mode (P□000=H.□□0□)

The following external input signal circuits and equivalent signal circuits must be configured.



伺服驱动器	Servo drive
VE:最大电压 12V	VE: maximum voltage 12 V
（括号内为 b 轴接线端子）	(b axis connection terminal in the bracket)

Step	Content	Verification methods and supplementary instruction
1	Please validate the power and input signal circuit again and validate the speed command input (voltage between V-REF and GND) is 0 V.	Please refer to the input signal circuit shown in the above figure.
2	Set servo ON(/S-ON) input signal as ON.	If the servo motor rotates at small angle, see "Adjustment of Command Shift" to set the motor as not to rotate.
3	Increase the voltage (between V-REF and GND) input slowly from 0 V with speed command.	Factory setting: 150(r/min)/V.

4	Please validate the speed command (Un004[r/min]) value input to servo driver.	See "Selection and Operation of Basic Mode" for relevant display methods.
5	Please validate servo motor speed (Un000[r/min]).	See "Selection and Operation of Basic Mode" for relevant display methods.
6	Please validate the values of Step 4 and 5 (Un004 and Un000) are equivalent.	Change speed command input voltage to validate whether Un004=Un000 is valid when there are multiple speed command values.
7	Please validate the speed command input or motor rotation direction.	Refer to the following equation when speed command input gain (P□300) changes. Un004 ＝ P□300[rpm/V]×(V-REF voltage)[V] To change the motor rotation direction without changing speed command input voltage polarity, see “Rotation Direction Switching of Motor”. Start from Step 2 after change.
8	If the servo is OFF when the speed input command is set as 0 V, the test run of servo motor unit has completed.	

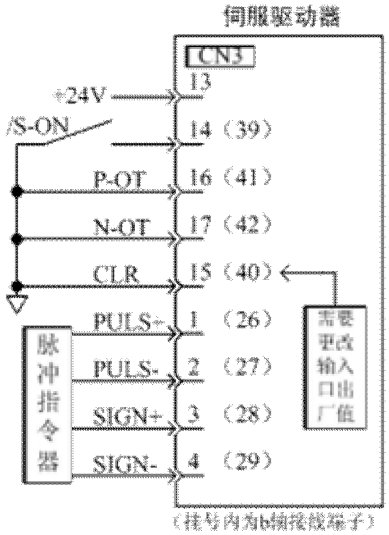
Note: The position control is configured in command controller

When servo is under speed control and subject to position control in command controller, please validate the following items after the said “Operation Steps under Speed Control Mode”.

Step	Content	Verification methods and supplementary instruction
9	Please validate the power and input signal circuit again and validate the speed command input (voltage between V-REF and GND) is 0 V.	
10	Set servo ON(/S-ON) input signal as ON.	If the servo motor rotates at small angle, see “Adjustment of Command Shift” to set the motor as not to rotate.
11	Give the motor rotation command (e.g., the motor rotates 1 round) easy to validate in advance from command controller and validate the motor rotation commanded and realized by visual inspection and monitoring motor actual angle (Un015[pulse]).	Motor rotation angle 1 (Un015[pulse]): the pulse count starting from original point.
12	In case of rotation difference of Step 11, please properly set the PG frequency dividing ratio (Pn201) that outputs encoder pulse from servo unit.	See "Encoder Signal Output" for relevant setting method. PG frequency dividing ratio (Pn201[P/Rev]): the encoder pulse count per rotation round.
13	If the servo is OFF when the speed input command is set as 0 V, the test run to set the command control as position control has completed.	

(3) Operation steps under position control mode (P□000=H.□□1□)

The following external input signal circuits and equivalent signal circuits must be configured.



伺服驱动器	Servo drive
脉冲指令器	Pulse commander
需要更改输入口出厂值	Factory setting of input port should be changed
（挂号内为 b 轴接线端子）	(b axis connection terminal in the bracket)

Step	Content	Verification methods and supplementary instruction
1	Please validate the conformity between pulse shape and the pulse output shape of superior pulse commander.	Command pulse shape is set with P□200=H.××□×. Please refer to "Setting of User Parameter".
2	Set command unit and set electronic gear ratio based on command controller.	Electronic gear ratio is set with (Pn202/Pn203). Please refer to "Setting of Electronic Gear".
3	Power on and set servo ON(/S-ON) input signal as ON.	
4	Use the motor rotation to be easily validated in advance (e.g., motor rotates 1 round) to output slow command pulse from command controller.	Set the command pulse rate as the safe rate around 100 r/min.
5	Please validate the command pulse count input to servo unit with the variation before and after inputting the command of command pulse counter ((Un010[pulse]).	See "Selection and Operation of Basic Mode" for relevant display methods. Un010(input command pulse counter [pulse])
6	Please validate the actual rotation of the motor before/after change of feedback pulse counter (Un011[pulse]).	See "Selection and Operation of Basic Mode" for relevant display methods. Feedback pulse counter (Un011 [pulse])
7	Please validate that Step 5 and 6 meet the following conditions. Un011=Un010	
8	Please validate the conformity of rotation direction with the servo motor giving command.	Please validate the input pulse polarity and input command pulse shape. Please refer to "Selection of Pulse Command shape".
9	Please validate motor rotation direction.	To change the motor rotation direction without changing input command pulse shape, see “Rotation Direction Switching of Motor”. Start from Step 9 after change.
10	If the servo will be OFF when the pulse command input stops, the test run under servo motor unit position control mode using superior position command has completed.	

5.1.3 Supporting Test Run for Machinery and Servo Motor

Danger
• Please carry out operations indicated in this section as per instructions. Upon connection between servo motor and machinery, in case of operation mistake, not only damages to machinery but also personal injuries will be caused therefrom.

Test run should be completed as per the following steps.

Step	Content	Verification methods and supplementary instruction
1	Switch on power and set mechanical configuration in respect of protection functions for overtravel and brake.	Please refer to "Setting of General Basic Functions". When using servo motor with brake, measures against natural falling of machinery and vibration caused by external force should be taken prior to confirmation of brake operation. Please check whether operations for servo motor and brake are normal. Please refer to "Setting for Holding Brake".
2	Please set necessary parameters for users based on used control mode.	Based on used control mode, please refer to: the Speed Control (Analog Voltage Command) Operation the Position Control Operation the Torque Control Operation
3	Please connect to servo motor and machinery via coupling with power being cut off.	Please refer to "Installation Precautions for Servo Motor".
4	When servo controller is turned to "Servo Off" mode (de-energized state), switch on power of command controller of machinery. Please confirm once again whether operation of protection functions in step 1 is normal.	Please refer to "Setting of General Basic Functions". In case of any abnormality during operation of following step, emergency stop may be carried out to safely stop operation.
5	Please carry out test run in accordance with objectives specified in the Test Run for Servo Motor Unit Based on Superior Command upon completed installation of machinery and servo motor.	Please check whether results are in line with test run of servo motor unit. In addition, please check whether settings like command unit conform to that of machinery.
6	Please confirm once again whether user parameter settings conform to control mode in step 2.	Please check whether servo motor operates according to specification for machinery operation.
7	Please adjust servo gain as necessary to improve responsiveness of servo motor.	Test run should be fully completed since insufficient "running-in" with machinery may occur in the test run.
8	Please record the user parameters set for maintenance in the 12.4 User Parameter Setting Memo. At this point, the Supporting Test Run for Machinery and Servo Motor is completed.	

5.1.4 Test Run for Servo Motor with Brake

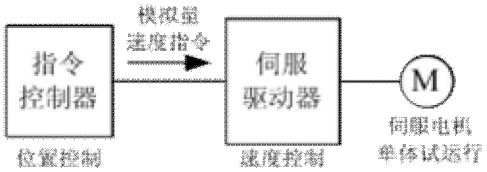
In terms of a servo motor with brake, operation for its holding brake should be controlled by interlocking output (/BK) signals of the brake in servo driver.

Measures against natural falling of machinery and vibration caused by external force should be taken prior to confirmation of brake operation. Please check operations of servo motor and holding brake upon disconnection between servo motor and machinery. If operations are normal, servo motor may be connected to machinery for test run.

Please refer to "Setting for Holding Brake" for wiring of servo motor with brake and settings for user parameters.

5.1.5 Position Controlled by Command Controller

According to the above mentioned, make sure that test run for servo motor unit should be conducted after disconnection of servo motor and machinery, Please confirm operation and specification of servo motor first based on the following table.



指令控制器	Command controller
模拟量速度指令	Analogue speed command
伺服驱动器	Servo drive
位置控制	Position control
速度控制	Velocity control
伺服电机单体试运行	Test run for servo motor unit

Commands of command controller	Confirming matters	Confirming methods	Re-corrected content	Reference
JOG operation (Command with certain speed input by command controller)	RPM of servo motor	Confirm speed of servo motor by the following methods. •RPM monitoring for motor using panel operator (Un000) •Try to operate servo motor at a lower speed. For example, input a speed command of 60r/min and check whether the servo motor rotates 1 round per second.	Please determine whether input gain (P□300) of speed command is correct via confirmation of setting values of user parameters.	
Simple positioning	Rotation amount of servo motor	After inputting a command to order the servo motor to rotate 1 round, visually inspect whether the shaft of servo motor rotates 1 round.	Please determine whether PG divider ratio (P□201) is correct via confirmation of setting values of user parameters.	
Overtravel operation (when using POT and NOT signals)	Input POT and NOT signals and check whether the servo motor stops.	During continuous rotation of servo motor, make sure that servo motor stops after POT and NOT signals is switched to be ON.	If it fails to be stopped, correct wiring of POT and NOT again.	

5.2 Selection of Control Mode

Control modes applicable to servo driver are explained as follows:

User Parameter		Control modes	Reference
P□000	H.□□0□	Speed control (analog voltage command) Control RPM of servo motor by command of analog voltage speed in case of: · required RPM control · feedback for frequency dividing output by encoder of servo; setting position loop in command controller; and implementation of position control	
	H.□□1□	Position control (pulse train command) Control position of servo motor via command of pulse train position.	

		Control position via number of incoming pulse and control speed via frequency of incoming pulse. Use it if in need of positioning operation.	
	H.□□2□	Torque control (analog voltage command) Control output torque of servo motor by analog voltage torque command which should be used if in need of output torque for pushing.	
	H.□□3□	Speed control (selection of internal set speed) With 3 input signals (/P-CON, /P-CL and /N-CL), speed is controlled by operation speed set by servo in advance. 3 operation speeds can be set for the servo without analog voltage command.	
	H.□□3□ . . . H.□□B□	It is supporting switching modes for the above 4 control modes. Please select an applicable switching mode of control mode for purposes of clients.	
	H.□□C□	Motion control mode	

5.3 Setting of General Basic Functions

5.3.1 Servo ON Setting

Set the servo ON signal (/S-ON) which sends out commands for energized/de-energized state of servo motor.

(1) Servo ON signal (/S-ON)

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Input	/S-ON	CN3-14	CN3-39	ON = L Level	Servo motor can operate in energized state (servo ON state).
				OFF = H Level	Servo motor cannot operate in de-energized state (servo OFF state).
■Attentions Make sure that commands are input to start/stop servo motor after sending servo ON signal. Do not use /SON signal to start/stop servo motor after inputting commands. In case of repeated switching between ON and OFF modes for AC power, accidents may be caused by aging of internal components. /S-ON signals may distribute inputted connector pin numbers to other places by user parameters.					

(2) Select to use/disuse servo ON signal

Regular servo ON can be set by user parameters without wiring of /S-ON, however, servo driver is switched to action state when power is on, therefore you should handle with care.

User Parameter			Meanings
P□509	A axis	H.□□1□	Input /S-ON signal via the input terminal IN1(CN3-13) (factory setting)
		H.□□9□	Set the /S-ON signal to be "valid " in regular time
	B axis	H.□□5□	Input /S-ON signal via the input terminal IN5 (CN3-39) (factory setting)
		H.□□9□	Set the /S-ON signal to be "valid " in regular time
· Power must be turned on again upon changes to the user parameter so as to effect the setting. · When the signal is set to be "valid " in regular time, reset can be realized by power restarting in case of alarm (alarm reset is			

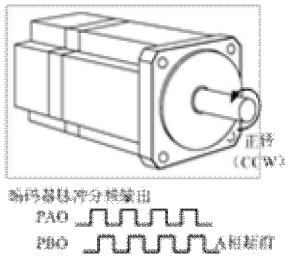
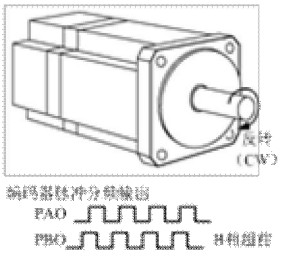
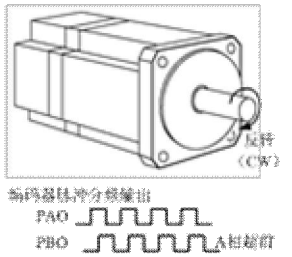
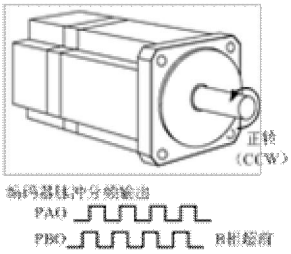
invalid).

5.3.2 Rotation Direction Switching of Motor

In this case, only rotation direction of motor should be switched without changes to pulse and voltage polarity of commands being sent into servo driver.

At the same time, moving direction (+, -) of shaft is switched but polarity for output signals from servo (such as pulse output of encoder and analog monitor signal) is kept unchanged.

In standard setting, "positive direction" is observed to be "counterclockwise rotation" from the loading side of servo motor.

<table>
<tr><th colspan="2" rowspan="2">User Parameter</th><th rowspan="2">Name</th><th colspan="2">Command</th></tr>
<tr><th>Positive rotation command</th><th>Negative rotation command</th></tr>
<tr><td rowspan="2">P□000</td><td>H.□□□0</td><td>Standard setting (CCW refers to positive rotation) (Factory setting)</td><td>  </td><td>  </td></tr>
<tr><td>H.□□□1</td><td>Negative rotation mode (CW refers to positive rotation)</td><td>  </td><td>  </td></tr>
<tr><td colspan="5">In terms of direction switching of POT and NOT, CCW direction is POT if P□000= H.□□□0 (standard setting) and CW direction is POT if P□000= H.□□□1 (negative rotation mode).</td></tr>
</table>

正转（CCW）	Positive rotation (CCW)
编码器脉冲分频输出	Frequency dividing ratio of encoder pulse
A相超前	A phase advance
反转（CW）	Negative rotation (CW)
编码器脉冲分频输出	Frequency dividing ratio of encoder pulse
B相超前	B phase advance
反转（CW）	Negative rotation (CW)
编码器脉冲分频输出	Frequency dividing ratio of encoder pulse
A相超前	A phase advance
正转（CCW）	Positive rotation (CCW)
编码器脉冲分频输出	Frequency dividing ratio of encoder pulse
B相超前	B phase advance

5.3.3 Overtravel Setting

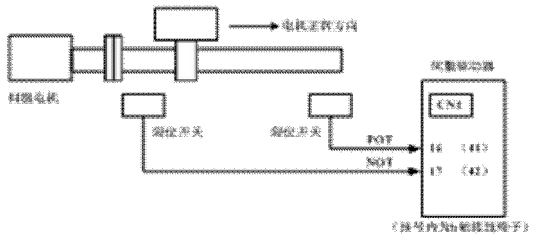
Overtravel refers to a state enabling limit switch to move (ON) due to the fact that removable part of machinery exceeds allowable moving area. Overtravel function for servo driver effects force stop in such condition.

(1) Connection of overtravel signal

In order to use overtravel function, connect input signals of the following overtravel limit switch to corresponding pin numbers in CN3 connector of servo driver without fail.

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Input	POT	CN3-16	CN3-41	ON = L Level	Positive rotation side run enabled (normal operation)
				OFF = H Level	Positive-side over travel disabled (overtravel in positive rotation side)
Input	NOT	CN3-17	CN3-42	ON = L Level	Negative-side over travel enabled (normal operation)
				OFF = H Level	Negative-side over travel disabled (overtravel in negative rotation side)

In respect of linear drive, limit switches must be connected as per the following figure so as to avoid machinery damage.
Even in case of overtravel, it can also drive to the opposite side.
For example, negative-side run can be enabled in case of positive-side overtravel.



■Attentions

During position control, position shift pulse will occur if the motor is stopped by overtravel.
In order to eliminate position shift pulse, clear signals (CLR) must be input.

伺服电机	Servo motor
电机正转方向	Motor positive direction
限位开关	Limit switch
限位开关	Limit switch
伺服驱动器	Servo drive
（挂号内为b轴接线端子）	(b axis connection terminal in the bracket)

Notes

Workpieces may fall under the overtravel state when using servo motor in vertical shaft.
In order to prevent workpieces from falling in case of overtravel, make sure to set P□000= H.1□□□ so as to switch on zero clamping state after stop. (Please refer to "Selection of Motor Stop Methods when Using Overtravel")

(2) Select to use/disuse overtravel signal

Internal user parameters of servo driver can be set to disuse overtravel signals. At this time, it is not required to use wiring of input signals for overtravel.

User Parameter			Meanings
P□509	A axis	H.□3□□	Input positive-side over travel disabled (POT) signal from IN3 (CN3-13). (Factory setting)
		H.□9□□	Disable the positive-side over travel disabled (POT) signal (positive-side over travel can be conducted frequently)

	B axis	H.□7□□	Input positive-side over travel disabled (POT) signal from IN7 (CN3-41). (Factory setting)
		H.□9□□	Disable the positive-side over travel disabled (POT) signal (positive-side over travel can be conducted frequently)
	A axis	H.4□□□	Input negative-side over travel disabled (NOT) signal from IN4 (CN3-14). (Factory setting)
		H.9□□□	Disable the negative-side over travel disabled (POT) signal (negative-side over travel can be conducted frequently)
	B axis	H.9□□□	Input negative-side over travel disabled (NOT) signal from IN8 (CN3-42). (Factory setting)
		H.9□□□	Disable the negative-side over travel disabled (POT) signal (negative-side over travel can be conducted frequently)

· Effective control modes: speed control, position control and torque control
· Power must be turned on again upon changes to the user parameter so as to effect the setting.
* POT and NOT signals may freely distribute inputted connector pin numbers by user parameters. See the Signal Distribution of Input Circuit for details.

(3) Selection of motor stop methods when using overtravel

Methods used to stop operation of motor when inputting overtravel signals (POT and NOT) during rotation of servo motor.

User Parameter		Methods for motor stop	After stop of motor	Meanings
P□000	H.□0□□	Plug braking stopping	Inertial operation state	Reduce speed to stop the servo motor by emergency stop torque (P□407). Servo motor will be in inertial operation (de-energized) state after stop.
	H.□1□□	Inertial operation stopping		Stop the servo motor in the same manner as servo OFF (inertial operation stop). The servo motor will be in inertial operation (de-energized) state after stop.
	H.0□□□	Plug braking stopping	Inertial operation state	Reduce speed to stop the servo motor by emergency stop torque (P□407). Servo motor will be in inertial operation (de-energized) state after stop.
	H.1□□□	Plug braking stopping	Zero clamping state	Reduce speed to stop the servo motor by emergency stop torque (P□407). Servo motor will be in zero clamping (servo locking) state after stop.
	H.2□□□	Inertial operation stopping	Inertial operation state	Stop the servo motor in the same manner as servo OFF (inertial operation stop). The servo motor will be in inertial operation (de-energized) state after stop.

· Power must be turned on again upon changes to the user parameter so as to effect the setting.
· During setting of inertial operation for H.□1□□, the servo motor may be controlled if servo ON signals are received.
■Words and expressions
· Inertial operation stopping: naturally stop the motor by friction resistance arising from motor rotation other than braking.
· Plug braking stopping: stop the motor via deceleration (brake) torque (P□407).
· Zero clamping state: use state of position loop in zero configuration of position command.

* See the Selection of Stop Methods in Servo OFF for stop methods in servo OFF and alarm condition.

(4) Setting for stop torque in overtravel

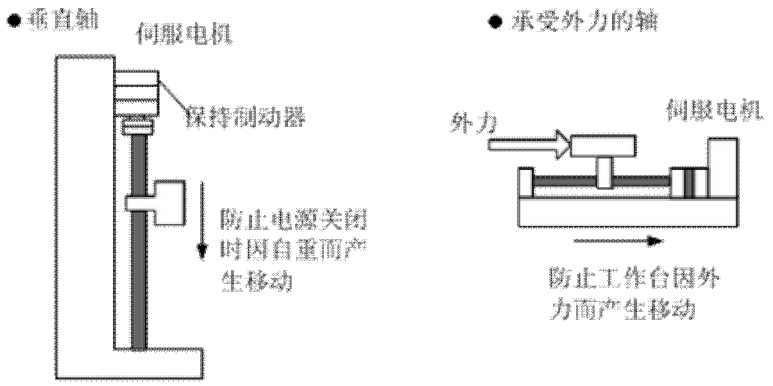
P□407	反接制动扭矩限制	速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起
	0 ~ 300	1%	300	不需要

- 设定输入超程信号 (POT，NOT) 时的停止扭矩。
- 设定单位为相对于额定扭矩的%。(额定扭矩为100%)
- 出厂时的紧急停止扭矩必须设定为电机最大扭矩那样的充分大的值300%，但实际输出的紧急停止扭矩取决于电机的额定值。

反接制动扭矩限制	Limit of plug braking torque
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
·设定输入超程信号(POT，NOT) 时的停止扭矩。	· Set the stop torque used for inputting overtravel signals (POT and NOT).
· 设定单位为相对于额定扭矩的%。(额定扭矩为100%)	· Set unit corresponds to a percent (%) of the rated torque. (rated torque is 100%)
· 出厂时的紧急停止扭矩必须设定为电机最大扭矩那样的充分大的值300%，但实际输出的紧急停止扭矩取决于电机的额定值。	· Emergency stop torque must be set to 300 % of maximum torque of motor when delivery, but the emergency stop torque actually output should depend on rated value of motor.

5.3.4 Setting for Holding Brake

When the vertical shaft is driven by servo motor, it should be used. When power state of servo driver is OFF, use the servo motor with brake to prevent removable part from moving due to gravity. (Please refer to "Test Run for Servo Motor with Brake".)



垂直轴	Vertical shaft
伺服电机	Servo motor
保持制动器	Holding brake

防止电源关闭时因自重而产生移动	Prevent removable part from moving due to gravity
承受外力的轴	Shaft bearing external force
外力	External force
伺服电机	Servo motor
防止工作台因外力而产生移动	Prevent workbench from moving due to external force

Note:

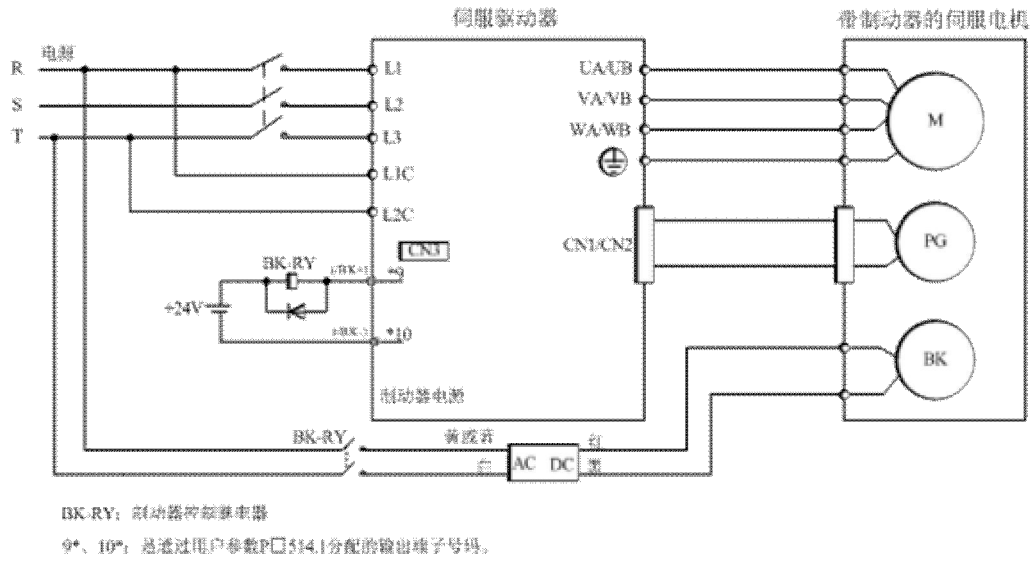
1. The brake built in the servo motor with brake should be a actuated-type holding brake without excitation, which cannot be used for braking. It should only be used to maintain the stop state of servo motor. Brake torque is over 120 % of rated torque of servo motor.

2. When operation of servo motor is enabled only by speed loop, servo and input command should be set to OFF and "OV" respectively during operation of brake.

3. In configuration of position loop, mechanical brakes cannot move since servo is locking during servo motor's stop.

(1) Connection example

Order output signal "/BK" of servo driver and brake power constitute ON/OFF circuit of brake. Standard connection examples are as follows.



BK-RY：制动器控制继电器

9*、10*：通过用户参数P□514.1分配的输出端子号码。

电源	Power
伺服驱动器	Servo drive
带制动器的伺服电机	Servo motor with brake
制动器电源	Brake power
黄或蓝	Yellow or blue
白	White
红	Red
黑	Black

(2) Brake interlocking output

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Output	/BK	Distribution through P□514		ON = L Level	Release brake.
				OFF = H Level	Use brake.
When using servo motor with brake, it is the output signal of control brake. In addition, this output signal is not used in factory setting. Distribution for output signals is required (setting of P□514). Do not connect when using motor without brake.					

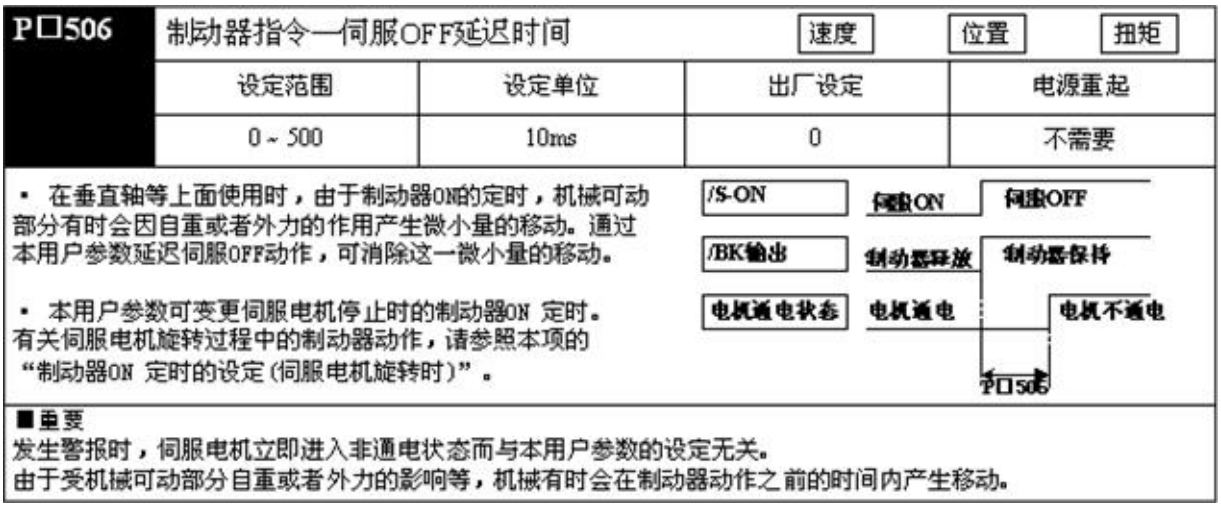
(3) Distribution of brake signal (/BK)

Brake signals (/BK) cannot be used under the condition of factory setting. Therefore it is required to distribute output signals.

User Parameter		Pin No. of connector	Meanings
P□514	H.□□0□	——	Do not use /BK signals. (factory setting)
	H.□□1□	OUT1(CN3-7,8)	Output /BK signal through output terminal of OUT1(CN3-7, CN3-8).
	H.□□2□	OUT2(CN3-9,10)	Output /BK signal through output terminal of OUT2(CN3-9, CN3-10).
	H.□□3□	OUT3(CN3-11,12)	Output /BK signal through output terminal of OUT3(CN3-11, CN3-12).
	H.□□4□	OUT4(CN3-32,33)	Output /BK signal through output terminal of OUT4(CN3-32, CN3-33).
	H.□□5□	OUT5(CN3-34,35)	Output /BK signal through output terminal of OUT5(CN3-34, CN3-35).
	H.□□6□	OUT6(CN3-36,37)	Output /BK signal through output terminal of OUT6(CN3-36, CN3-37).
■Attentions Brake signals (/BK) set in factory delivery are invalid. When several signals are distributed to the same output terminal, OR logic should be used for output. If you only want to enable /BK signal output, please distribute other signals of output terminal for /BK signal distribution to other output terminals or set them as invalid. See the Signal Distribution of Output Circuit for distribution methods of other output signals of servo unit.			

(4) Timing setting of brake ON (after stop of servo motor)

During factory setting, /BK signals should be output while /S-ON signals are set as OFF (servo OFF), however, timing of servo OFF can be changed by user parameters.



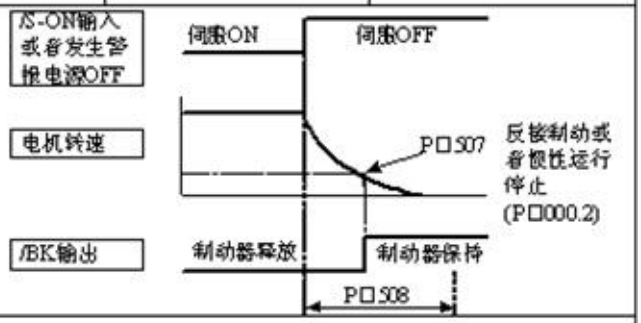
制动器指令—伺服OFF延迟时间	Brake command - delay time for servo OFF
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
在垂直轴等上面使用时，由于制动器ON的定时，机械可动部分有时会因自重或者外力的作用产生微小量的移动。通过本用户参数延迟伺服OFF动作，可消除这一微小量的移动。	When used in vertical shaft, removable parts of machinery may move slightly due to gravity or external force with timing of brake ON. Such slight movement can be eliminated by servo OFF operation delay via this user parameter.
本用户参数可变更伺服电机停止时的制动器ON 定时。	The user parameter can change the brake ON timing during stop of servo motor.
有关伺服电机旋转过程中的制动器动作，请参照本项的“制动器ON 定时的设定(伺服电机旋转时)”。	See the Timing Setting of Brake ON (after Stop of Servo Motor) for brake operation during rotation of servo motor.
/BK输出	/BK output
电机通电状态	Energized state of motor
伺服ON	Servo ON
制动器释放	Brake release
电机通电	Energized motor
伺服OFF	Servo OFF
制动器保持	Brake holding
电机不通电	De-energized motor
重要	Attentions
发生警报时，伺服电机立即进入非通电状态而与本用户参数的设定无关。	In case of alarm, servo motor will come into de-energized state immediately, which is unrelated to setting of user parameter.
由于受机械可动部分自重或者外力的影响等，机械有时会在制动器动作之前的时间内产生移动。	Machinery may move within period before brake operation due to gravity of removable parts of machinery or external force.

(5) Timing setting of brake ON (during rotation of servo motor)

Output conditions of /BK signals may be changed as per the following user parameters if stop commands are sent to rotating servo motor under the conditions of servo OFF or alarm.

P□507	制动器指令输出速度电平	速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起
	0 ~ 6000	1r/min	100	不需要
P□508	伺服OFF—制动器指令等待时间	速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起
	10 ~ 100	10ms	50	不需要

伺服电机旋转过程中的/BK信号输出条件
以下任一条件成立时，将/BK信号设定为H电平(制动器起动)。
- 伺服OFF后，电机转速为P□507以下时
- 伺服OFF后，超过P□508的设定时间时



■重要
- 即使将P□507设定为所用伺服电机的最高转数以上的数值，伺服电机也会受电机自身最高转速的限制。
- 请将电机旋转检测信号(/TGON)与制动器信号(/BK)分配给别的端子。
- 将制动器信号(/BK)与电机旋转检测信号(/TGON)分配给同一输出端子时，由于在垂直轴上落下的速度，/TGON信号变为L电平，即使本用户参数的条件成立，/BK信号也有可能无法变为H电平。(因为将多个输出信号分配给同一输出端子时以OR逻辑进行输出。)有关输出信号的分配，请参照“输出电路的信号分配”。

制动器指令输出速度电平	Level for output speed of brake command
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
伺服OFF—制动器指令等待时间	Servo OFF - latency time of brake command
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
伺服电机旋转过程中的/BK信号输出条件	Output conditions for /BK signals during rotation of servo motor
以下任一条件成立时，将/BK信号设定为H电平(制动器起动)。	/BK signals should be set as H level (brake initiates) if any of the following condition is met:
· 伺服OFF后，电机转速为P□507以下时	· RPM of motor is lower than P□507 after servo

	OFF
· 伺服OFF后，超过P□508的设定时间时	· Setting time for P□508 is exceeded after servo OFF
/S-ON输入或者发生警报电源OFF	Power is OFF for /S-ON input or alarm given
电机转速	Motor speed
/BK输出	/BK output
伺服 ON	Servo ON
制动器释放	Brake release
伺服OFF	Servo OFF
反接制动或者惯性运行停止	Plug braking or inertial operation stopping
制动器保持	Brake holding
重要	Attentions
· 即使将P□507设定为所用伺服电机的最高转数以上的数值，伺服电机也会受电机自身最高转速的限制。	· Even P□507 is set as a value higher than maximum RPM of used servo motor, operation of the motor will also be limited by its maximum RPM.
· 请将电机旋转检测信号(/TGON) 与制动器信号(/BK) 分配给别的端子。	· Distribute motor rotation detection signal (/TGON) and brake signal (/BK) to other terminals.
· 将制动器信号(/BK)与电机旋转检测信号(/TGON)分配给同一输出端子时，由于在垂直轴上落下的速度，/TGON信号变为L电平，即使本用户参数的条件成立，/BK信号也有可能无法变为H电平。(因为将多个输出信号分配给同一输出端子时以OR逻辑进行输出。)有关输出信号的分配，请参照“输出电路的信号分配”。	· When brake signal (/BK) and motor rotation detection signal (/TGON) are distributed to the same output terminal, /TGON signal is changed to L level due to falling speed in the vertical shaft. Even conditions for the user parameter are met, /BK signal may also cannot be changed to H level. (Since output is completed by OR logic when several output signals are distributed to the same output terminal) Refer to "Signal Distribution of Output Circuit" for details of distribution of output signals.

5.3.5 Selection of Stop Methods in Servo OFF

Select stop methods for servo unit in servo off.

User Parameter		Methods for motor stop	After stop of motor	Meanings
P□000	H.□0□□	Plug braking stopping	Inertial operation state	Reduce speed to stop the servo motor by emergency stop torque (P□407). Servo motor will be in inertial operation (de-energized) state after stop.
	H.□1□□	Inertial operation stopping		Stop the servo motor in the same manner as servo OFF (inertial operation stop). The servo motor will be in inertial operation (de-energized) state after stop.
Setting of user parameter is valid under the following conditions: · /S-ON output signal OFF (servo OFF) · Main power (L1, L2 and L3) OFF				

■Words and expressions

· Plug braking stopping: stop the motor via deceleration (brake) torque (P□407).

· Inertial operation stopping: naturally stop the motor by friction resistance arising from motor rotation other than braking.

■Attentions

· When power of main circuit (L1, L2 and L3) or control power supply (L1C and L2C) is OFF, the following servo drivers will force to execute plug braking stop despite of the above setting of user parameter.

· In case of alarm from servo driver, the servo driver will execute inertial stop.

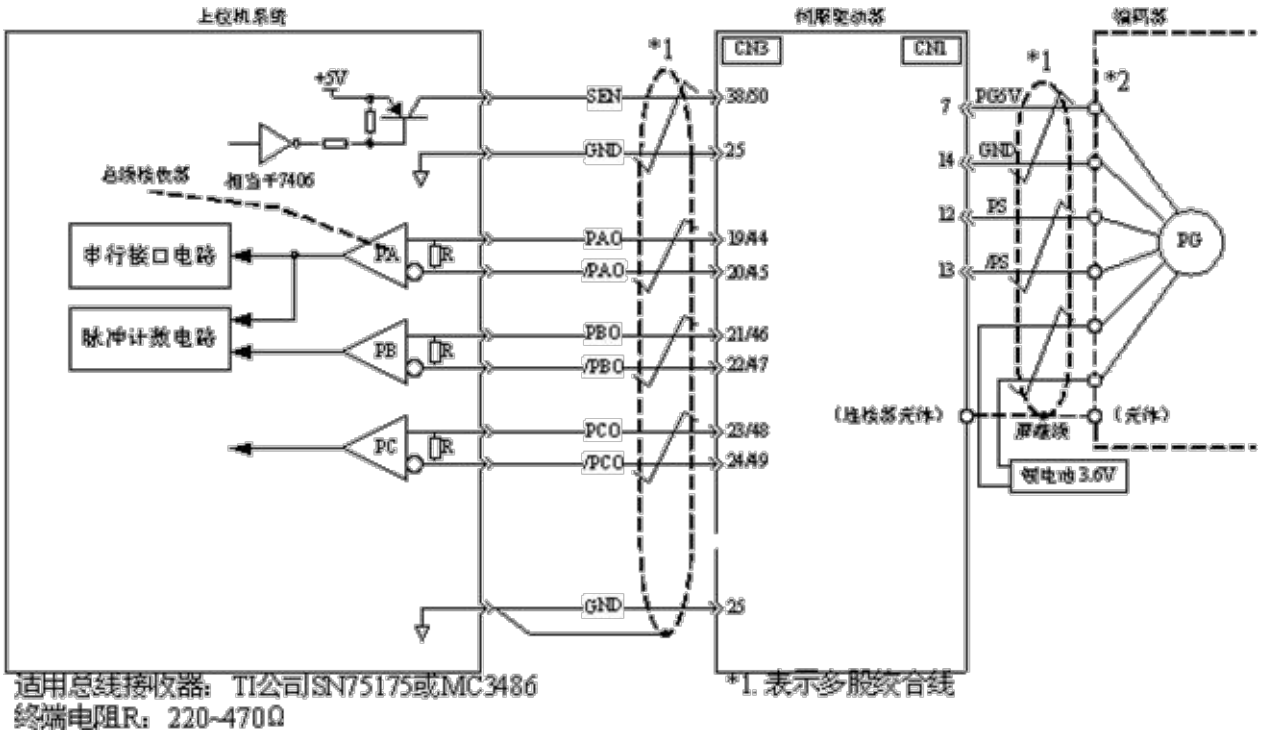
5.4 Use of Absolute Encoder

If a servo motor with absolute encoder is used, absolute value detection system can be configured in the command controller (host system). Results indicate that it can operate again directly without need of origin reset when power is ON again.

Resolution of absolute encoder	Output range of multi-turn data	Operation when exceeding limit
17 digit (*131072 pulse/circle)	-32768 ~ +32767	When upper limit value (+32767) for positive direction is exceeded, multi-turn data is changed to -32768 When upper limit value (-32768) for negative direction is exceeded, multi-turn data is changed to +32767

5.4.1 Interface Circuit

Standard connection of absolute encoder installed in the servo motor is as follows:



上位机系统	Host system
总线接收器	Bus receiver

相当于 7406	Equal to 7406
串行接口电路	Serial interface circuit
脉冲计数电路	Pulse count circuit
适用总线接收器：TI 公司 SN75175 或 MC3486	Applicable bus receiver: TI SN75174 or MC3487
终端电阻 R：220~470Ω	Terminal resistance: 220 - 470Ω
伺服驱动器	Servo drive
编码器	Encoder
（连接器壳体）	(Connector shell)
屏蔽线	Shielded wire
（壳体）	(Shell)
锂电池 3.6V	3.6 V lithium battery
*1. 表示多股绞合线	*1. refers to multi-stranded wire

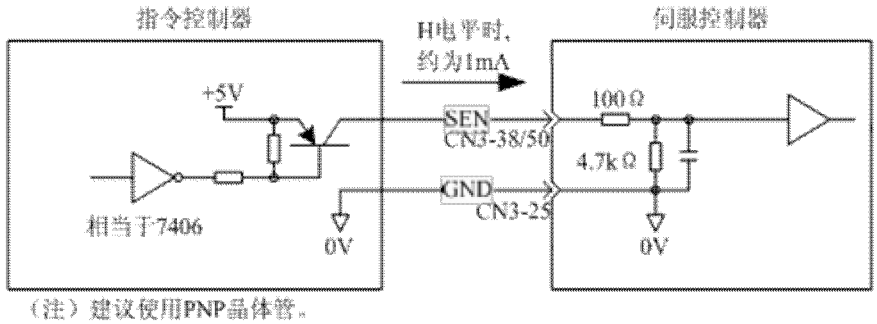
■ Connection of SEN signal

Name	Signal	Pin No. of connector	Set	Meanings
Input	ASEN	CN3-38	FF= L level	When power is supplied
			ON = H level	Absolute value is required
Input	BSEN	CN3-50	FF= L level	When power is supplied
			ON = H level	Absolute value is required

This input signal must be used to command the servo driver to output absolute data. Please set the SEN signal as H level after the power is connected for 3 seconds.

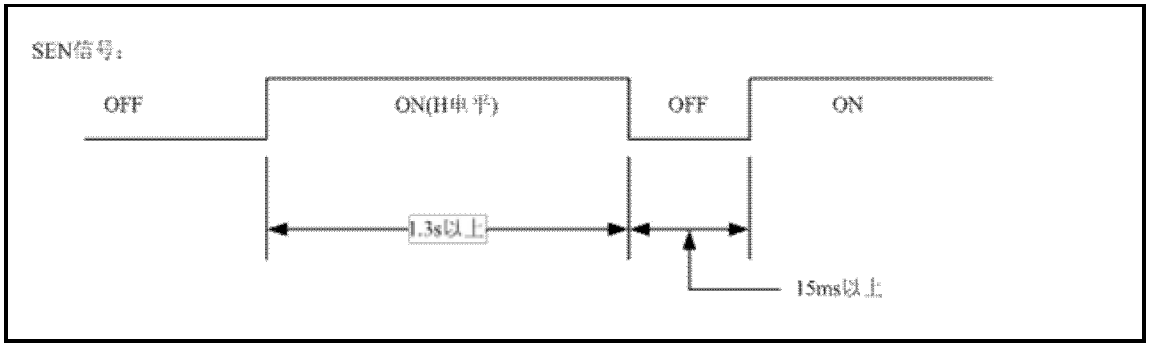
If SEN signal is switched between L level and H level, then multi-turn data and initial incremental pulse should be output.

Before completion of these operations, the servo motor will not be energized even if servo ON signal (/S-ON) is in ON state. Operation panel displays "OFF".



■ Attentions

In order to set the ON SEN signal as OFF and then ON, operation should be executed when H level is kept for over 1.3 s as shown in the following figure.



指令控制器	Command controller
相当于7406	Equal to 7406
H电平时，约为1mA	About 1 mA for H level
伺服控制器	Servo controller
（注）建议使用PNP晶体管。	Notes: the PNP transistor is suggested.
信号电平（H电平：4.0V以上，L电平：最大0.8V）	Signal level (H level: above 4.0 V; L level: max. 0.8 V)
ON(H电平)	ON (H level)
1.3s以上	Above 1.3s
15ms以上	Above 15 ms

5.4.2 Selection of Absolute Encoder

Absolute encoder can also be used as incremental encoder.

User Parameter		Meanings
P□001	n.□□□0	Use absolute encoder as absolute encoder and enable serial output of absolute data (PG frequency dividing PAO 口)
	n.□□□1	Use absolute encoder as incremental encoder
	n.□□□2	Use absolute encoder as absolute encoder and prevent serial output of absolute data (PG frequency dividing PAO 口)
● As an incremental encoder, SEN signal and battery is not required ● Power must be turned on again upon changes to the user parameter so as to effect the setting.		

5.4.3 How to Use Battery

Recommended battery specification: ER36V

■Procedures for battery replacement

1. Please replace batteries when control power of servo unit is ON;

2. After batteries are replaced, use auxiliary function F□010 to remove alarm of absolute encoder so as to stop alarm of absolute encoder battery.

3. If no abnormal operation is found after restart of servo driver power, it indicates that replacement of battery is over

Attentions:

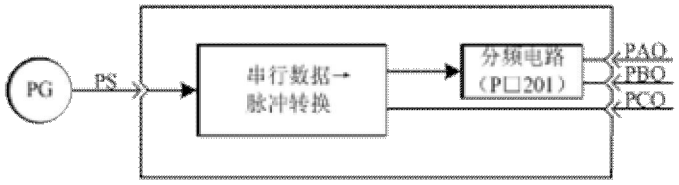
Data of absolute encoder will be lost if control power of servo driver is set as OFF and wires(including encoder cables) of battery is removed. At this time, setting operation for absolute encoder must be carried out. Please refer to "2.3.4 Setting of Absolute Encoder (F□009)"

5.4.4 Giving and Receiving Sequence of Absolute Data

After receipt of output from absolute encoder, the sequence used for the driver to send absolute data to the command controller is as follows.

(1) Summary of absolute signal

As shown below, serial data and pulse of absolute encoder are output by servo driver via "PAO, PBO and PCO".



串行数据	Serial data
脉冲转换	Pulse conversion
分频电路	Frequency dividing circuit

Signal	State	Signal content
PAO	In commencement	Serial data Initial incremental pulse
	Generally	Incremental pulse
PBO	In commencement	Initial incremental pulse
	Generally	Incremental pulse
PCO	Regularly	Origin pulse

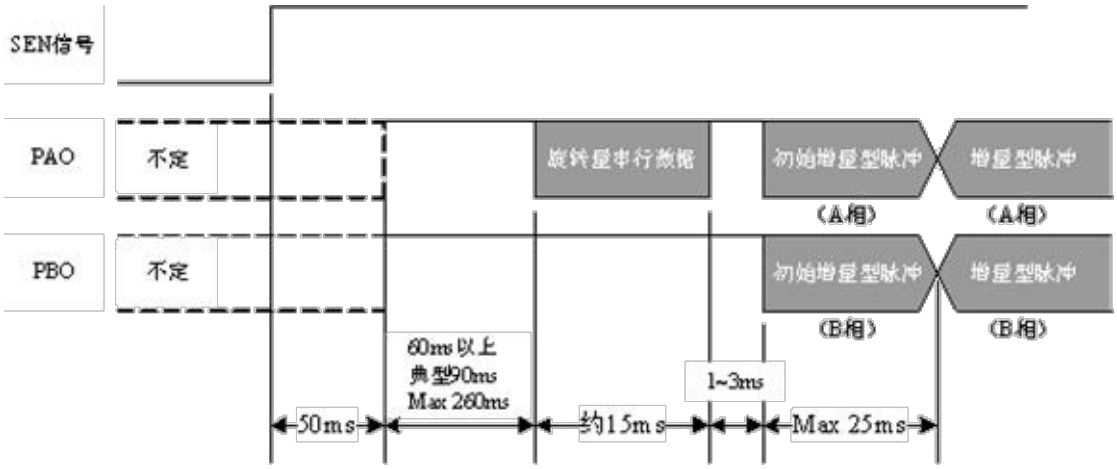
(2) Sending sequence and content of absolute data

1、 Set SEN signal as H level

2、 After 100 ms, wait state for serial data acceptance starts. Reversible counters used for incremental pulse count should be reset.

3、 Receive serial data in 8 bytes

4、 It will change to common incremental operation state after last serial data is received for 25 ms.



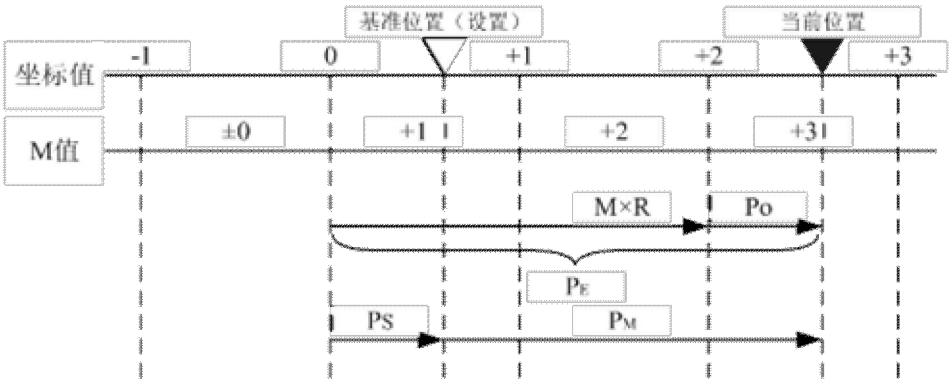
SEN 信号	SEN signal
不定	Indefinite
不定	Indefinite
60ms 以上	Above 60 ms
典型 90ms	Typically 90ms
旋转量串行数据	Serial data for rotation
约 15ms	About 15 ms
初始增量型脉冲	Initial incremental pulse
（A 相）	(Phase A)
初始增量型脉冲	Initial incremental pulse
（B 相）	(Phase B)
增量型脉冲	Incremental pulse
（A 相）	(Phase A)
增量型脉冲	Incremental pulse
（B 相）	(Phase B)

＊ Serial data

It indicates position of motor shaft after circuits of rotation from the reference position (as per setting value)

＊ Initial incremental pulse

Pulse should be output at the same speed as pulse for rotation of 1250rpm (factory setting is used for 17 byte frequency dividing pulse).



坐标值	Coordinate value
M 值	M value
基准位置（设置）	Reference position (position)
当前位置	Current position

Final absolute data PM can be calculated by the following formula:

$P_E = M \times R + P_0$

$P_M = P_E - P_S$

Notes: the following formula is used in negative rotation mode (Pn000.0 = 1)

$P_E = -M \times R + P_0$

$P_M = P_E - P_S$

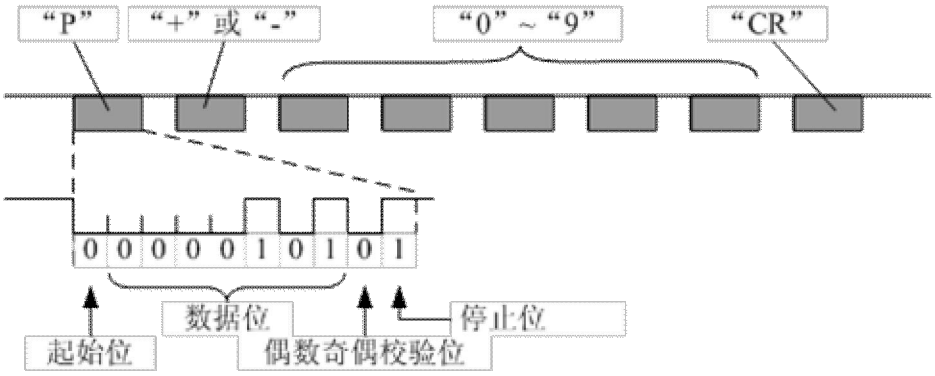
P_E	Current value read from encoder
M	Multi-turn data (number of turns of encoder)
P_0	Count of initial incremental pulse
P_S	Count of initial incremental pulse read from the set point (this value is subject to storage and management of host)
P_M	Current value required in client system
R	Pulse count for 1 circle of rotating encoder (value after frequency dividing and value of P□201)

(3) Detailed specification of signal

(a) Specification of PAO serial data

Output rotation in 5 digits

Data transmission method	Start-stop synchronism (ASYNC)
Baud rate	9600 bps
Initial bit	1 digit
Stop bit	1 digit
Parity	Even parity check
Character code	ASCII 7 bits
Data format	See the following figure for data in 5 characters.



2，旋转量范围处在“＋32767～－32768”之间。
如果超出该范围，则在“＋32767”时，数据变更为“－32768”；
在“－32768”时，变更为“＋32767”。

“+”或“-”	“+” or “-”
起始位	Initial bit
数据位	Data bit
偶数奇偶校验位	Even parity check bit
停止位	Stop bit

5.4.5 Setting of Absolute Encoder (F□009/ F□010)

In addition, setting operation for absolute encoder must be carried out in case of:

- ＊ initial startup of machinery
- ＊ "Bus encoder multi-coil information error (A25 / b25)"
- ＊ "Bus encoder multi-coil information overflow (A26 / b26)"
- ＊ "Bus encoder battery alarm 1 (A27 / b27)"
- ＊ requiring to set multi-turn data of absolute encoder as 0

Implement setting by panel operator.

Attentions:

1、 Setting operation of encoder only can be implemented under servo OFF state.

2、 When absolute encoder alarm is displayed, auxiliary function F□010 should be executed to stop alarm. Alarm reset (/ALM-RST) of servo driver cannot stop alarm.

- ＊ "Bus encoder multi-coil information error (A25 / b25)
- ＊ Bus encoder multi-coil information overflow (A26 / b26)
- ＊ Bus encoder battery alarm 1 (A27 / b27)
- ＊ Bus encoder battery alarm 2 (A28 / b28)
- ＊ Bus encoder overspeed (A41 / b41)

5.4.6 Clear of Multi-coil Data of Absolute Encoder

When using bus absolute encoder, the operation can be used to remove multi-coil information.

Operation steps	Operation instruction	Operation key	Display after operation

1	Press M function key (for more than 1 second) and switch to auxiliary function mode of axis 1, which will display FA000.	M	
2	Press UP or DOWN and select the desired auxiliary function FA010.	∧ ∨	
3	Press SET to display "PoSCL" and clear multi-coil position operation.	SET	
4	Press function key to display "CLFin" which indicates that multi-coil position is completely cleared.	M	
5	Press SET to return to the display of FA009.	SET	

5.4.7 Removal of Internal Errors of Bus Encoder

When using bus absolute encoder, the operation can be used to remove multi-coil information.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select auxiliary function mode for A axis. In case of failing to display FA010 press UP or DOWN to set FA010.	M	
2	Press SET to display "ErrCL".	SET	
3	Press M function key to display "CLFIn" and clear encoder multi-coil information completely.	M	
4	Press SET to return to the display of FA009.	SET	

5.5 Speed Control (Analog Voltage Command) Operation

5.5.1 User Parameter Setting

User Parameter		Meanings
P□000	H.□□0□	Selection of control mode: speed control (analog voltage command)

P□300	速度指令输入增益		速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起	
	0～3000	(r/min)/V	150	不需要	

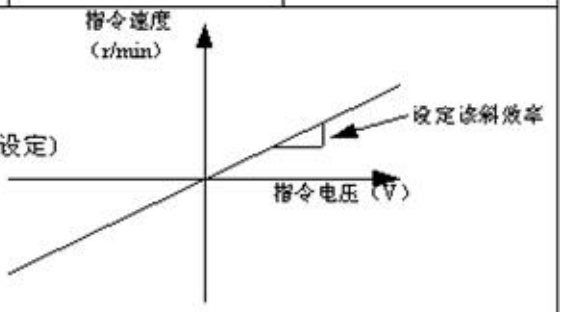
设定模拟指令电压—指令速度斜率。

■例

P□300=150：表示设定为每1V电压对应输入150r/min(出厂时的设定)

P□300=300：表示设定为每1V电压对应输入300r/min

P□300=200：表示设定为每1V电压对应输入200r/min



速度指令输入增益	Speed command input gain
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
设定模拟指令电压—指令速度斜率。	Set slope for analog command voltage — command speed.
例	For example,
P□300=150：表示设定为每 1V 电压对应输入 150r/min(出厂时的设定)	P□300=150: each 1 V voltage corresponds to inputting 150r/min (factory setting)
P□300=300：表示设定为每 1V 电压对应输入 300r/min	P□300=300: each 1 V voltage corresponds to inputting 300r/min (factory setting)
P□300=200：表示设定为每 1V 电压对应输入 200r/min	P□300=200: each 1 V voltage corresponds to inputting 200r/min (factory setting)
指令速度（r/min）	Command speed (r/min)
设定该斜效率	Set the slope efficiency
指令电压（V）	Command voltage (V)

5.5.2 Setting of Input Signal

(1) Speed command input

If speed command is sent to servo driver in the form of analog voltage command, speed of servo motor is controlled in proportion to input speed.

Name	Signal	Pin No. of connector (factory)		Meanings
		A axis	B axis	
Input	V-REF	CN3-5	CN3-30	Speed command input

	GND	CN3-6	CN3-31	Signal ground for speed command input
It should be used for speed control (analog voltage command) (P□000.1 = 0, 4, 7, 9, A) P□300 is used to set speed command input gain. Please refer to "Setting of User Parameter for details". ■ Input specification · Input voltage range: DC ± 10V · Maximum allowable input voltage: DC ± 12V				

(2) Proportional action command signal (/P-CON)

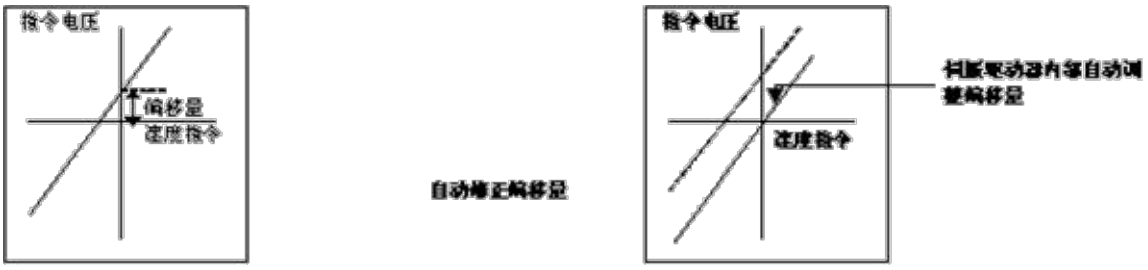
Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Input	/P-C0N	CN3-15	CN3-40	ON = L Level	Operate servo driver by P control mode.
				OFF = H Level	Operate servo driver by PI control mode.
/P-CON signal is a signal that selects speed control modes from PI (proportional and integral) or P (proportional) control. If P control is set, motor rotation and slight vibration arising from input shift of speed command can be reduced. Input command: servo motor rotation due to 0 V shift can be reduced, but servo rigidity (support force) will decrease when rotation is stopped. /P-CON signals may distribute inputted connector pin numbers to other places by user parameters. Please refer to “Signal Distribution of Input Circuit”.					

5.5.3 Adjustment of Command Offset

In speed control mode, even if OV command is sent under analog command voltage, motor will rotate with low speed in case of small command voltage offset (unit: mV) of superior control unit or in external circuit. In such case, command offset can be automatically or manually adjusted by panel operator. See "5.2 Operation in Auxiliary Function Execution Mode" for details.

Auto-adjustment of analog (speed · torque) or command offset is the function for offset measurement and auto-adjustment of voltage.

In case of voltage command offset of the superior controller or in external circuit, servo driver will make following adjustment towards the automatic offset.



指令电压	Command voltage
偏移量速度指令	Offset speed command
自动修正偏移量	Auto-correction of offset
指令电压	Command voltage
速度指令	Speed command
伺服驱动器内部自动调整偏移量	Auto-adjustment of offset in servo driver

Once auto-adjustment of command offset begins, offset will be saved in the servo driver.

Offset can be confirmed through manual adjustment of speed command offset (F□006). See "5.5.3(2) Manual adjustment of speed command offset" for details.

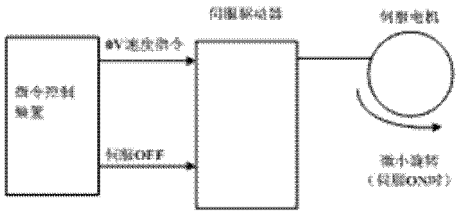
(1) Auto-adjustment of speed command offset

When offset pulse is set as zero with the servo locked in the OFF state by the command controller equipped with a position loop, auto-adjustment of command offset (F□008) is not available, instead, manual adjustment of speed command offset (F□00A) should be applied.

Under speed command of zero, function of zero clamping speed control which can lock the servo in a mandatory manner is provided. See "5.5.6 Use of Zero Clamping Function" for details.

Note: Auto-adjustment of zero analog offset should be conducted when the servo is OFF.

Auto-adjustment of speed command offset of A axis is conducted as below.

Operation steps	Operation instruction	Operation key	Display after operation
1			Set the servo unit as OFF, and input OV command voltage through command controller or external circuit.
2	Press M function key to select auxiliary function mode for A axis. In case of failing to display FA008, press UP or DOWN to set.	M	FA008
3	Press SET, and "rEF_o" is displayed.	SET	rEF_o
4	Press M function key to start auto-zeroing, and flickering "donE" is displayed.	M	donE
5	After completion of auto-zeroing, "rEF_o" instead of flickering "donE" is displayed.	——	rEF_o
6	Press SET to return to the display of FA008.	SET	FA008

指令控制装置	Command control unit
0V速度指令	OV speed command
伺服OFF	Servo OFF
伺服驱动器	Servo drive
伺服电机	Servo motor
微小旋转（伺服ON时）	Rotation within a narrow scope (servo in ON state)

(2) Manual adjustment of speed command offset

Manual adjustment of speed command offset (F□006) should be applied in case that:

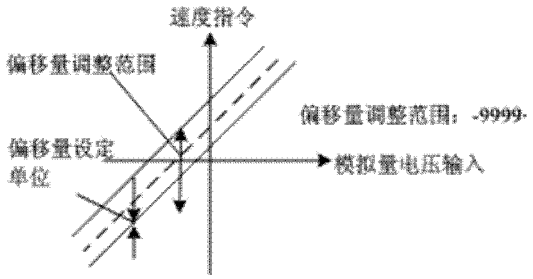
· the command controller is equipped with a position loop to set the offset pulse as zero when the servo is locked in the OFF state

· offset is set as a certain value consciously

· offset set for auto-adjustment is applied

Basic function and auto-adjustment of analog (speed · torque) command offset (F□008) are the same. But for manual adjustment (F□006), adjustment must be made along with direct input of offset.

Adjustment range of offset and setting unit are listed as below.



速度指令	Speed command
偏移量调整范围	Adjustment range of offset
偏移量设定单位	Setting unit of offset
偏移量调整范围：-9999~+	Adjustment range of offset: -9999 - +
模拟量电压输入	Analog voltage input

Auto-adjustment of speed command offset of A axis is conducted as below.

Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select auxiliary function mode for A axis. In case of failing to display FA006, press UP or DOWN to set.	M	FA006
2	Press SET, and "A.SPd" is displayed.	SET	A.SPd
3	Press SET for at least 1 s, and "0000" is displayed.	<	0000
4	Press UP or DOWN to set offset.	∧ ∨	0083
5	Press SET for at least 1 s to save offset.	<	A.SPd
6	Press SET to return to the display of FA006.	SET	FA006

5.5.4 Soft Start

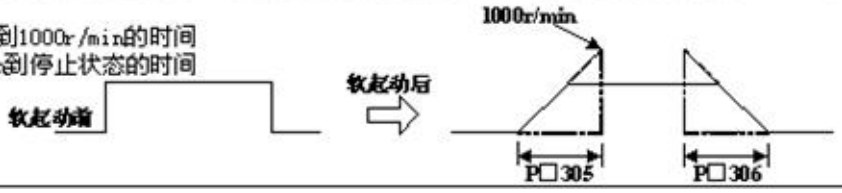
Soft start is the function to transfer step speed command input to the command with certain acceleration and deceleration in the servo driver.

(1) Trapezoidal start-up

User Parameter		Meanings
P□309	H.□□□0	Trapezoidal start-up

P□305	软起动加速时间		速度	
	设定范围	设定单位	出厂设定	电源重起
	0～10000	1ms	0	不需要
P□306	软起动减速时间		速度	
	设定范围	设定单位	出厂设定	电源重起
	0～10000	1ms	0	不需要

在输入阶跃速度指令或选择内部设定速度时，可进行平滑的速度控制。（一般的速度控制请设为“0”。）
各设定值如下所示。
- P□305：从停止状态到1000r/min的时间
- P□306：从1000r/min到停止状态的时间

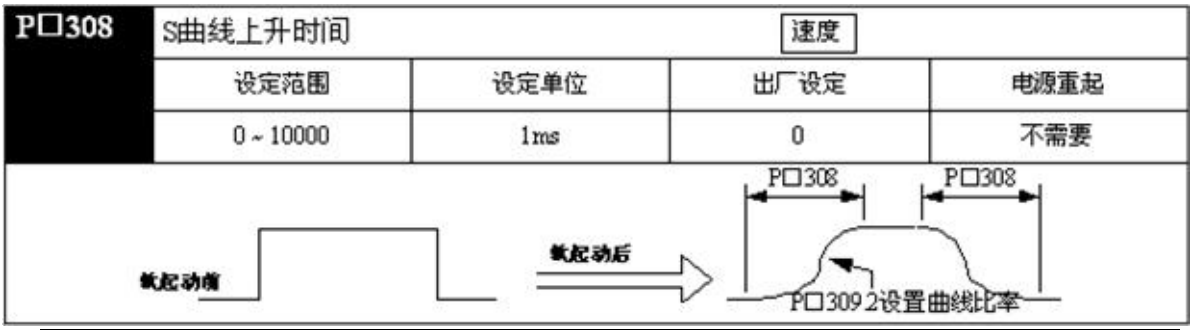


软起动加速时间	Acceleration time of soft start
速度	Speed
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
软起动减速时间	Deceleration time of soft start
速度	Speed
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
在输入阶跃速度指令或选择内部设定速度时，可进行平滑的速度控制。(一般的速度控制请设为“0”。)	While inputting step speed command or selecting internal speed setting, smooth speed control is available. (set "0" for common speed control.)
各设定值如下所示。	Setting values are listed as below.
· P□305：从停止状态到 1000r/min 的时间	· P□305: time required from the OFF state to the speed of 1000r/min
· P□306：从 1000r/min 到停止状态的时间	· P□306: time required from the speed of 1000r/min to the OFF state
软起动前	Before soft start
软起动后	After soft start

(2) S-curved start-up

User Parameter		Meanings	
P□309	H.□□□1	S-curved start-up	
	H.□0□□	Close to linearity	Selection of S curve ratio

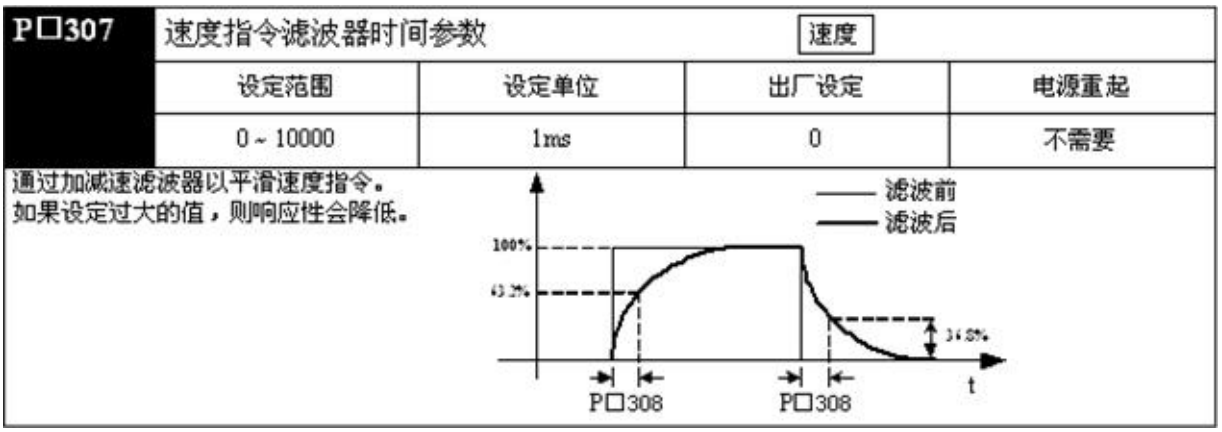
	H.□1□□	Low	
	H.□2□□	Central	
	H.□3□□	Height	



S 曲线上升时间	Rise time of S curve
速度	Speed
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
软起动前	Before soft start
软起动后	After soft start
P□309.2 设置曲线比率	P□309.2 setting of curve ratio

(3) Acceleration and deceleration filtering start-up

User Parameter		Meanings
P□309	H.□□□2	Acceleration and deceleration filtering start-up
	H.□□0□	First acceleration and deceleration filtering
	H.□□1□	Second acceleration and deceleration filtering



速度指令滤波器时间参数	Time parameter of speed command filter
速度	Speed
设定范围	Setting range

设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
通过加减速滤波器以平滑速度指令。	Smooth speed command through acceleration and deceleration filter.
如果设定过大的值，则响应性会降低。	A overlarge value set will reduce responsiveness.
滤波前	Before filtering
滤波后	After filtering

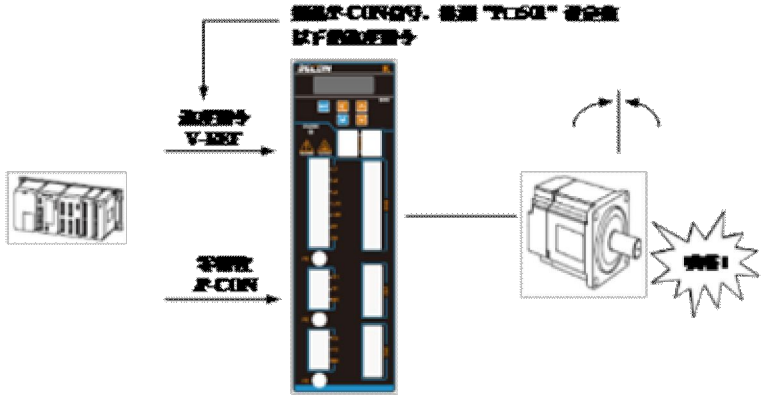
5.5.5 Use of Zero Clamping Function

(1) Meaning of zero clamping function

Zero clamping function refers to the function in the system where command controller is not equipped with position loops under speed control.

If the zero clamping (/P-CON) signal is set as ON, servo driver will be equipped with a position loop, and servo motor will fall into emergency stop with servo in the locked state regardless of speed command when input voltage of speed command (V-REF) is lower than the value corresponding to the rotation speed of P□501 (zero clamping level).

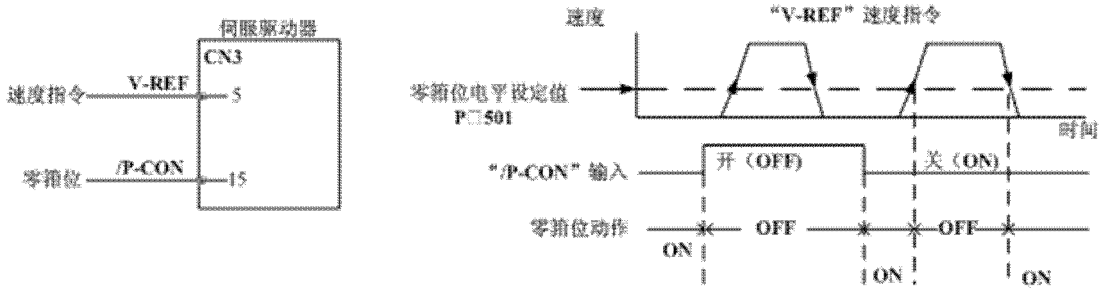
Servo motor is clamped within ± 1 pulse at the position where zero clamping takes effect. Even through external rotation, the servo motor will return to zero clamping.



接通/P-CON 信号，检测 P 501 设定值以下的速度指令	Connect /P-CON signal to detect speed command whose value is lower than that of P 501
速度指令 V-REF	Speed command V-REF
零钳位/P-CON	Zero clamping /P-CON
叭嗒！	Splat!

User Parameter		Meanings
P□000	H.□□A□	Control mode: speed control (analog voltage command) ßà zero clamping
Condition for switching of zero clamping action When P□000 is set as H.□□A□, zero clamping will be activated in case of any of the followings: · /P-CON is ON (L level)		

· Speed command (V-REF) is lower than the setting value of P□501



伺服驱动器	Servo drive
速度指令	Speed command
零箝位	Zero clamping
速度	Speed
零箝位电平设定值	Setting value of zero clamping level
“V-REF”速度指令	"V-REF" speed command
“/P-CON”输入	"/P-CON" input
零箝位动作	Zero clamping action
时间	Time

P□501	零箝位电平		速度	
	设定范围	设定单位	出厂设定	电源重起
	0～10000	1r/min	10	不需要
选择带零箝位功能的速度控制(P□000=H.□□□A□)时，设定进入零箝位动作的转速。即使在P□501中设定超过所用伺服电机最大转速的值，所用伺服电机的最大转速仍然采用有效值。				

零箝位电平	Zero clamping level
速度	Speed
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
选择带零箝位功能的速度控制(P□000=H.□□□A□)时，设定进入零箝位动作的转速。即使在 P□501 中设定超过所用伺服电机最大转速的值，所用伺服电机的最大转速仍然采用有效值。	When speed control with zero clamping function (P□000=H.□□□A□) is selected, rotation speed to activate zero clamping should be set. Even if the value of P□501 exceeds the maximum rotation speed of the servo motor, maximum rotation speed of servo motor still adopts valid value.

(3) Setting of input signal

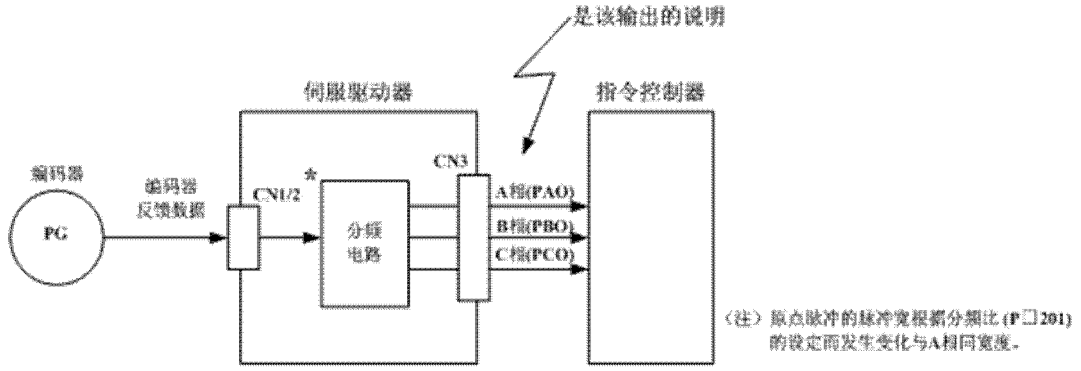
Name	Signal	Pin No. of connector	Set	Meanings

		(factory)			
		A axis	B axis		
Input	/P-C0N	CN3-15	CN3-40	ON = L Level	Zero clamping function ON (valid)
				OFF = H Level	Zero clamping function OFF (invalid)
It is the input signal to switch to zero clamping action. Anyone of /P-CON signal can be switched to zero clamping action. See "signal distribution of input circuit" for distribution					

5.5.6 Encoder Signal Output

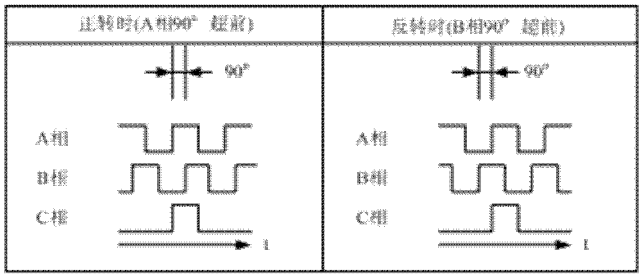
Feedback pulse of encoder is output after processing in servo unit.

Name	Signal	Pin No. of connector		Name
		A axis	B axis	
Output	APAO+	CN3-19	CN3-44	Encoder output Phase A+
	APA0-	CN3-20	CN3-45	Encoder output Phase A-
Output	APBO+	CN3-21	CN3-46	Encoder output Phase B+
	APB0-	CN3-22	CN3-47	Encoder output Phase B-
Output	APCO+	CN3-23	CN3-48	Encoder output Phase C+
	APC0-	CN3-24	CN3-49	Encoder output Phase C-
Input	SEN	CN3-38	CN3-50	SEN signal input (valid when using absolute encoder)
	GND	CN3-25		Signal ground



* Even in the negative rotation mode (P□000.0=1), frequency division output phase form is the same as that in the standard setting (P□000.0=0).

■Output phase form



编码器	Encoder
编码器反馈数据	Encoder feedback data
伺服驱动器	Servo drive
分频电路	Frequency dividing circuit

是该输出的说明	Instruction to the output
指令控制器	Command controller
A相(PAO)	Phase A (PAO)
B相(PBO)	Phase B (PBO)
C相(PCO)	Phase C (PCO)
（注）原点脉冲的脉冲宽根据分频比(P□201)的设定而发生变化与A相同宽度。	(Note) Pulse width of the origin pulse varies by setting of frequency dividing ratio (P□201), same as that of phase A.
正转时(A相90　超前)	Positive rotation (Phase A 90　advance)
A相	Phase A
B相	Phase B
C相	Phase C
反转时(B相90　超前)	Negative rotation (Phase B 90　advance)
A相	Phase A
B相	Phase B
C相	Phase C

Note:

For bus encoder, C-phase pulse output of servo driver should be applied for mechanical origin reset after two cycles of rotation of servo motor.

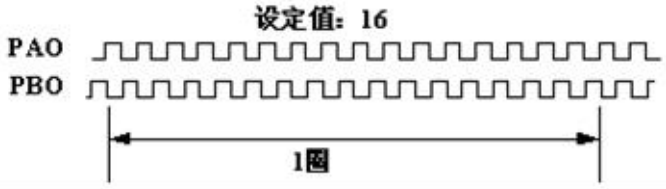
· Setting of frequency dividing ratio of encoder pulse

P□201	PG分频数		速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起	
	16 ~ 32768	1P/rev	2500	需要	

设定从伺服驱动器发向外部的PG输出信号 (PAO, PBO)的输出脉冲数。
来自编码器的每1圈反馈脉冲在伺服驱动器内部被分频为P□201的设定值并进行输出。 (请根据机械与指令控制器的系统规格进行设定。)

■输出实例

P□201=16 (每1圈16脉冲输出) 时



PG 分频数	PG frequency dividing
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
设定从伺服驱动器发向外部的 PG 输出信号(PAO,PBO)的输出脉冲数。	Set output pulse of PG output signal (PAO,PBO) sent from servo driver.

来自编码器的每 1 圈反馈脉冲在伺服驱动器内部被分频为 P□201 的设定值并进行输出。(请根据机械与指令控制器的系统规格进行设定。)	Frequency of each cycle of feedback pulse from encoder is divided into the setting value of P□201 in the servo driver and output. (setting based on system specification of machinery and command controller.)
输出实例	Output example
P□201=16(每 1 圈 16 脉冲输出) 时	P□201=16 (16 pulse output in each cycle)
设定值：16	Setting value: 16
1 圈	1 circle

5.5.7 Same Speed Detection Output

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Output	/V-CMP	CN3-9 CN3-10	CN3-34 CN3-35	ON = L Level	State of same speed
				OFF = H Level	State of different speed
The output signal can be distributed to other output terminals through user parameter P□513. See "Signal distribution of output circuit" for distribution of output signal.					

5.6 Position Control Operation

5.6.1 User Parameter Setting

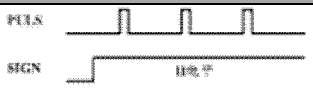
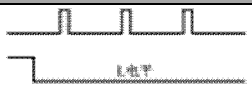
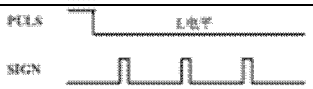
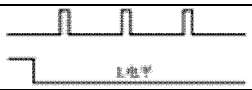
Following user parameters should be set for position control by pulse train.

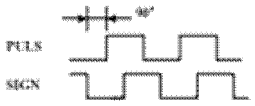
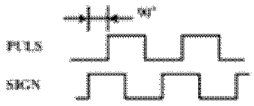
(1) Control mode selection

User Parameter		Meanings
P□000	H.□□1□	Control mode selection: position control (pulse train command)

Name	Signal	Pin No. of connector		Name
		A axis	B axis	
Input	PULS+	CN3-1	CN3-26	Command pulse input
	PULS-	CN3-2	CN3-27	Command pulse input
	SIGN+	CN3-3	CN3-28	Sign input
	SIGN-	CN3-4	CN3-29	Sign input

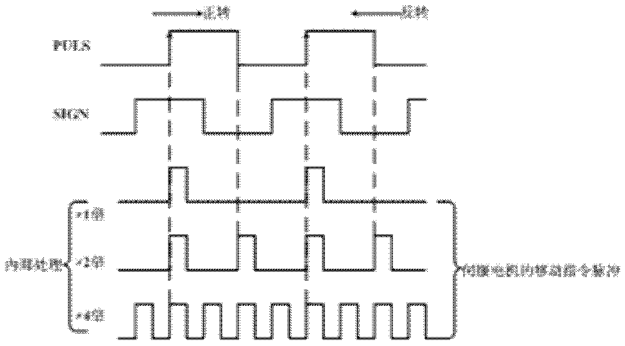
(2) Selection of pulse command form

User Parameter		Command form	Input multiple	Positive rotation command	Negative rotation command
P□200	H.□□0□	Sign + pulse train	——		
	H.□□1□	CW+CCW	——		

	H.□□2□	90° phase difference Two phase pulse	×1		
	H.□□3□		×2		
	H.□□4□		×4		

■Supplement

Input multiplication can be set in the state of 90° phase difference under two phase pulse command.



H电平	H level
L电平	L level
L电平	L level
L电平	L level
正转	Positive rotation
反转	Negative
内部处理	Internal processing
×1倍	× 1 time
×2倍	× 2 time
×4倍	× 4 time
伺服电机的移动指令脉冲	Movement command pulse of servo driver

(3) Pulse instruction input complement

User Parameter		Meanings
P□200	H.□0□□	PULS input negation, and SIGN input non-negation
	H.□1□□	PULS input non-negation and SIGN input negation
	H.□2□□	PULS input negation, and SIGN input non-negation
	H.□3□□	PULS input negation, and SIGN input non-negation
Logic negation for pulse command is available by setting the parameter.		

(4) Selection of clear signal form

Name	Signal	Pin No. of connector (factory)		Name
		A axis	B axis	
Input	/CLR	Distribution through P□510		Clear input

If input is cleared, following actions can be performed.

· Offset counter in the servo driver is set as "0".

· Action of position loop is set in the invalid state.

→In clear state, servo clamping does not work, and servo motor may rotate with a low speed due to drifting in the speed loop.

(5) Selection of clear action

In the condition other than clear signal CLR, regular clear of offset pulse can be selected based on state of servo driver. Three types of action mode of clear offset pulse can be selected through user parameter P□200.0.

User Parameter		Meanings
P□200	H.□□□0	Under servo OFF, clear offset pulse; under over travel, not clear offset pulse
	H.□□□1	Under servo OFF or over travel, not clear offset pulse
	H.□□□2	Under servo OFF or over travel (excluding zero clamping), not clear offset pulse

5.6.2 Setting of Electronic Gear

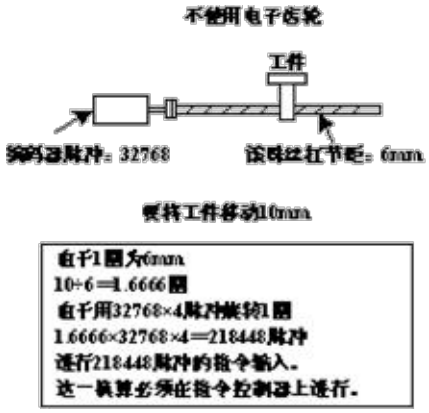
(1) Encoder pulse

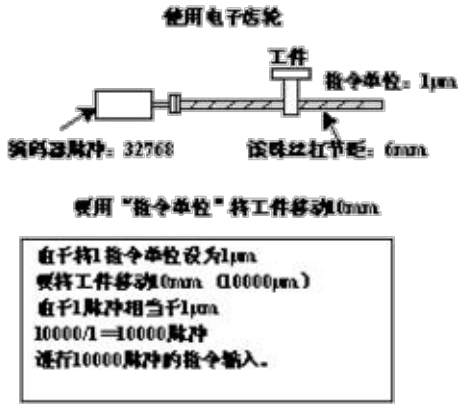
Encoder type	Encoder pulse	
Common incremental encoder	2500 P/R	
Bus encoder	17 digit	32768 P/R

Note: Bits representing encoder resolution are different from pulse of signal output of encoder (phase A and phase B), and are four times of encoder pulse.

(2) Electronic gear

Electronic gear is the function to set any value for movement of workpiece with 1 pulse input command by command controller. 1 pulse command by command controller is "1 command unit" as the smallest unit.





不使用电子齿轮	Without electronic gear
工件	Work piece
编码器脉冲：32768	Encoder pulse: 32768
滚珠丝杠节距：6mm	Ball screw pitch: 6 mm
要将工件移动10mm	Workpiece movement of 10 mm
由于1圈为6mm	6 mm/cycle
10÷6＝1.6666圈	10÷6＝1.6666 cycles
由于用32768×4脉冲旋转1圈	32768×4 pulses/cycle
1.6666×32768×4＝218448脉冲	1.6666×32768×4＝218448 pulses
进行218448脉冲的指令输入。	Command input of 218448 pulses.
这一换算必须在指令控制器上进行。	The conversion must be performed in command controller.
使用电子齿轮	With electronic gear

工件	Work piece
指令单位：1μm	Command unit: 1 μm
编码器脉冲：32768	Encoder pulse: 32768
滚珠丝杠节距：6mm	Ball screw pitch: 6 mm
要用“指令单位”将工件移动10mm	Workpiece movement of 10 mm by "command unit"
由于将1指令单位设为1μm	1 command unit is calculated as 1 μm
要将工件移动10mm（10000μm）	Workpiece movement of 10 mm (equal to 10000 μm)
由于1脉冲相当于1μm	1 pulse equal to 1 μm
10000/1＝10000脉冲	10000/1＝10000 pulses
进行10000脉冲的指令输入。	Command input of 10000 pulses.

(3) Relevant user parameter

P□202 电子齿轮（分子） 位置

设定范围	设定单位	出厂设定	电源重起
1～65535	—	1	需要

P□508 电子齿轮（分母） 位置

设定范围	设定单位	出厂设定	电源重起
1～65535	—	1	需要

如果将电机轴与负载侧的机械减速比设为n/m，则可由下式求出电子齿轮比的设定值。
（伺服电机旋转m 圈、负载轴旋转n 圈时）

$$\text{电子齿轮比}\ \frac{B}{A}=\frac{P\square 202}{P\square 203}=\frac{\text{编码器脉冲数}\times 4}{\text{负载轴旋转1圈的移动量}}\times\frac{m}{n}$$

* 超过设定范围时，请将分子与分母约分成设定范围内的整数。
请注意，不要改变电子齿轮比(B/A)。

■重要
电子齿轮比的设定范围：0.01 ≤电子齿轮比(B/A) ≤ 100
超出上述范围时，伺服驱动器不能正常动作。请变更机械构成或者指令单位。

电子齿轮（分子）	Electronic gear (numerator)
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
电子齿轮（分母）	Electronic gear (denominator)
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting

电源重起	Power reboot
需要	Required
如果将电机轴与负载侧的机械减速比设为n/m，则可由下式求出电子齿数比的设定值。	Mechanical reduction ratio between motor axis and loading side is set as n/m. Setting value of electronic gear ratio can be calculated by formula below.
(伺服电机旋转m 圈、负载轴旋转n 圈时)	(Rotation of servo motor of m cycles, and rotation of loading axis of n cycles)
电子齿轮比	Electronic gear ratio
编码器脉冲数×4	Encoder pulse × 4
负载轴旋转1圈的移动量	Movement of loading axis with 1 cycle of rotation
* 超过设定范围时，请将分子与分母约分成设定范围内的整数。	* In case of beyond the setting range, numerator and denominator should be reduced to the integer within the setting range.
请注意，不要改变电子齿数比(B/A)。	Note: electronic gear ratio (B/A) should not be changed.
重要	Attentions
电子齿数比的设定范围：0.01 电子齿数比(B/A) 100	Setting range of electronic gear ratio: 0.01 ≤ electronic gear ratio (B/A) ≤ 100
超出上述范围时，伺服驱动器不能正常动作。请变更机械构成或者指令单位。	In case of beyond the range, servo driver cannot work normally. In such case, mechanical structure or command unit should be changed.

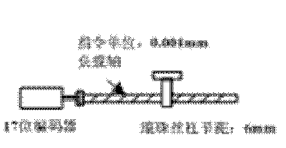
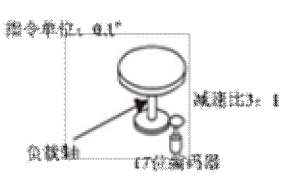
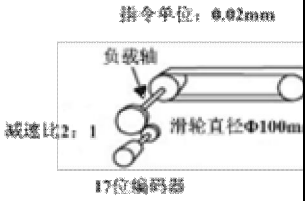
(4) Procedure for setting of electronic gear ratio

Electronic gear ratio should be set as below.

Step	Content	Instruction
1	To confirm mechanical specifications	Reduction ratio, ball screw pitch, pulley diameter, etc. should be confirmed.
2	To confirm encoder pulse	Encoder pulse of servo motor should be confirmed.
3	To determine command unit	1 command unit by command controller should be determined. Command unit should be determined based on mechanical specifications and positioning accuracy.
4	To calculate movement of loading axis with 1 cycle of rotation	Command units for 1 cycle of rotation of loading axis should be calculated based on determinate command unit.
5	To calculate electronic gear ratio	Electronic gear ratio (B/A) should be calculated according to the related formula.
6	To set user parameter	The value calculated should be set as electronic gear ratio.

(5) Example for setting of electronic gear ratio

Electronic gear ratio is determined based on several examples.

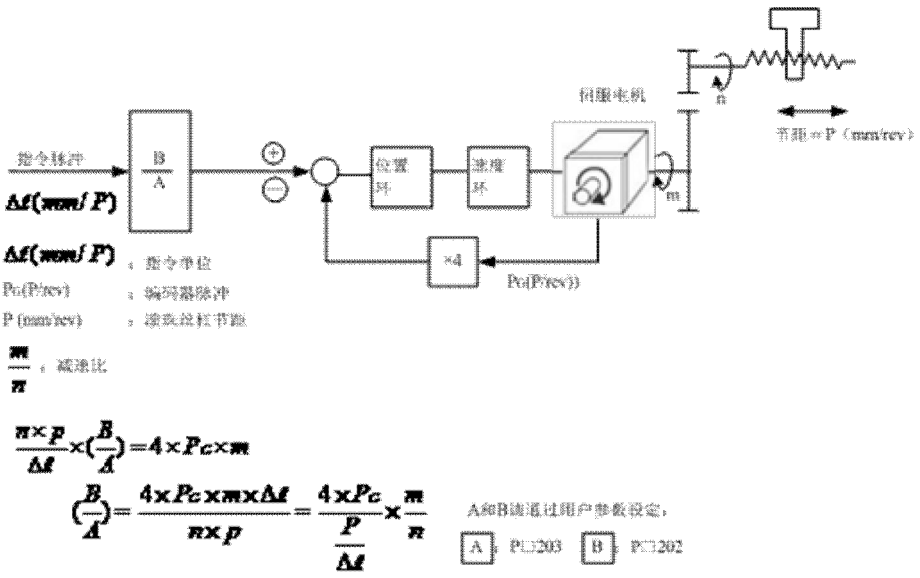
Step	Content	Machine structure		
		Ball screw	Round stand	Belt + pulley
				
1	To confirm	· Ball screw pitch: 6 mm	Rotation angle of 1 cycle: 360°	Pulley diameter: 100 mm

	mechanical structure	· Reduction ratio: 1/1		Reduction ratio: 3/1		(Pulley perimeter: 341 mm) · Reduction ratio: 2/1	
2	Encoder	17-bit: 32768P/R		17-bit: 32768P/R		17-bit: 32768P/R	
3	To set command unit	1 command unit: 0.001 mm (1 μm)		1 command unit: 0.1°		1 command unit: 0.02mm	
4	To calculate movement of loading axis with 1 cycle of rotation	6mm/0.001mm=6000		360°/0.1°=3600		314 mm/0.02 mm=15700	
5	To calculate electronic gear ratio	$\frac{B}{A}=\frac{32768}{6000}\times\frac{1}{1}$		$\frac{B}{A}=\frac{32768\times4}{3600}\times\frac{3}{1}$		$\frac{B}{A}=\frac{32768\times4}{15700}\times\frac{2}{1}$	
6	To set user parameter	P□202	131072 *	P□202	393216	P□202	262144
		P□203	6000	P□203	3600	P□203	15700

指令单位：0.001mm	Command unit: 0.001 mm
负载轴	Loading axis
17位编码器	17-bit encoder
滚珠丝杠节距：6mm	Ball screw pitch: 6 mm
指令单位：0.1°	Command unit: 0.1°
负载轴	Loading axis
17位编码器	17-bit encoder
减速比3：1	Reduction ratio 3:1
指令单位：0.02mm	Command unit: 0.02 mm
负载轴	Loading axis
减速比2：1	Reduction ratio 2:1
17位编码器	17-bit encoder
滑轮直径Φ100m	Pulley diameter: 100 m

* Calculation result is not within the setting range. Hence numerator and denominator are reduced.
For example, numerator and denominator are reduced by 4. As a result, P□202 = 32768 and P□203 = 1500. Then the setting is completed.

(6) Formula of electronic gear ratio



指令脉冲	Command pulse

位置环	Position loop
速度环	Speed loop
伺服电机	Servo motor
节距＝P（mm/rev）	Pitch = P (mm/rev)
指令单位	Command unit
编码器脉冲	Encoder pulse
滚珠丝杠节距	Ball screw pitch
减速比	Reduction ratio
A和B请通过用户参数设定：	A and B should be set through user parameter:

5.6.3 Position Command

Position of servo motor is controlled by the command in the form of pulse train.
Pulse train output forms of command controller are listed as below.

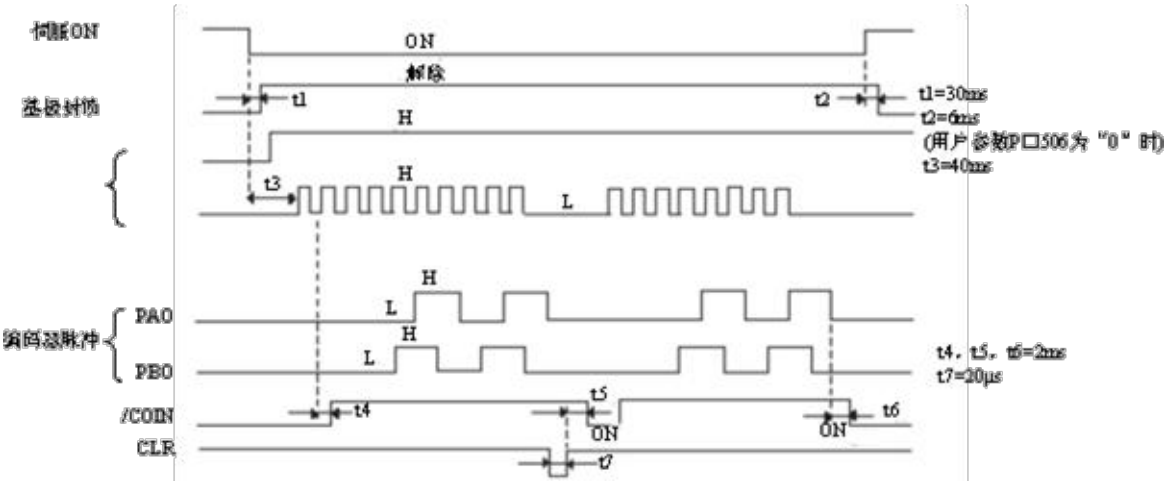
· Bus driver output
· +24V collector open circuit output
· +12 V collector open circuit output
· +5 V collector open circuit output

Note:

Note for collector open circuit output: when pulse output is conducted through collector open circuit, noise margin of input signal will reduce. In case of offset caused by noise, following user parameters should be changed.

User Parameter		Meanings
P□200	H.1□□□	Command input filtering for collector open-circuit signal

(1) Timing example for input/output signal

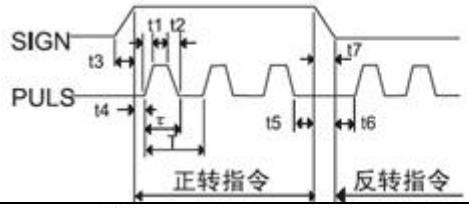
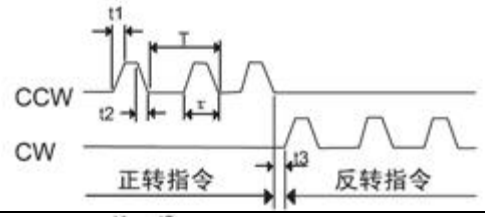
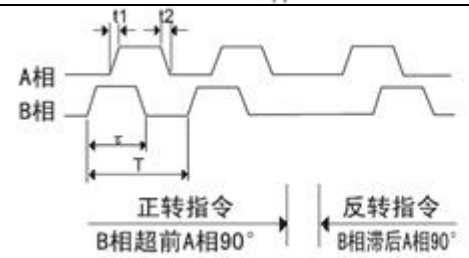


伺服ON	Servo ON
基极封锁	Base blockage
解除	Release
(用户参数P□506为“0”时)	(User parameter P□506 is equal to "0")
编码器脉冲	Encoder pulse

Note:

1. Interval between ON set for servo ON signal to input of command pulse should be more than 40 ms; otherwise, servo driver may not accept command pulse.
2. Clear signal ON should be set more than 200 μs.

Table: Timing for command pulse input signal

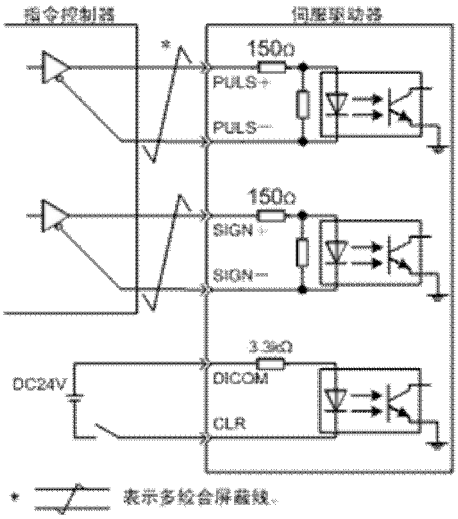
Command pulse signal form	Electrical specification	Remarks
Sign + pulse train input (SIGN + PULS signal) Maximum command frequency: 500 kpps (At collector open circuit output: 200 kpps)	 t1，t2 ≤ 0.1μs t3，t7 ≤ 0.1μs t4，t5，t6 > 3μs τ ≥ 1.0μs (τ /T)×100|≤ 50%	SIGN H = Positive rotation command L = Negative rotation command
CW pulse + CCW pulse Maximum command frequency: 500 kpps (At collector open circuit output: 200 kpps)	 t1，t2 ≤ 0.1μs t3 > 3μs τ ≥ 1.0μs (τ /T)×100 ≤ 50%	
90° phase difference Two phase pulse (Phase A + Phase B) Maximum command frequency: × multiplication: 500kpps × 倍增：400kpps × 倍增：200kpps	 t1，t2 ≤ 0.1μs τ ≥ 1.0μs (τ /T)×100=50%	Multiplication mode can be switched through user parameter P□200.1.

正转指令	Positive rotation command
反转指令	Negative rotation command
正转指令	Positive rotation command
反转指令	Negative rotation command
A相	Phase A
B相	Phase B
正转指令	Positive rotation command
B相超前A相90°	Phase B advancing phase A by 90°
反转指令	Negative rotation command
B相滞后A相90°	Phase B lagging phase A by 90°

(2) Connection example

(a) Connection example of bus driver output

Applicable bus driver: equivalent of TI SN75174 or MC3487

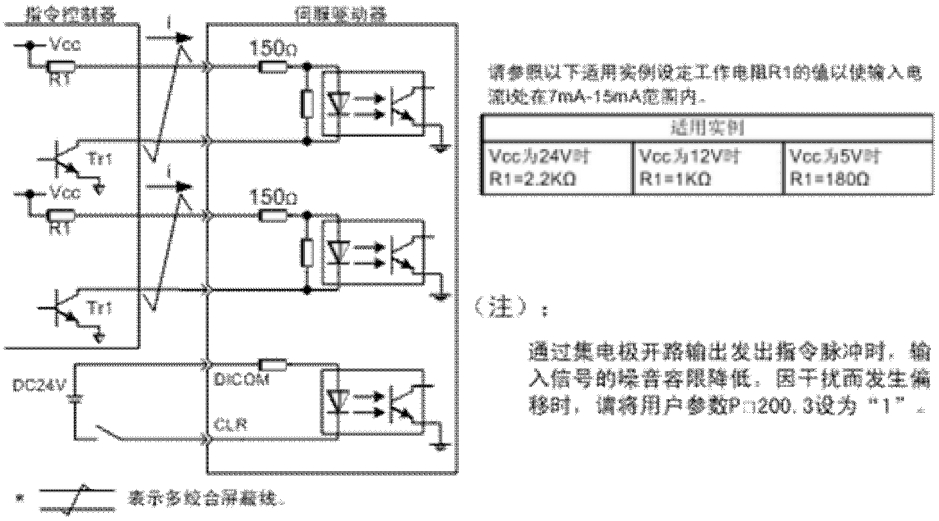


指令控制器	Command controller
伺服驱动器	Servo drive
表示多绞合屏蔽线。	refers to multi-stranded shielded wire.

(b) Connection example of collector open circuit output

R1 value of limiting resistor should be selected to ensure that input current is within the range below.

Input current i = 7 - 15mA

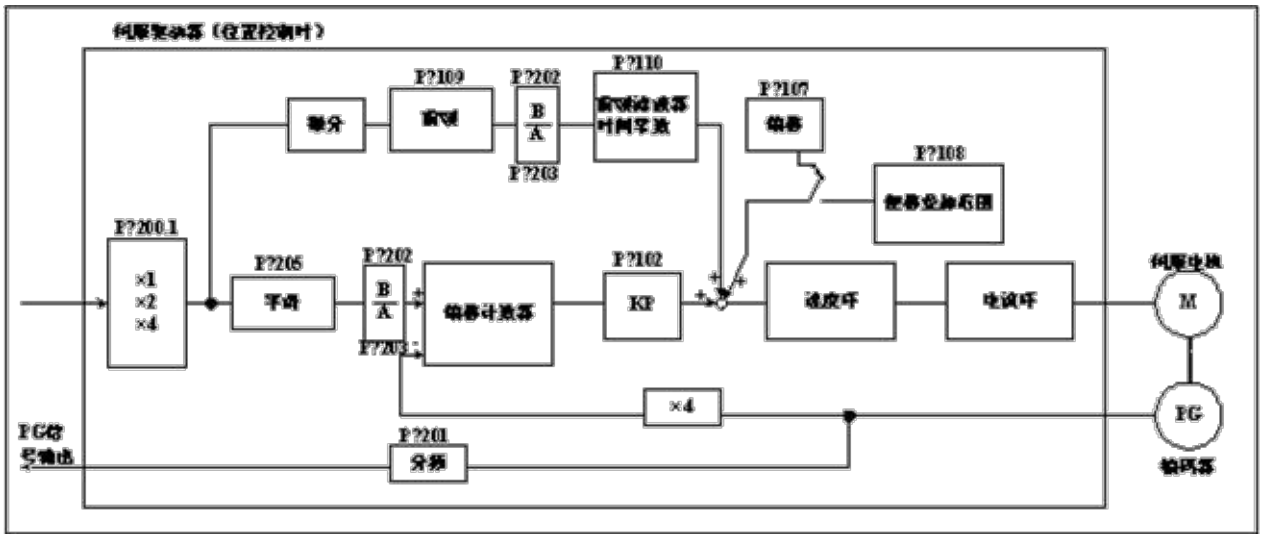


指令控制器	Command controller
伺服驱动器	Servo drive
表示多绞合屏蔽线。	refers to multi-stranded shielded wire.
请参照以下适用实例设定工作电阻R1的值以使输入电流i处在7mA-15mA范围内。	Please refer to the following applicable examples for setting of the working resistance R1 to maintain current i within 7 mA - 15 mA.
适用实例	Applicable examples
Vcc为24V时	Vcc on 24 V
Vcc为12V时	Vcc on 12 V

Vcc为5V时	Vcc on 5 V
（注）：	(Note):
通过集电极开路输出发出指令脉冲时，输入信号的噪音容限降低。因干扰而发生偏移时，请将用户参数P□200.3设为“1”。	When command pulse is sent through collector open circuit output, noise margin of input signal will reduce. In case of offset caused by interference, user parameter P□200.3 should be set as "1".

(3) Chart of control box

Chart of control box is as below during position control.



伺服驱动器（位置控制时）	Servo driver (during position control)
微分	Differential
前馈	Feedforward
前馈滤波器	Feedforward filter
时间常数	Time constant
偏移	Offset
便移叠加范围	Range of offset superposition
平滑	Smoothing
偏移计数器	Offset counter
速度环	Speed loop
电流环	Current loop
伺服电机	Servo motor
编码器	Encoder
PG信号输出	PG signal output
分频	Frequency division

5.6.4 Smoothing

Filtering is available in the servo unit through command pulse input with certain frequency.

(1) Selection of position command filter

User Parameter	Meanings

P□206	H.□□□0	First acceleration and deceleration filtering
	H.□□□1	Second acceleration and deceleration filtering

(2) User parameter related to filter

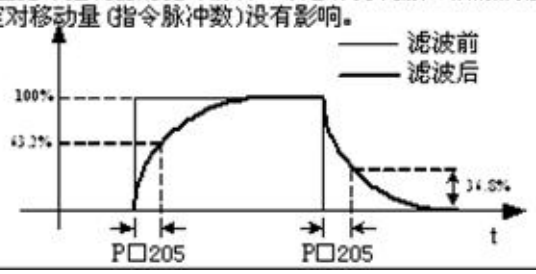
P□205 位置指令加减速滤波器时间参数 [位置]

设定范围	设定单位	出厂设定	电源重起
0 ~ 6400	0.1ms	0	不需要

■重要

在变更位置指令加减速时间参数(Pn204) 的情况下，没有指令脉冲输入并且偏移脉冲为0时变更的值才生效。为了切实地反映所设定的值，请输入清除信号 (CLR)以禁止指令控制器的指令脉冲，或者作为伺服ON清除偏移脉冲。即使在以下场合，也能平滑地运行电机。另外，本设定对移动量 (指令脉冲数)没有影响。

- 发出指令的指令控制器不能进行加、减速时
- 指令脉冲的频率较低时
- 电子齿数比较大时 (10 倍以上)

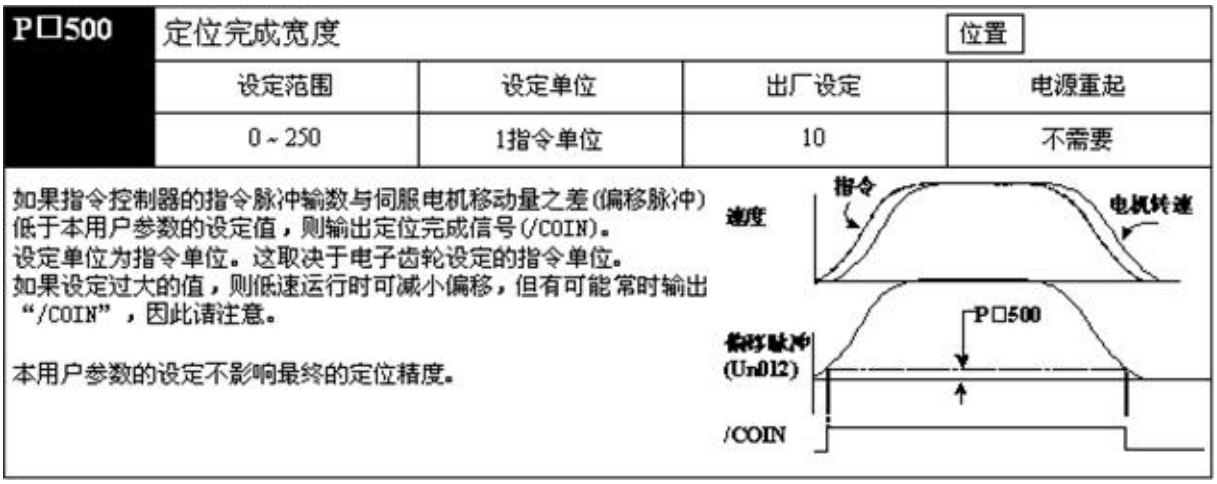


位置指令加减速滤波器时间参数	Position command acceleration/deceleration filter time parameter
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
重要	Attentions
在变更位置指令加减速时间参数(Pn204) 的情况下，没有指令脉冲输入并且偏移脉冲为0时变更的值才生效。为了切实地反映所设定的值，请输入清除信号(CLR)以禁止指令控制器的指令脉冲，或者作为伺服ON清除偏移脉冲。	Changing of position command acceleration/deceleration time parameter (Pn204) will take effects with no command pulse input and offset pulse of 0. To actually reflect the setting value, clear signal (CLR) should be input to disable command pulse from command controller or to clear offset pulse as servo ON.
即使在以下场合，也能平滑地运行电机。另外，本设定对移动量(指令脉冲数)没有影响。	Even in following conditions, motor can be operated smoothly. In addition, the setting has no impact on movement (command pulse).
· 发出指令的指令控制器不能进行加、减速时	· Command controller sending command cannot speed up or speed down
· 指令脉冲的频率较低时	· Frequency of command pulse is low
· 电子齿数比较大时(10 倍以上)	· Electronic gear is large (more than 10 times)
滤波前	Before filtering
滤波后	After filtering

5.6.5 Positioning Completion Signal

Positioning completion signal represents completion of servo motor positioning during position control, and should be used when interlocking is confirmed by positioning completion of command controller.

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Output	/COIN	CN3-9 CN3-10	CN3-34 CN3-35	ON = L Level	Positioning completed
				OFF = H Level	Positioning not completed
Positioning completion signal can be distributed to other output terminals through user parameter P□513. See "Signal distribution of output circuit" for distribution of output signal.					

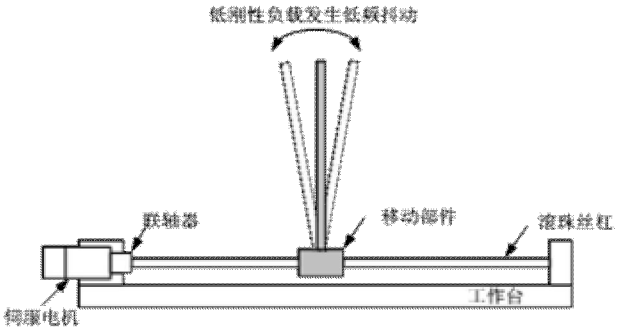


定位完成宽度	Positioning completion width
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
1指令单位	1 command unit
不需要	Not required
如果指令控制器的指令脉冲输数与伺服电机移动量之差(偏移脉冲)低于本用户参数的设定值，则输出定位完成信号(/COIN)。	If difference (offset pulse) between command pulse of command controller and movement of servo motor is lower than the setting value of user parameter, positioning completion signal (/COIN) should be output.
设定单位为指令单位。这取决于电子齿轮设定的指令单位。	Setting unit is the command unit, depending on command unit set for electronic gear.
如果设定过大的值，则低速运行时可减小偏移，但有可能常时输出“/COIN”，因此请注意。	If the setting value is overlarge, low-speed running can reduce offset, but it should be noted that "/COIN" may be output frequently.

本用户参数的设定不影响最终的定位精度。	Setting of user parameter will not affect final positioning accuracy.
速度	Speed
偏移脉冲	Offset pulse
指令	Command
电机转速	Motor speed

5.6.6 Low-frequency Jitter Suppression

For low-rigidity loading, rapid start-stop may produce continuous low-frequency jitter at early stage of loading, resulting in longer positioning and affecting production efficiency. Servo driver is equipped with jitter buffer control function which can suppress low-frequency jitter by estimating loading position and compensation.



低刚性负载发生低频抖动	Low-frequency jitter under low-rigidity loading
联轴器	Coupling
移动部件	Movable parts
滚珠丝杠	Ball screw
伺服电机	Servo motor
工作台	Workbench

(1) Scope of Application

Low-frequency jitter suppression is available in speed control mode and position control mode.Low-frequency jitter suppression may not work normally or reach expected effects in case of:

- Intensive vibration cause by external force
- Jitter frequency not within 5.0 Hz - 50.0 Hz
- Mechanical gap between mechanical joint parts of vibration structure
- Moving time lower than one vibration cycle

(2) Setting of user parameter

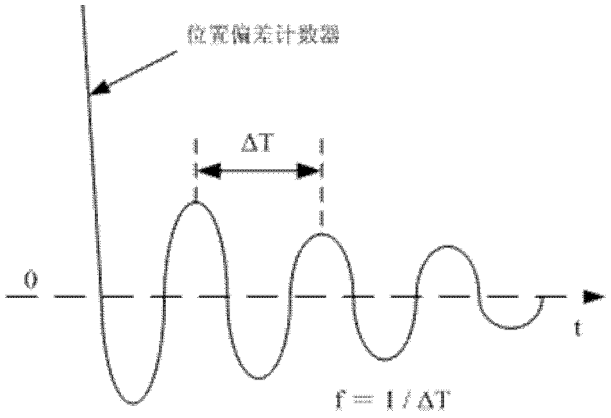
User Parameter		Meanings
P□004	H.□0□□0	Disable low-frequency jitter suppression
	H.□1□□1	Enable low-frequency jitter suppression

P□413	B型振动（低频抖动）频率		速度	位置
	设定范围	设定单位	出厂设定	电源重起
	10～1000	0.1Hz	1000	不需要
P□414	B型振动（低频抖动）阻尼		速度	位置
	设定范围	设定单位	出厂设定	电源重起
	0～200	—	25	不需要
将测得的负载抖动频率写入参数P□413后，可微调P□413以获得最佳抑制效果。 如果电机在停止时出现持续的振动，可以适当增大P□414，通常参数P□414不用修改。				

B型振动（低频抖动）频率	B type vibration (low-frequency jitter) frequency
速度	Speed
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
B型振动（低频抖动）阻尼	B type vibration (low-frequency jitter) damping
速度	Speed
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
将测得的负载抖动频率写入参数P□413后，可微调P□413以获得最佳抑制效果。	After inputting loading jitter frequency measured into parameter P□413, P□413 can be slightly adjusted to obtain best suppression.
如果电机在停止时出现持续的振动，可以适当增大P□414，通常参数P□414不用修改。	In case of continuous vibration of motor during shutdown, P□414 can be increased appropriately without modification of parameter P□414.

If jitter frequency can be directly measured by instrument, such as laser interferometer, frequency measured should be directly input into parameter P□413 in the unit of 0.1 Hz.

In case of no measuring instrument available, drawing or FFT analysis function of communication software of upper computer can be used to indirectly measure jitter frequency of loading.



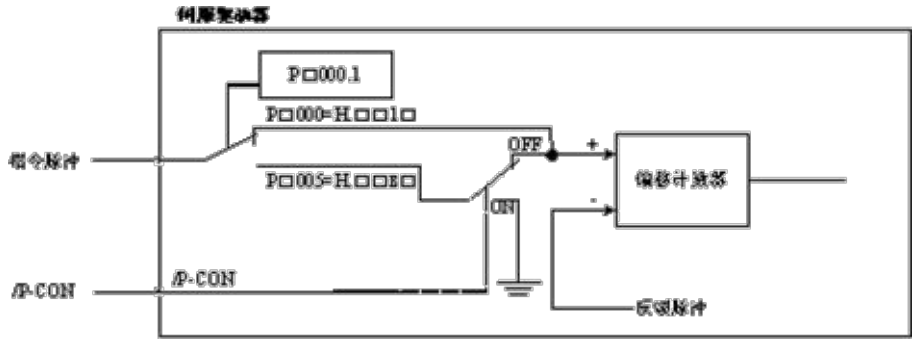
位置偏差计数器	Position offset counter

5.6.7 Inhibition Function of Command Pulse (INHIBIT Function)

(1) Inhibition function of command pulse (INHIBIT function)

It is the function to stop (inhibit) command pulse input counting during position control.

When the function is activated, servo locking (clamping) state is also activated.



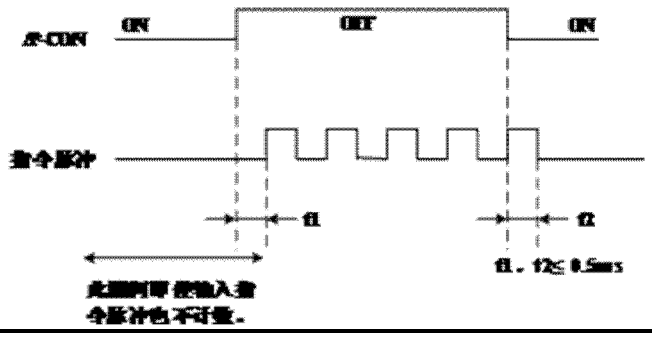
伺服驱动器	Servo drive
指令脉冲	Command pulse
偏移计数器	Offset counter
反馈脉冲	Feedback pulse

(2) Setting of user parameter

User Parameter		Meanings
P□000	H.□□B□	Control mode: position control (pulse train command) ßà position inhibition

■Inhibit switching condition

· /P-CON signal is ON (L level)



指令脉冲	Command pulse
此期间即使输入指令脉冲也不计数。	Counting is not available even if command pulse is input during this period.

(3) Setting of input signal

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Input	/P-CON	CN3-15	CN3-40	ON = L Level	INHIBIT function ON (stop counting of command pulse)
				OFF = H Level	INHIBIT function OFF (counting of command pulse)

5.7 Torque Control Operation

5.7.1 User Parameter Setting

User Parameter		Meanings
P□000	H.□□2□	Control mode: torque control (analog voltage command)

扭矩指令输入增益	Torque command input gain
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
0.1V/额定扭矩	0.1V/rated torque
30（3V/额定扭矩）	30 (3V/rated torque)
不需要	Not required
设定以额定扭矩运行伺服电机所需的扭矩指令	Set analog voltage level of torque command (T-REF) for servo motor operation under rated torque.
(T-REF) 的模拟量电压电平。	
例	For example,
P□400=30：表示设定为3V 输入时使用的电机额定扭矩(出厂时的设定)	P□400 = 30: rated torque of motor under 3 V input (factory setting)
P□400=1000：表示设定为10V 输入时使用的电机额定扭矩	P□400=1000: rated torque of motor under 10 V input
P□400=200：表示设定为2V 输入时使用的电机额定扭矩	P□400=200: rated torque of motor under 2 V input
指令扭矩	Command torque
额定扭矩	Rated torque
指令电压(V)	Command voltage (V)
设定该电压指令	Set voltage command

5.7.2 Torque Command Input

If torque command is sent to servo driver in the form of analog voltage command, torque of servo motor is controlled in proportion to input voltage.

Name	Signal	Pin No. of	Name

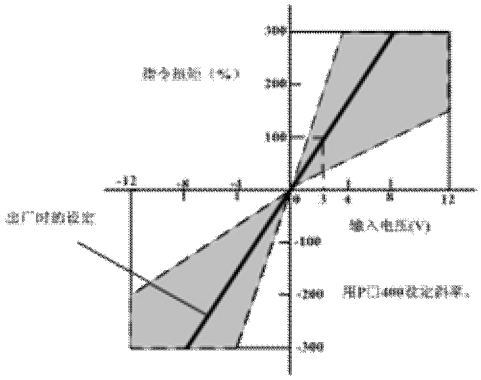
		connector		
		A axis	B axis	
Input	T-REF	CN3-18	CN3-43	Torque command input
	GND	CN3-25	CN3-50	Signal earth for torque command input

It should be used for torque control (analog voltage command) (P□000.1 = 2, 6, 8 or 9)

P□400 is used to set torque command input gain. Please refer to "8.7.1 Setting of User Parameter" for details.

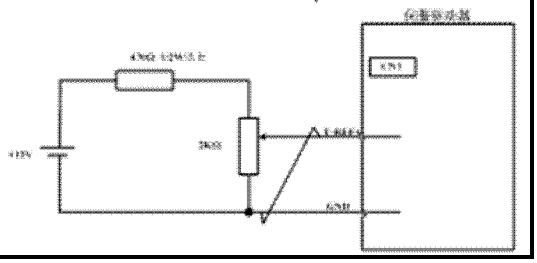
■ Input specification

· Input range: DC ± 1V - ± 10V/ rated torque
· Maximum allowable input voltage: DC ± 12V
· Factory settings
P□400 = 30: rated torque under 3 V
+3V input: rated torque in the positive direction
+9 V input: 300% of rated torque in the positive direction
-0.3 V input: 10 % of rated torque in the negative direction
Voltage input range can be changed through user parameter P□400.



■Example of input circuit

To adopt effective measures to prevent interference, multi-stranded wire should be used for wiring.



指令扭矩（%）	Command torque (%)
出厂时的设定	Factory settings
输入电压(V)	Input voltage (V)
用P□400设定斜率。	Slope should be set by P□400.
470Ω 1/2W以上	Over 470Ω 1/2W
伺服驱动器	Servo drive

Note:

Internal torque can be confirmed under monitoring mode (Un005). See "Operation under Monitoring Mode".

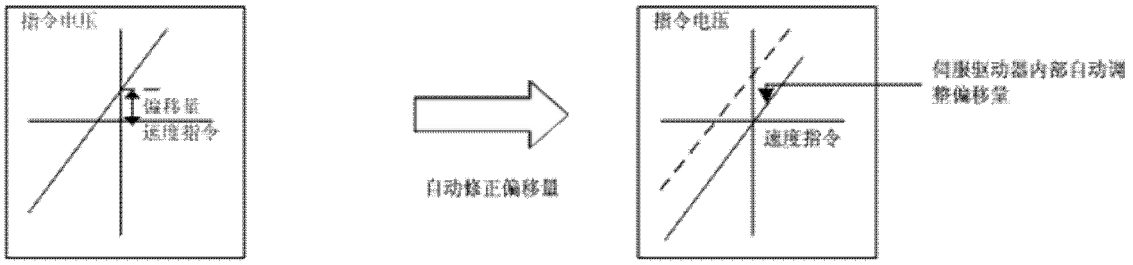
5.7.3 Adjustment of Offset

(1) Auto-adjustment of torque command offset

In torque control mode, even if OV command is sent under analog command voltage, motor will rotate with low speed in case of small command voltage offset (unit: mV) of superior control unit or in external circuit. In such case, command offset can be automatically or manually adjusted by panel operator.

Auto-adjustment of analog (speed · torque) or command offset is the function for offset measurement and auto-adjustment of voltage.

In case of voltage command offset of the superior controller or in external circuit, servo driver will make following adjustment towards the automatic offset.



指令电压	Command voltage
偏移量	Offset
速度指令	Speed command
自动修正偏移量	Auto-correction of offset
指令电压	Command voltage
速度指令	Speed command
伺服驱动器内部自动调整偏移量	Auto-adjustment of offset in servo driver

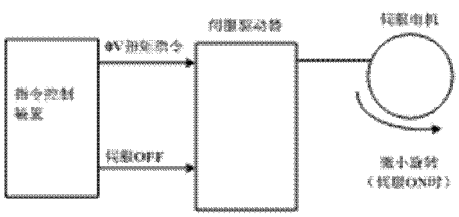
Once auto-adjustment of command offset begins, offset will be saved in the servo driver.

Offset can be confirmed through manual adjustment of speed command offset (F□006). When offset pulse is set as zero with the servo locked in the OFF state by the command controller equipped with a position loop, auto-adjustment of command offset (F□008) is not available, instead, manual adjustment of speed command offset (F□00A) should be applied.

Under speed command of zero, function of zero clamping speed control which can lock the servo in a mandatory manner is provided. See "Use of Zero Clamping Function" for details.

Note: Auto-adjustment of zero analog offset should be conducted when the servo is OFF.

Auto-adjustment of torque command offset of A axis is conducted as below.

Operation steps	Operation instruction	Operation key	Display after operation
1			Set the servo unit as OFF, and input OV command voltage through command controller or external circuit.

2	Press M function key to select auxiliary function mode for A axis. In case of failing to display FA008, press UP or DOWN to set.	M	FA008
3	Press SET, and "rEF_o" is displayed.	SET	rEF_o
4	Press M function key to start auto-zeroing, and flickering "donE" is displayed.	M	donE
5	After completion of auto-zeroing, "rEF_o" instead of flickering "donE" is displayed.	——	rEF_o
6	Press SET to return to the display of FA008.	SET	FA008

指令控制装置	Command control unit
0V扭矩指令	OV torque command
伺服OFF	Servo OFF
伺服驱动器	Servo drive
伺服电机	Servo motor
微小旋转（伺服ON时）	Rotation within a narrow scope (servo in ON state)

(2) Manual adjustment of torque command offset

Manual adjustment of torque command offset (F□007) should be applied in case that:

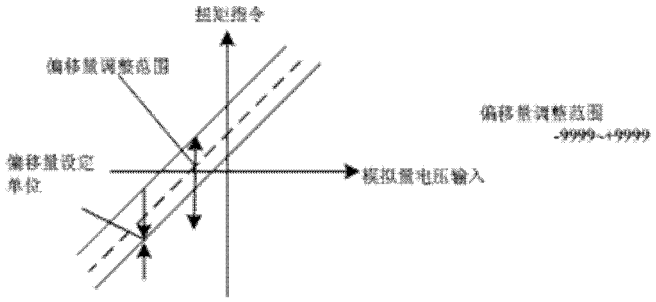
· the command controller is equipped with a position loop to set the offset pulse as zero when the servo is locked in the OFF state

· offset is set as a certain value consciously

· offset set for auto-adjustment is applied

Basic function and auto-adjustment of analog (speed · torque) command offset (F□008) are the same. But for manual adjustment (F□007), adjustment must be made along with direct input of offset.

Figure below shows adjustment range of offset and setting unit.



扭矩指令	Torque command
偏移量调整范围	Adjustment range of offset
偏移量设定单位	Setting unit of offset
模拟量电压输入	Analog voltage input
偏移量调整范围-9999~+9999	Adjustment range of offset: -9999 - +9999

Auto-adjustment of torque command offset of A axis is conducted as below.

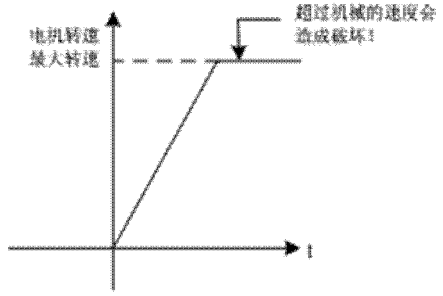
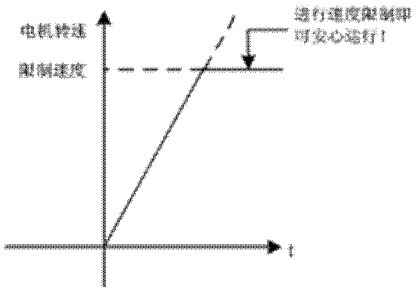
Operation steps	Operation instruction	Operation key	Display after operation
1	Press M function key to select auxiliary function mode for A axis. In case of failing to display FA006, press UP or DOWN to set.	M	FA007
2	Press SET, and "A.Tcr" is displayed.	SET	A.Tcr
3	Press SET for at least 1 s, and "0000" is displayed.	<	0000
4	Press UP or DOWN to set offset.	∧ ∨	0083
5	Press SET for at least 1 s to save offset.	<	A.Tcr
6	Press SET to return to the display of FA007.	SET	FA007

5.7.4 Speed Limit under Torque Control

Since servo motor is required to be controlled under torque control to output the torque that gives a command, motor speed (rpm) is not managed.

If the command torque is set to outnumber the load torque at the mechanical side, then it will exceed the torque of the machinery, which will lead to substantial increase of motor speed.

As a protective measure at the mechanical side, a function of limiting servo motor speed under torque control is provided.

Speed limit	No speed limit
	

电机转速	Motor speed
最大转速	maximum speed
超过机械的速度会造成破坏！	Damage may be caused if exceeding speed of machinery!
电机转速	Motor speed
限制速度	Limited speed

进行速度限制即可安心运行！	Safe operation may be ensured if speed is limited!

(1) Selection of speed control manner (torque limit option)

User Parameter		Meanings
P□001	H.□0□□	Value set in P□408 is used as speed limit. (Internal speed limiting function)
	H.□1□□	V-REF is used as external speed limit input.

(2) Internal speed limiting function

P□408	扭矩控制时的速度限制			扭矩
	设定范围	设定单位	出厂设定	电源重起
	0 ~ 6000	1r/min	1500	不需要

设定扭矩限制时的电机转速限值。
P□001=H. □0□□时，本用户参数的设定生效。
即使在P□408中设定超过所用伺服电机最大转速的值，实际值仍被限制为所用伺服电机的最大转速。

速度指令输入增益	Speed command input gain
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
扭矩控制时，设定进行外部速度限制的转速的电压电平。	Under torque control, voltage level is set for the rotation speed for external speed limiting.
P□300=150(出厂时的设定) 时，如果输入V-REF的6V电压，则将实际转速限制为900r/min。	When P□300=150 (factory setting), if the voltage input to the V-REF is 6 V, the actual speed limit is 900 r/min.

(3) External speed limiting function

Name	Signal	Pin No. of connector		Name
		A axis	B axis	
Input	V-REF	CN3-5	CN3-30	External speed limit input
	GND	CN3-6	CN3-31	Signal ground

Motor speed limit in case the torque limit is input under analog voltage command.
When P□001=H.□1□□, the smaller one of V-REF speed limit input and P□408 "speed limit under torque control" is the valid value.
The set value of P□300 is determined to be the voltage level of limit input and it is not related to polarity.

P□300	速度指令输入增益		速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起	
	0 ~ 3000	(r/min)/V	150	不需要	
扭矩控制时，设定进行外部速度限制的转速的电压电平。 P□300=150(出厂时的设定)时，如果输入V-REF的6V电压，则将实际转速限制为900r/min。					

速度指令输入增益	Speed command input gain
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
扭矩控制时，设定进行外部速度限制的转速的电压电平。	Under torque control, voltage level is set for the rotation speed for external speed limiting.
P□300=150(出厂时的设定)时，如果输入V-REF的6V电压，则将实际转速限制为900r/min。	When P□300=150 (factory setting), if the voltage input to the V-REF is 6 V, the actual speed limit is 900 r/min.

Note: Principle of speed limit.

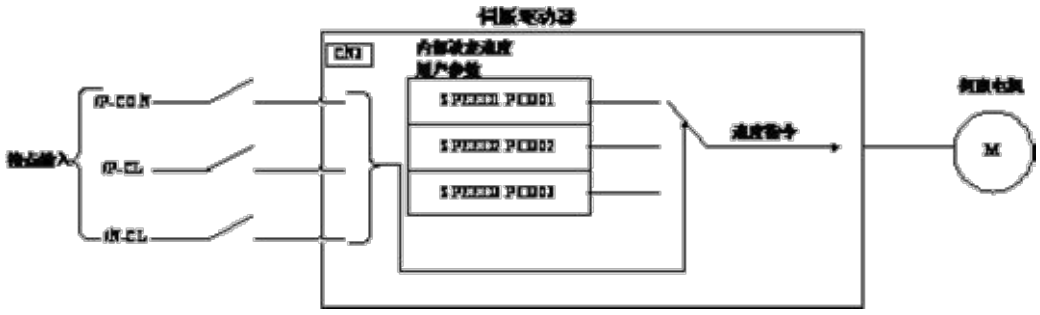
If the speed is out of the range of speed limit, it may return to the range of speed limit through negative feedback of torque proportional to the speed difference with the limited speed. Therefore, actual motor speed limit will fluctuate based on loading conditions.

5.8 Speed Control (Internal Speed Selection) Operation

· Meaning of internal set speed selection

Internal set speed selection refers to the function of selecting speed from the 3 motor speeds preset through internal user parameters of servo drive by taking advantage of external input signals to control operation by speed. Control action is valid if the operating speed is within the 3 motor speeds.

It is not necessary to provide a speed generator or pulse generator externally.



伺服驱动器	Servo drive
内部设定速度	Internal set speed
用户参数	User Parameter

速度指令	Speed command
伺服电机	Servo motor

5.8.1 User Parameter Setting

User Parameter		Meanings
P□000	H.□□3□	Selection of control manner: internal set speed control (contact command)

P□301	内部设定速度1		速度	
	设定范围	设定单位	出厂设定	电源重起
	0～6000	1r/min	100	不需要
P□302	内部设定速度2		速度	
	设定范围	设定单位	出厂设定	电源重起
	0～6000	1r/min	200	不需要
P□303	内部设定速度3		速度	
	设定范围	设定单位	出厂设定	电源重起
	0～6000	1r/min	300	不需要

(注)
即使在P□301～P□303中设定超过所用伺服电机最大转速的值，实际值仍被限制为所用伺服电机的最大转速。

内部设定速度1	Internal set speed 1
速度	Speed
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
内部设定速度2	Internal set speed 2
速度	Speed
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
内部设定速度3	Internal set speed 3
速度	Speed
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
(注)	(Note)

即使在P□301～P□303中设定超过所用伺服电机最大转速的值，实际值仍被限制为所用伺服电机的最大转速。	Even through the value set at P□301-P□303 is larger than the maximum speed of the used servo motor, the actual value is still limited to the maximum speed of the servo motor.

5.8.2 Setting of Input Signal

Name	Signal	Pin No. of connector		Name
		A axis	B axis	
Input	/P-CON	CN3-15	CN3-40	Shift of rotation direction of servo motor
	/PCL	Need to distribute		Selection of internal set speed
	/NCL	Need to distribute		Selection of internal set speed

■ As for input signal selection

For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory.
For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510.
Operation modes of the three input signals /P-CON, /P-CL and /N-CL are utilized (they are distributed in factory settings).

5.8.3 Operation at Internal Set Speed

Operation is allowed through internal settings by ON/OFF combination of the following input signals.

Input signal			Rotation direction of motor	
/P-CON	/PCL	/NCL		
OFF(H)	OFF(H)	OFF(H)	Positive rotation	Stop by the internal speed command 0
	OFF(H)	ON(L)		P□301: internal set speed 1 (SPEED1)
	ON(L)	ON(L)		P□302: internal set speed 2 (SPEED2)
	ON(L)	OFF(H)		P□303: internal set speed 3 (SPEED3)
ON(L)	OFF(H)	OFF(H)	Negative	Stop by the internal speed command 0
	OFF(H)	ON(L)		P□301: internal set speed 1 (SPEED1)
	ON(L)	ON(L)		P□302: internal set speed 2 (SPEED2)
	ON(L)	OFF(H)		P□303: internal set speed 3 (SPEED3)

Note:

In case that the control mode is switching mode

When P□000.1 = 4, 5, 6, if the signal of either /PCL or /NCL is OFF (H level), then the control mode is shifted.

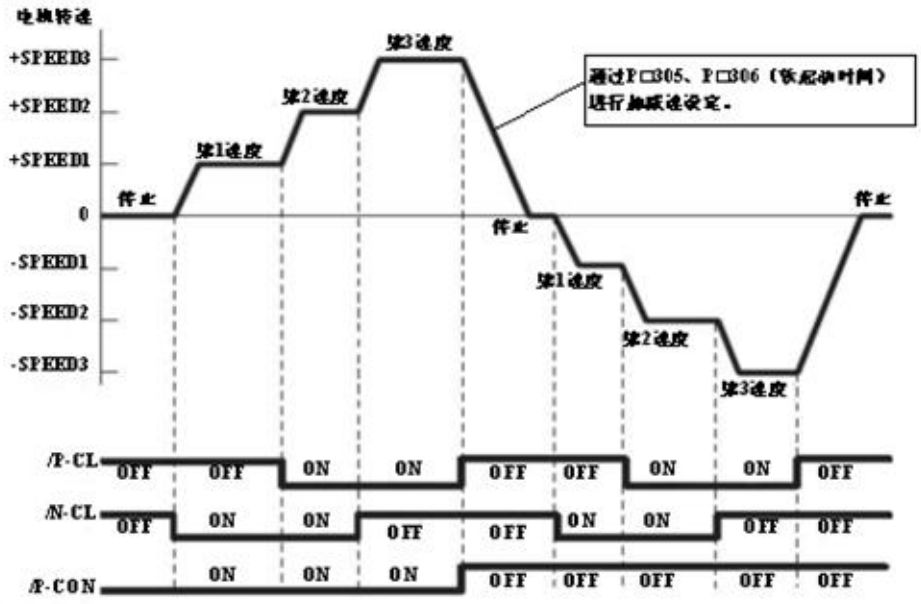
For example, P□000.1=5: when internal set speed is set to select <--> position control (pulse train)

Input signal		Speed
/PCL	/NCL	
OFF(H)	OFF(H)	Stop by the internal speed command 0
OFF(H)	ON(L)	P□301: internal set speed 1 (SPEED1)
ON(L)	ON(L)	P□302: internal set speed 2 (SPEED2)
ON(L)	OFF(H)	P□303: internal set speed 3 (SPEED3)

· Operation example based on internal speed setting selection

If soft start function is used, then the impact during speed shifting will decrease. Please refer to "Soft start" for soft start.

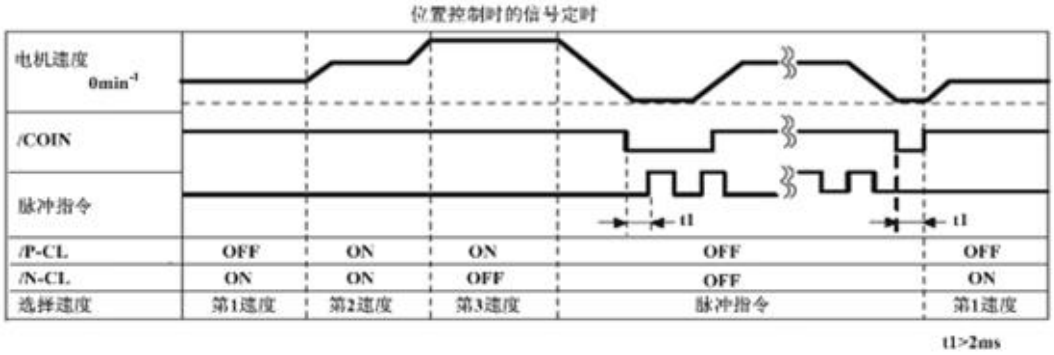
Example: operation based on internal set speed + soft start



电机转速	Motor speed
停止	Stop
第1速度	Speed 1
第2速度	Speed 2
第3速度	Speed 3
通过P□305、P□306（软起动时间）进行加减速设定。	Acceleration and deceleration are set through P□305 and P□306 (soft start time)
停止	Stop
第1速度	Speed 1
第2速度	Speed 2
第3速度	Speed 3
停止	Stop

If "(P□000.1 = 5 internal set speed control" position control)" is set, the soft start function only works when the internal set speed is selected. The soft start function is not available when pulse command is input. If it is shifted to pulse command input during operation at any speed of speed 1-3, the servo drive will accept the pulse command after output of positioning completion signal (/COIN). Please start output of pulse command of user command controller only after output of positioning completion signal of servo drive.

(Internal set speed + soft start) based <--> position control (operation example of pulse train command)



位置控制时的信号定时	Signal timing in case of position control
电机速度	Motor speed
脉冲指令	Pulse command
选择速度	Selection speed
第1速度	Speed 1
第2速度	Speed 2
第3速度	Speed 3
脉冲指令	Pulse command
第1速度	Speed 1

Note:

1. The figure above is the case of using soft start function.
2. Value of t1 will not be affected, whether soft start function is used. Read-in of /PCL and /NCL may delay at most 2 ms.

5.9 Torque Limit

For purposes like protecting machinery, output torque may be limited. There are 4 ways of torque limit in the servo drive.

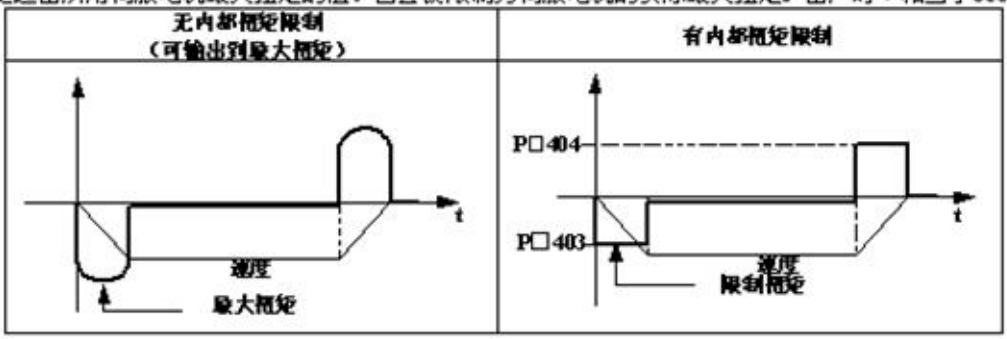
Method	Way of limit	Reference
1	Internal torque limit	
2	External torque limit	
3	Torque limit based on analog voltage command	
4	Torque limit based on external torque limit + analog voltage command	

5.9.1 Internal Torque Limit (Limitation on Output Torque Maximum Value)

Internal torque limit is a function that limits the maximum output torque through user parameters frequently.

P□403	正转扭矩限制		速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起	
	0～300	1%	300	不需要	
P□404	反转扭矩限制		速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起	
	0～300	1%	300	不需要	

本用户参数的设定值常时有效。设定单位为相对于电机额定扭矩的%。
即使设定超出所用伺服电机最大扭矩的值，也会被限制为伺服电机的实际最大扭矩。出厂时：相当于300%的状态。



■补充
如果将P□403、P□404 设定为过小的值，则会在伺服电机加减速时导致扭矩不足，请注意。

正转扭矩限制	Positive torque limit
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
反转扭矩限制	Negative torque limit
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
本用户参数的设定值常时有效。设定单位为相对于电机额定扭矩的%。	Set value of the user parameter is constantly valid. Set unit corresponds to a percent (%) of motor rated torque.
即使设定超出所用伺服电机最大扭矩的值，也会被限制为伺服电机的实际最大扭矩。出厂时：相当于300%的状态。	Even through the value is set to exceed the maximum torque of the used servo motor, it will still be limited to be the actual maximum torque of the servo motor. Factory setting:

	equivalent to 300%.
无内部扭矩限制（可输出到最大扭矩）	There is no internal torque limit (may output up to the maximum torque)
速度	Speed
最大扭矩	Maximum torque
有内部扭矩限制	There is internal torque limit
速度	Speed
限制扭矩	Limited torque
补充	Supplement
如果将P□403、P□404 设定为过小的值，则会在伺服电机加减速时导致扭矩不足，请注意。	Please note that if values of P□403 and P□404 are set to be too small, then torque may be insufficient during acceleration and deceleration of servo motor.

5.9.2 External Torque Limit (through Input Signal)

External torque limit will be used during machinery operation or at a certain time set for torque limit. For example, it is used to press stop action or maintain robot workpiece, or for other applications.

The torque limit value preset at the user parameter become valid through signal input.

(1) Relevant user parameter

P□405	正转侧外部扭矩限制		速度 位置 扭矩	
	设定范围	设定单位	出厂设定	电源重起
	0～300	1%	100	不需要
P□406	反转侧外部扭矩限制		速度 位置 扭矩	
	设定范围	设定单位	出厂设定	电源重起
	0～300	1%	100	不需要

正转侧外部扭矩限制	Positive-side external torque limit
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
反转侧外部扭矩限制	External torque limit at negative side
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required

Note: Set unit corresponds to a percent (%) of the used servo motor rated torque. (Limit under rated torque is 100%.)

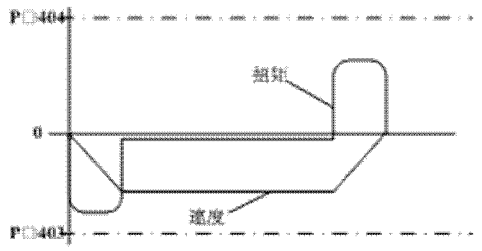
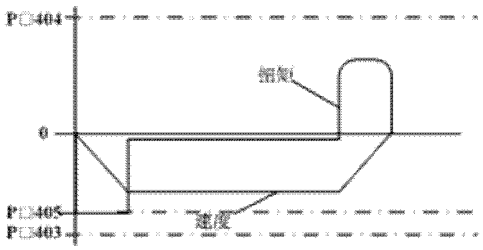
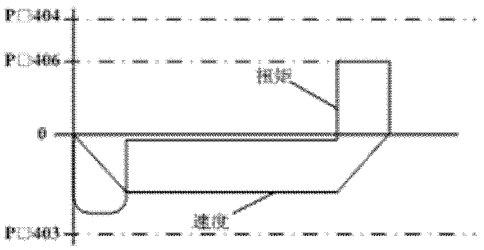
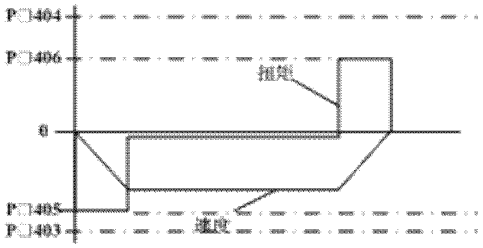
(2) Input signal

Name	Signal	Pin No. of connector		Set	Meanings	Limit value
		A axis	B axis			
Input	/PCL	Different drives for single axis and double axis		ON = L Level	Positive-side external torque limit ON	The smaller value at Pn403 and Pn405
				OFF = H	Positive-side external	Pn403

			Level	torque limit OFF	
Input	/NCL	Different drives for single axis and double axis	ON = L Level	External torque limit at negative side OFF	The smaller value in Pn404 and Pn406
			OFF = H Level	Negative-side external torque limit OFF	Pn404
For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory. For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510. When using external torque limit, please confirm whether to distribute other signals to the same terminal of /P-CL and /N-CL. Since the logic becomes OR logic when several signals are distributed to a terminal, effects from ON/OFF of other signals distributed to the same terminal may be inevitable. Please refer to "Signal distribution of input circuit" for distribution of input signal.					

(3) Output torque change under external torque limit

When internal torque limit (P□403, P□404)=800%

		/PCL (positive external torque limit)	
		H level	L level
/NCL (External torque limit at reverse side)	H level		
	L level		

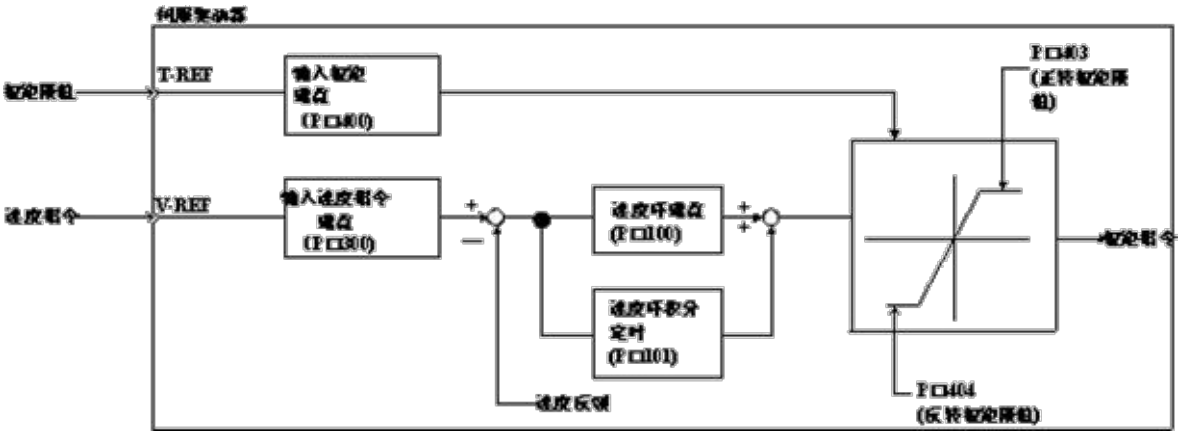
扭矩	Torque
速度	Speed
扭矩	Torque
速度	Speed
扭矩	Torque
速度	Speed
扭矩	Torque
速度	Speed

Note: select motor rotation direction when setting P□000=H.□□□ 0 (standard setting [CCW as positive rotation direction]).

5.9.3 Torque Limit Based on Analog Voltage Command

The function is to realize torque limit at random through analog voltage command. T-REF is used as the input terminal of analog voltage command. Therefore, the function cannot work under torque control and is available under speed control or position control.

Under speed control, the block diagram in the case of "torque limit based on analog voltage command" is as shown below.



伺服驱动器	Servo drive
扭矩限值	Torque limit
速度指令	Speed command
输入扭矩增益	Input torque gain
输入速度指令增益	Input speed command gain
速度环增益	Speed loop gain
速度环积分	Speed loop integral
定时	Timing
速度反馈	Speed feedback
(正转扭矩限值)	(Positive torque limit value)
扭矩指令	Torque command
(反转扭矩限值)	(Negative torque limit value)

Note:

Input voltage for analog voltage command of torque limit does not have polarity. The value is absolute value, no matter it is positive or negative, and the torque limit based on the absolute value is applicable to both positive and negative directions.

(1)Relevant user parameter

User Parameter		Meanings
P□001	H.□□1□	Speed control option: T-REF terminal is used as the external torque limit input.
If H.□□2□ is set, then T-REF terminal may also be used as the torque feed-forward input. However, please note that it cannot serve for these two input functions simultaneously.		

(2) Input signal

Name	Signal	Pin No. of connector		Name
		A axis	B axis	
Input	T-REF	CN3-18	CN3-30	Torque command input
	GND	CN3-25	CN3-50	Signal ground

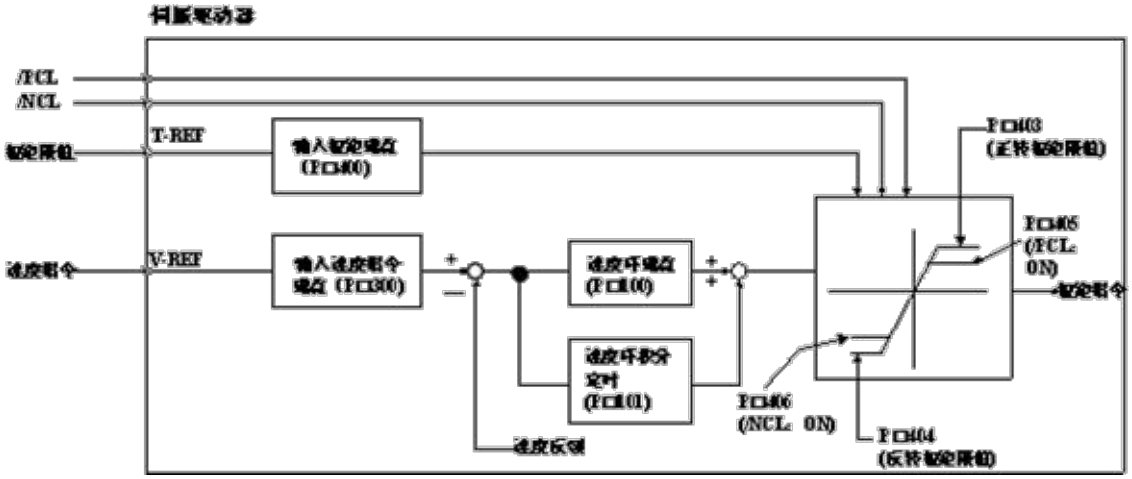
P□400 is used to set torque command input gain. Please refer to "Setting of user parameter".

5.9.4 Torque Limit Based on External Torque Limit + Analog Voltage Command

Torque limit based on external input signal and torque limit based on analog voltage command can be used simultaneously.

For torque limit based on analog voltage command, T-REF is used for input. Hence, it cannot work under torque control. For torque limit based on external input signal, /P-CL or /N-CL is used.

If signal of /P-CL (or /N-CL) is set to be ON, torque limit relies on the smaller one of torque limit based on analog voltage command and the set value of P□405(or P□406).



伺服驱动器	Servo drive
扭矩限值	Torque limit
速度指令	Speed command
输入扭矩增益	Input torque gain
输入速度指令增益（P□300)	Input speed command gain (P□300)
速度环增益(P□100)	Speed loop gain (P□100)
速度环积分定时(P□101)	Speed loop integral timing (P□101)
速度反馈	Speed feedback
(正转扭矩限值)	(Positive torque limit value)
扭矩指令	Torque command
(反转扭矩限值)	(Negative torque limit value)

(1) Relevant user parameter

User Parameter		Meanings
P□001	H.□□3□	Speed control option: If /P-CL or /N-CL is valid, T-REF terminal is used as the external torque limit input.
If H.□□2□ is set, then T-REF terminal may also be used as the torque feed-forward input. However, please note that it cannot serve for these two input functions simultaneously.		

P□405	正转侧外部扭矩限制		速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起	
	0～300	1%	100	不需要	
P□406	反转侧外部扭矩限制		速度	位置	扭矩
	设定范围	设定单位	出厂设定	电源重起	
	0～300	1%	100	不需要	

正转侧外部扭矩限制	Positive-side external torque limit
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
反转侧外部扭矩限制	External torque limit at negative side
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required

(2) Input signal

Name	Signal	Pin No. of connector		Name
		A axis	B axis	
Input	T-REF	CN3-18	CN3-30	Torque command input
	GND	CN3-25	CN3-50	Signal ground
P□400 is used to set torque command input gain. Please refer to "Setting of user parameter".				

Name	Signal	Pin No. of connector		Set	Meanings	Limit value
		A axis	B axis			
Input	/PCL	Different drives for single axis and double axis		ON = L Level	Positive-side external torque limit ON	The smaller value at Pn403 and Pn405
				OFF = H Level	Positive-side external torque limit OFF	Pn403
Input	/NCL	Different drives		ON = L Level	External torque limit at	The smaller value in Pn404 and Pn406

		for single axis and double axis		negative side OFF	
			OFF = H Level	Negative-side external torque limit OFF	Pn404
For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory. For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510. When using external torque limit + torque limit based on analog voltage command, please confirm whether to distribute other signals to the terminal same to /P-CL and /N-CL. Since the logic becomes OR logic when several signals are distributed to a terminal, affect from ON/OFF of other signals distributed to the same terminal may be inevitable. Please refer to "Signal distribution of input circuit" for distribution of input signal.					

5.9.5 Confirmation under Input Torque Limit

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Output	/CLT	Need to distribute		ON = L Level	Motor input torque is under limiting
				OFF = H Level	Not torque limit status
To use the signal in case of motor output torque limit, it is necessary to distribute output terminal through user parameter P□514. Please refer to "Signal distribution of output circuit".					

5.10 Shift of Control Mode

The servo drive can be used with various control modes for shifting. The shifting method and conditions are described as follows.

5.10.1 User Parameter Setting

Control mode can be any of the following combination. Please select based on customers' usage.

User Parameter		Meanings
P□000	H.□□4□	Internal set speed control (contact command) ←→ Speed control (analog command)
	H.□□5□	Internal set speed control (contact command) ←→ Position control (pulse train command)
	H.□□6□	Internal set speed control (contact command) ←→ Torque control (analog command)
	H.□□7□	Position control (pulse train command) ←→ Speed control (analog command)
	H.□□8□	Position control (pulse train command) ←→ Torque control (analog command)
	H.□□9□	Torque control (analog command) ←→ Speed control (analog command)
	H.□□A□	Speed control (analog command) ←→ Zero clamping
	H.□□B□	Position control (pulse train command) ←→ Torque control (pulse prohibited)

5.10.2 Shift of Control Mode

(1) Shift between internal set speed control (P□00.1 = 4, 5, 6)

Name	Signal	Pin No. of connector		Set	Meanings
		A axis	B axis		
Input	/PCL	Different drives for single axis and double axis		OFF = H Level	Shift of control mode
Input	/NCL	Different drives for single axis and double axis		OFF = H Level	
For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory. For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510.					

(2) Shift beyond internal speed control (P□000.1=7, 8, 9, A, B)

Please use the following signal shift control mode. Conduct the following control mode shift based on signal status.

Name	Signal	Pin No. of connector	Set	Setting of P□000

		A axis	B axis		H.□□7□	H.□□8□	H.□□9□	H.□□A□	H.□□B□
Input	/PCON	CN3-15	CN3-40	ON = L Level	Speed	Torque	Speed	Zero clamping	Prohibited
				OFF = H Level	Position	Position	Torque	Speed	Position

5.11 Other Output Signal

Describe other signals that can be output, although they have no direct relationship with various control manners.

5.11.1 Servo Alarm Output (ALM)

(1) Servo alarm output (ALM)

Refer to signals output when the servo drive detects any abnormalities.

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Output	ALM	CN3-7 CN3-8	CN3-32 CN3-33	ON = L Level	Normal status of servo drive
				OFF = H Level	Alarm status of servo drive
■Attentions If constituting an external circuit, it is necessary to ensure the main circuit power supply of servo drive is set to be OFF when the alarm is output.					

(2) Reset alarm

Name	Signal	Pin No. of connector (factory)		Name
		A axis	B axis	
Input	/ALM-RST	Different drives for single axis and double axis		
For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory. For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510. This signal may be distributed to other pin number through user parameter P□510. Please refer to "Signal distribution of input circuit" for detailed procedures. /ALM-RST signal is set based on distribution of external input signal, so it cannot be set to be "constantly valid". Please use the action of setting level from H to L to reset alarm. In case of "servo alarm (ALM)", finish troubleshooting and set this signal (/ALM-RST) from OFF (H level) to ON (L level) to reset to alarm status. In addition, alarm reset can also be done through panel operator or digital operator. Please refer to "Name and function of key".				

Note:

1. Sometimes alarms related encoder cannot reset after /ARM-RST signal input. In such cases, please cut down control power supply to reset.
2. In case of alarm, please reset only after troubleshooting.
   Troubleshooting methods for alarms are described in the "Alarm displays and treatment measures".

5.11.2 Rotation Detection Output (/TGON)

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Output	/TGON	CN3-11 CN3-12	CN3-36 CN3-37	ON = L Level	Servo motor is rotating (motor speed is larger than the set value of P□502)
				OFF = H Level	Servo motor stops rotating (motor speed is larger than the set value of P□502)
■Attentions When brake signal (/BK) and rotation detection signal (/TGON) are distributed to the same output terminal, /TGON signal is changed to L level, but /BK signal may cannot change to H level. (The reason is that OR logic prevails for output when several output signals are distributed to the same output terminal) Please distribute (/TGON) signal and (/BK) signal to other terminals.					

5.11.3 Servo Ready Output (/S-RDY)

Name	Signal	Pin No. of connector (factory)		Set	Meanings
		A axis	B axis		
Output	/S-RDY	Need P□513 for distribution		ON = L Level	Servo ready status
				OFF = H Level	Servo not ready status
Indicate that servo unit is under the status ready for servo ON signal reception. Output when the main circuit power supply is ON and under the status of no servo alarm.					

5.12 Mode Motion Sequence Manner

The Product supports 15 data sets that can set parameters in the parameter manner, 32 data sets that can set parameters in the communication manner. These data sets can start up independently or in sequence.

Data sets that can set parameters contain the setting about data set types and the setting of related goal value and subsequent data sets.

The following motion types are available in motion type:

- Invalid motion (null data)
- Absolute motion
- Relative motion

Data sets can start up through 2 different manners.

- Start up a single data set

  For startup of a single data set, only the selected data set starts up. No other data sets will start up upon successful execution of the data set. Time coordination among several data sets is then completed through main control system (e.g. PLC).

- Start up a data set sequence (several data sets in sequence)

  For startup of a sequence, the selected data set will start up first. When a data set is executed successfully and the transitional conditions are fulfilled, subsequent data sets will then start up. Time coordination among several data sets is then completed through the product.

5.12.1 Single Data Set Manner

In the single data set manner, 15 sets of internal motion tasks are available. Mode of motion can be incremental or absolute.

(1) Setting of user parameter

User Parameter		Meanings
P□000	H.□□C□	Selection of control mode: mode motion sequence manner
P□764	H.□□□0	Selection of data set startup manner: single data set manner

P□701	第0组数据组位置低位			位置
	设定范围	设定单位	出厂设定	电源重起
	－9999～＋9999	1指令脉冲	0	需要
P□702	第0组数据组位置高位			位置
	设定范围	设定单位	出厂设定	电源重起
	－9999～＋9999	10000指令脉冲	0	需要
P□703	第0组数据组速度			位置
	设定范围	设定单位	出厂设定	电源重起
	0～6000	1r/min	0	需要

1、第1组数据组参数P□708～P□711；　第2组数据组参数P□716～P□719；
第3组数据组参数P□724～P□727；　第4组数据组参数P□732～P□735；
第5组数据组参数P□740～P□743；　第6组数据组参数P□748～P□751；
第7组数据组参数P□756～P□759。

第0组数据组类型	Type of data set 0
位置	Position
第0组数据组位置低位	Low position of data set 0
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
1指令脉冲	1-command pulse
需要	Required
第0组数据组位置高位	High position of data set 0
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
10000指令脉冲	10000-command pulse
需要	Required
第0组数据组速度	Speed of data set 0

位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
第1组数据组参数P□708 ~ P□711;	Data set 1 parameters P□708 ~ P□711;
第2组数据组参数P□716 ~ P□719;	Data set 2 parameters P□716 ~ P□719;
第3组数据组参数P□724 ~ P□727;	Data set 3 parameters P□724 ~ P□727;
第4组数据组参数P□732 ~ P□735;	Data set 4 parameters P□732 ~ P□735;
第5组数据组参数P□740 ~ P□743;	Data set 5 parameters P□740 ~ P□743;
第6组数据组参数P□748 ~ P□751;	Data set 6 parameters P□748 ~ P□751;
第7组数据组参数P□756 ~ P□759。	Data set 7 parameters P□756 ~ P□759.

P□765	数据组加速度			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 60000	10r/min/s	10000	需要
P□766	数据组减速度			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 60000	10r/min/s	10000	需要
P□767	数据组紧急减速度			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 60000	10r/min/s	60000	需要
P□768	数据组电子齿轮（分子）			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 65535	——	2	需要
P□769	数据组电子齿轮（分母）			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 65535	——	1	需要

数据组加速度	Acceleration of data set
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
数据组减速度	Deceleration of data set
位置	Position

设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
数据组紧急减速度	Emergency deceleration of data set
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
数据组电子齿轮（分子）	Electronic gear of data set (numerator)
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
数据组电子齿轮（分母）	Electronic gear of data set (denominator)
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required

(2) Setting of input signal

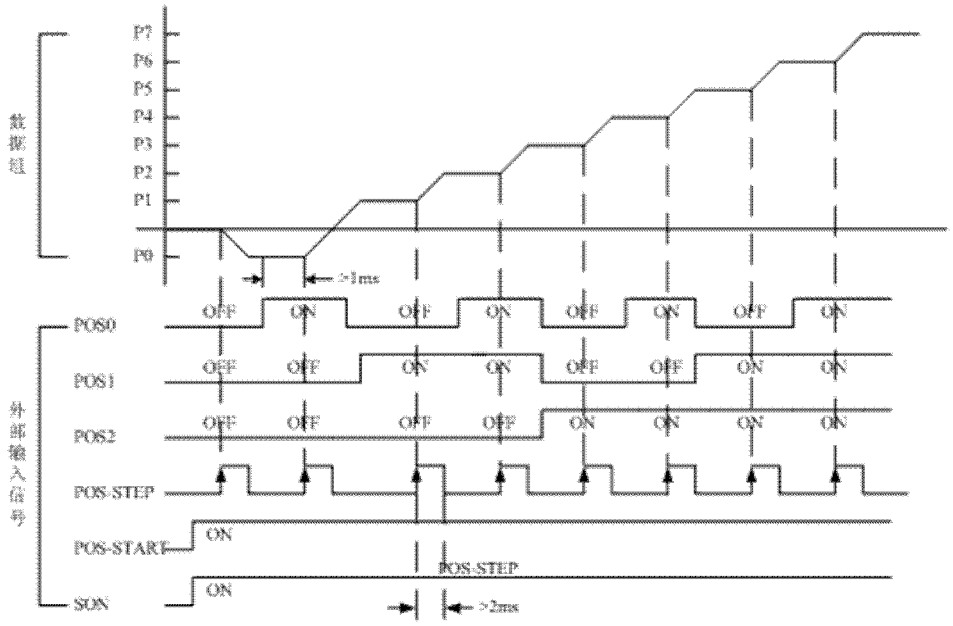
Name	Signal	Pin No. of connector		Name
		A axis	B axis	
Input	/POS-START	Need P□512 for distribution		Startup signal of mode motion sequence
Input	/POS-STEP	Need P□512 for distribution		Step change signal of mode motion sequence
Input	/POS0	Need P□511 for distribution		Option switch 0 signal of data sets in mode motion sequence
Input	/POS1	Need P□511 for distribution		Option switch 1 signal of data sets in mode motion sequence
Input	/POS2	Need P□511 for distribution		Option switch 2 signal of data sets in mode motion sequence
Input	/PCON	Need P□509 for distribution		Option switch 3 signal of data sets in mode motion sequence
In the single data set manner, when /POS-START signal is ON, the motor is allowed to operate; when it is OFF, the motor stops operation.				

For input signals (/POS-START, /POS-STEP, /POS0, /POS1, /POS2, /PCON), any of the 15 data sets are available for selection as the current data set to be executed. The data sets are as follows:

Data set	/POS2	/POS1	/POS0	/POS-START	/POS-STEP	Corresponding parameter

P0	OFF	OFF	OFF	ON	↑	P□700 ~ P□703
P1	OFF	OFF	ON	ON	↑	P□708 ~ P□711
P2	OFF	ON	OFF	ON	↑	P□716 ~ P□719
P3	OFF	ON	ON	ON	↑	P□724 ~ P□727
P4	ON	OFF	OFF	ON	↑	P□732 ~ P□735
P5	ON	OFF	ON	ON	↑	P□740 ~ P□743
P6	ON	ON	OFF	ON	↑	P□748 ~ P□751
P7	ON	ON	ON	ON	↑	P□756 ~ P□759

Sequence diagram of input signals and data sets is as below:



数据组	Data set
外部输入信号	External input signal

5.12.2 Data Set Sequence Manner

The data set sequence manner supports 8 data sets in the parameter manner and 32 data sets in the communication manner. Mode of motion can be incremental or absolute.

(1) Setting of user parameter

User Parameter		Meanings
P□000	H.□□C□	Selection of control mode: mode motion sequence manner
P□764	H.□□□0	Selection of data set startup manner: single data set manner

P□700	第0组数据组类型			位置
	设定范围	设定单位	出厂设定	电源重起
	0～2	——	0	需要

0：数据组无效
1：该数据组为绝对运动方式
2：该数据组为相对运动方式

第0组数据组类型	Type of data set 0
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
0：数据组无效	0: data set is null
1：该数据组为绝对运动方式	1: data set is in absolute motion
2：该数据组为相对运动方式	2: data set is in relative motion

User Parameter		Meanings
P□704	H.□□□0	No step change condition, directly start up subsequent data sets; 2nd step change condition invalid.
	H.□□□1	Delay step change, with delay time as "step change condition value 1" in the data set
	H.□□□2	Pulse edge step change, with "step change condition value 1" in the data set determining validity of rising edge or falling edge.
	H.□□□3	Level step change, with "step change condition value 1" in the data set determining validity of rising edge or falling edge.

User Parameter		Meanings
P□704	H.□□0□	No step change condition, directly start up subsequent data sets.
	H.□□1□	No step change condition, directly start up subsequent data sets.
	H.□□2□	Pulse edge step change, with "step change condition value 2" in the data set determining validity of rising edge or falling edge.
	H.□□3□	Level step change, with "step change condition value 2" in the data set determining validity of rising edge or falling edge.

P□705	第0组数据组换步条件1值			位置
	设定范围	设定单位	出厂设定	电源重起
	0～65535	——	0	需要

该参数意义取决于数据组换步条件1类型，当数据组换步条件1类型为

- 无换步条件
  — 无意义
- 延迟换步
  — 延迟时间0～65535，单位ms
- 脉冲沿换步
  — 值0：上升沿换步
  — 值1：下降沿换步
  — 值2：上升沿或下降沿换步
  — 其他值：无效
- 脉冲沿换步
  — 值3：高电平换步
  — 值4：低电平换步
  — 其他值：无效

第0组数据组换步条件1值	Step change condition value 1 in data set 0
位置	Position
设定范围设定单位出厂设定	Set range Set unit Factory setting
电源重起	Power reboot
需要	Required
该参数意义取决于数据组换步条件1类型，当数据组换步条件1类型为	The parameter significance depends on the types of data set step change condition 1, as below:
• 无换步条件	• No step change condition
— 无意义	- Insignificant
• 延迟换步	• Delay step change
— 延迟时间0～65535，单位ms	- Delay time 0 ~ 65535, unit: ms
• 脉冲沿换步	• Pulse edge step change
— 值0：上升沿换步	- Value 0: rising edge step change
— 值1：下降沿换步	- Value 1: falling edge step change
— 值2：上升沿或下降沿换步	- Value 2: rising edge or falling edge step change
— 其他值：无效	- Other value: invalid
• 脉冲沿换步	• Pulse edge step change
— 值3：高电平换步	- Value 3: H level step change
— 值4：低电平换步	- Value 4: L level step change
— 其他值：无效	- Other value: invalid

P□706	第0组数据组换步条件2值			位置
	设定范围	设定单位	出厂设定	电源重起
	0～65535	——	0	需要

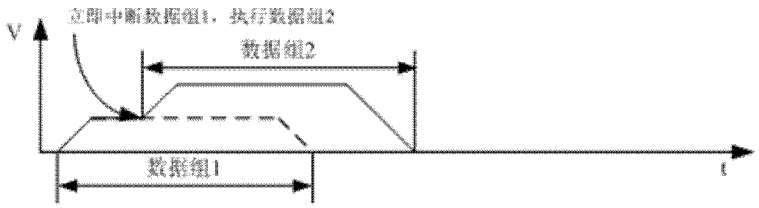
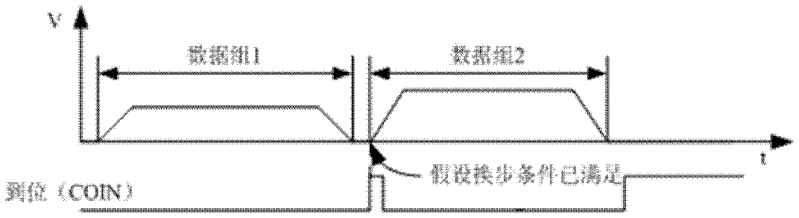
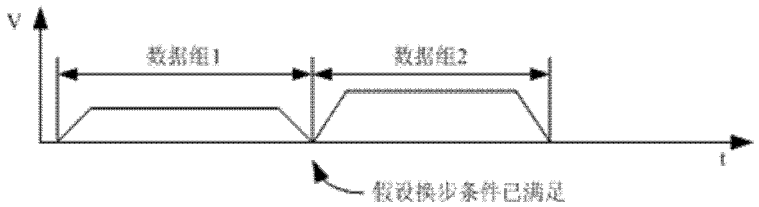
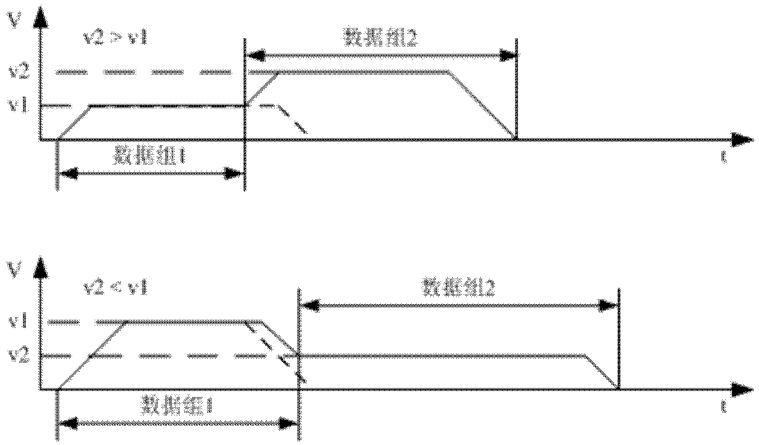
该参数意义取决于数据组换步条件1类型，当数据组换步条件1类型为

- 无换步条件
  - 无意义
- 脉冲沿换步
  - 值0：上升沿换步
  - 值1：下降沿换步
  - 值2：上升沿或下降沿换步
  - 其他值：无效
- 脉冲沿换步
  - 值3：高电平换步
  - 值4：低电平换步
  - 其他值：无效

第0组数据组换步条件2值	Step change condition value 2 in data set 0
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
该参数意义取决于数据组换步条件1类型，当数据组换步条件1类型为	The parameter significance depends on the types of data set step change condition 1, as below:
• 无换步条件	• No step change condition
— 无意义	- Insignificant
• 脉冲沿换步	• Pulse edge step change
— 值0：上升沿换步	- Value 0: rising edge step change
— 值1：下降沿换步	- Value 1: falling edge step change
— 值2：上升沿或下降沿换步	- Value 2: rising edge or falling edge step change
— 其他值：无效	- Other value: invalid
• 脉冲沿换步	• Pulse edge step change
— 值3：高电平换步	- Value 3: H level step change
— 值4：低电平换步	- Value 4: L level step change
— 其他值：无效	- Other value: invalid

User Parameter		Meanings
P□704	H.□0□□	No conjunction, step change condition 2 invalid
	H.□1□□	"And" conjunction between condition 1 and 2.
	H.□2□□	"Or" conjunction between condition 1 and 2.

User Parameter	Meanings

P□705	H.0□□□	Aborting: neglect step change condition, immediately interrupt motion, and start up subsequent data sets.
		
	H.1□□□	Standard: when the current motion is in place and the step change condition is fulfilled, start up subsequent data sets.
		
	H.2□□□	Standard: after reaching the goal position and if the step change condition is fulfilled, start up subsequent data sets.
		
	H.3□□□	BlendingLow: neglect step change condition, and after reaching the goal position, adjust speed based on the speed of subsequent data set.
		
	H.4□□□	BlendingPrevious: neglect step change condition, and after reaching the goal position, adjust speed based on the speed of subsequent data set.

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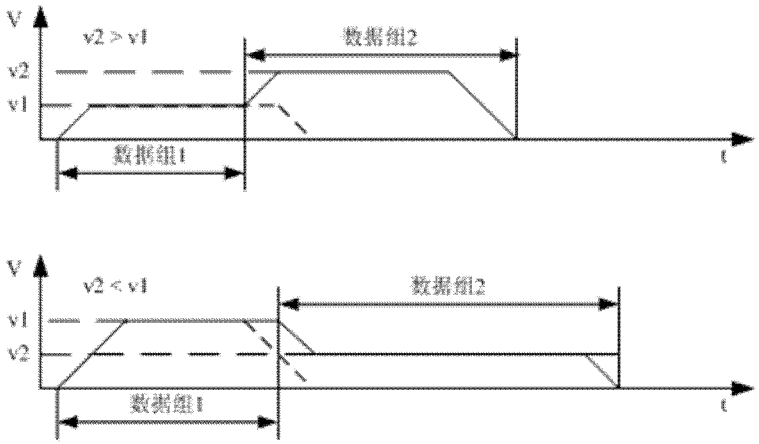
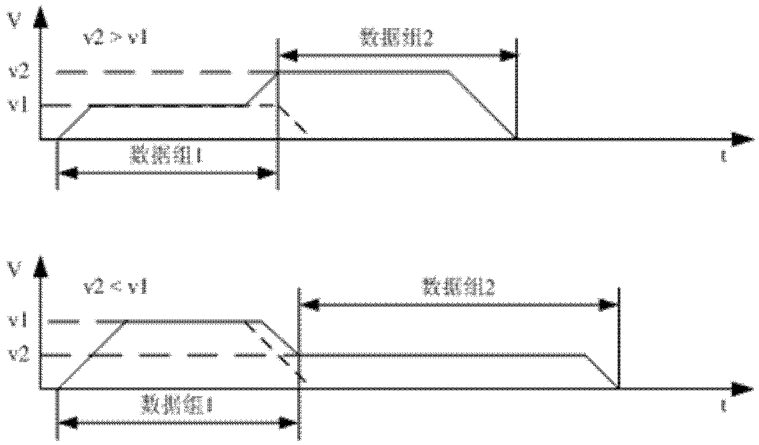
<tr><td></td><td></td><td> 
</td></tr>
<tr><td></td><td>H.5□□□</td><td>BlendingNext: neglect step change condition, and after reaching the goal position, adjust speed based on the speed of subsequent data set.</td></tr>
<tr><td></td><td></td><td> 
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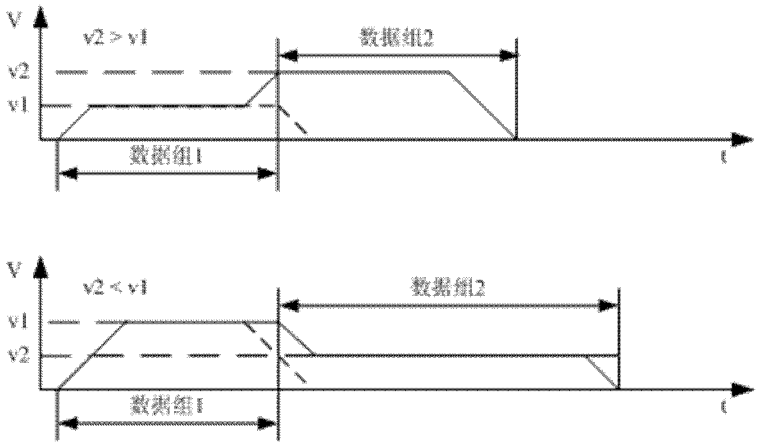
<tr><td></td><td>H.6□□□</td><td>BlendingHigh: neglect step change condition, and after reaching the goal position, adjust speed based on the speed of subsequent data set.</td></tr>
<tr><td></td><td></td><td> 
</td></tr>
</table>

立即中断数据组1，执行数据组2	Immediately interrupt data set 1 and execute date set 2
数据组2	Data set 2

数据组1	Data set 1
数据组1	Data set 1
数据组2	Data set 2
到位（COIN）	In place (COIN)
假设换步条件已满足	Presume that step change condition is fulfilled
数据组1	Data set 1
数据组2	Data set 2
假设换步条件已满足	Presume that step change condition is fulfilled
数据组2	Data set 2
数据组1	Data set 1
数据组2	Data set 2
数据组1	Data set 1
数据组2	Data set 2
数据组1	Data set 1
数据组2	Data set 2
数据组1	Data set 1
数据组2	Data set 2
数据组1	Data set 1
数据组2	Data set 2
数据组1	Data set 1
数据组2	Data set 2
数据组1	Data set 1

P□707	第0组数据组后续数据组号		位置
设定范围	设定单位	出厂设定	电源重起
0～7	1r/min	0	需要

1、第1组数据组参数P□708～P□715；　第2组数据组参数P□716～P□713；
第3组数据组参数P□724～P□731；　第4组数据组参数P□732～P□739；
第5组数据组参数P□740～P□747；　第6组数据组参数P□748～P□755；
第7组数据组参数P□756～P□763。

第0组数据组后续数据组号	Subsequent data set number after data set 0
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required

第1组数据组参数P□708 ~ P□715;	Data set 1 parameters P□708 ~ P□715;
第2组数据组参数P□716 ~ P□713;	Data set 2 parameters P□716 ~ P□713;
第3组数据组参数P□724 ~ P□731;	Data set 3 parameters P□724 ~ P□731;
第4组数据组参数P□732 ~ P□739;	Data set 4 parameters P□732 ~ P□739;
第5组数据组参数P□740 ~ P□747;	Data set 5 parameters P□740 ~ P□747;
第6组数据组参数P□748 ~ P□755;	Data set 6 parameters P□748 ~ P□755;
第7组数据组参数P□756 ~ P□763。	Data set 7 parameters P□716 ~ P□763.

P□765	数据组加速度			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 60000	10r/min/s	10000	需要
P□766	数据组减速度			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 60000	10r/min/s	10000	需要
P□767	数据组紧急减速度			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 60000	10r/min/s	60000	需要
P□768	数据组电子齿轮（分子）			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 65535	——	2	需要
P□769	数据组电子齿轮（分母）			位置
	设定范围	设定单位	出厂设定	电源重起
	1 ~ 65535	——	1	需要

数据组加速度	Acceleration of data set
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
数据组减速度	Deceleration of data set
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
数据组紧急减速度	Emergency deceleration of data set

位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
数据组电子齿轮（分子）	Electronic gear of data set (numerator)
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
数据组电子齿轮（分母）	Electronic gear of data set (denominator)
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required

(2) Setting of input signal

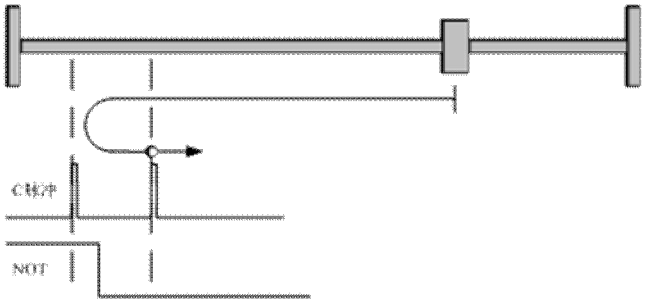
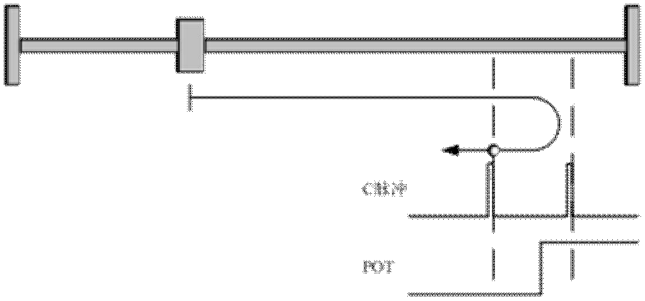
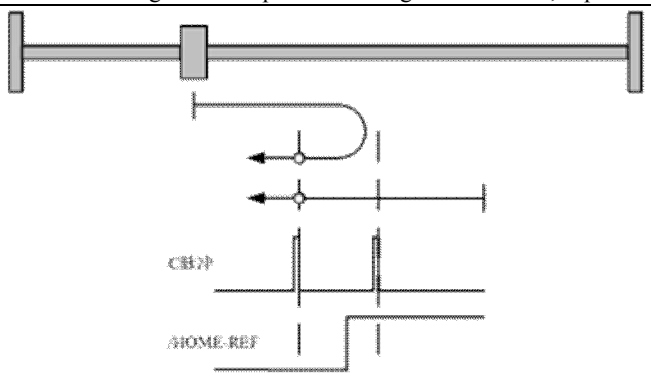
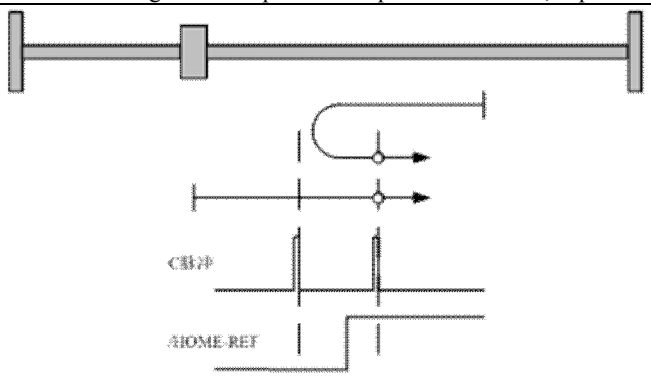
Name	Signal	Pin No. of connector		Name
		A axis	B axis	
Input	/POS-START	Need P□512 for distribution		Startup signal of mode motion sequence
Input	/POS-STEP	Need P□512 for distribution		Step change signal of mode motion sequence
When /POS-START signal is from OFF à ON, the motor is allowed to operate; when it is OFF, the motor stops operation. ■Attentions Every time after servo is OFF (or alarm is solved) and before data set sequence is rerun, it is necessary to set /POS-START signal from ON to OFF and then ON so as to start up load data set.				

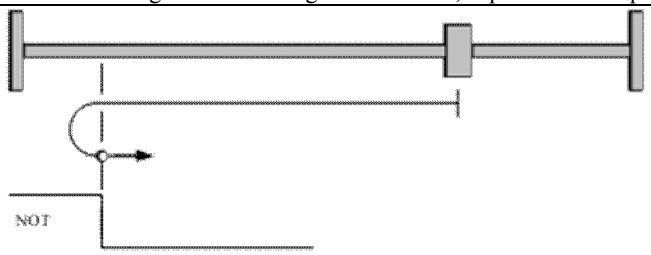
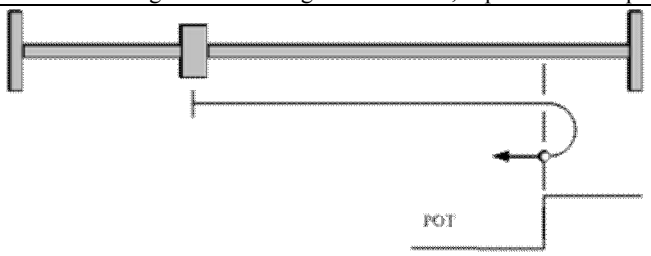
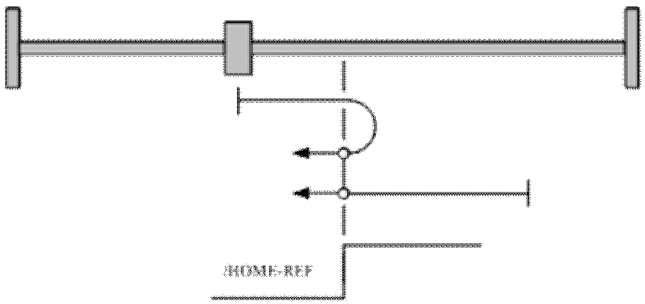
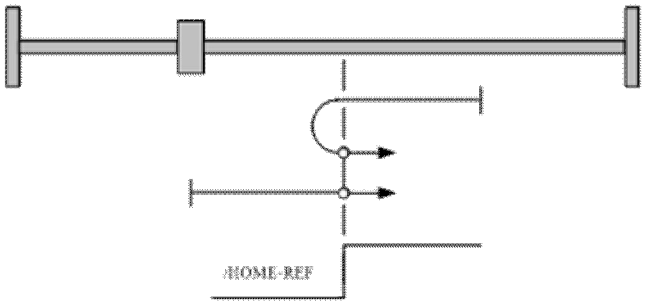
5.12.3 Operation of Seeking Reference Point (Return to Zero)

Zero point can also be determined through reference point and it is the reference point in the absolute motion in mode motion sequence manner.

(1) Setting of user parameter

User Parameter		Meanings
P□770	H.□□□0	Current position is zero point
	H.□□□1	For on-off operation of seeking NOT in the negative direction, C pulse is required

		
	H.□□□2	For on-off operation of seeking POT in the negative direction, C pulse is required 
	H.□□□3	For on-off operation of seeking reference point in the negative direction, C pulse is required 
	H.□□□4	For on-off operation of seeking reference point in the positive direction, C pulse is required 

	H.□□□5	For on-off operation of seeking NOT in the negative direction, C pulse is not required 
	H.□□□6	For on-off operation of seeking POT in the negative direction, C pulse is not required 
	H.□□□7	For on-off operation of seeking reference point in the negative direction, C pulse is not required 
	H.□□□8	For on-off operation of seeking reference point in the positive direction, C pulse is not required 
P□770	H.0□□□	Not return to zero automatically after power-on.
	H.1□□□	After power-on, return to zero automatically after 1st servo is enabled, with the return to zero manner determined by P□770.0.

C脉冲	C pulse
C脉冲	C pulse
C脉冲	C pulse
C脉冲	C pulse

P□771	撞参考点开关速度			位置
	设定范围	设定单位	出厂设定	电源重起
	0 ~ 6000	1r/min	100	需要
P□772	离开参考点开关速度			位置
	设定范围	设定单位	出厂设定	电源重起
	0 ~ 6000	1r/min	30	需要

撞参考点开关速度	On-off speed to meet reference point
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required
离开参考点开关速度	On-off speed to leave reference point
位置	Position
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
需要	Required

(2) Setting of input signal

Name	Signal	Pin No. of connector		Name
		A axis	B axis	
Input	/POS-START	Need P□512 for distribution		Startup signal of mode motion sequence
Input	/HOME-REF	Need P□512 for distribution		Zero reference on-off
Input	/POS-START-HOME	Need P□512 for distribution		Start return to zero operation and seek for zero point as per P□770.0 setting.
When /POS-START signal is ON, the motor is allowed to operate (return to zero allowed); when it is OFF, the motor suspends operation (return to zero suspended).				

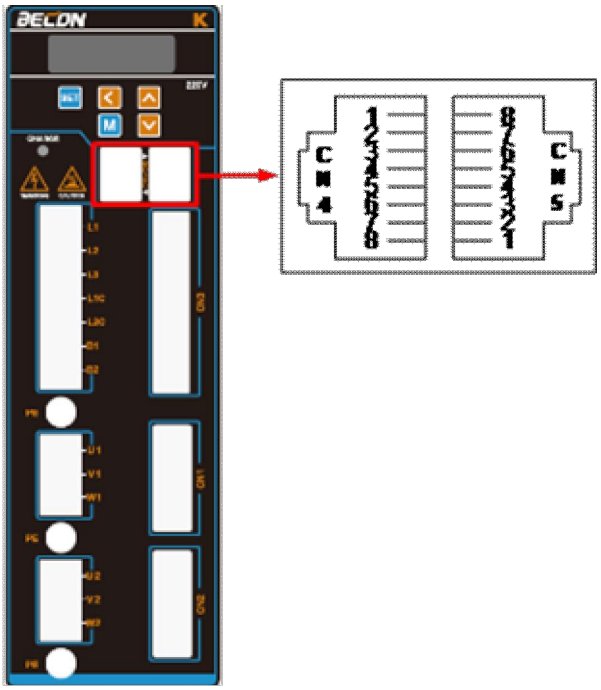
Chapter VI Communication

MGD-K servo drives are equipped with standard MODBUS communication of RS485 interface and optional CANopen of CAN interface (conforming to DS301 and DS402 standard protocols). The Chapter mainly describes MODBUS communication.

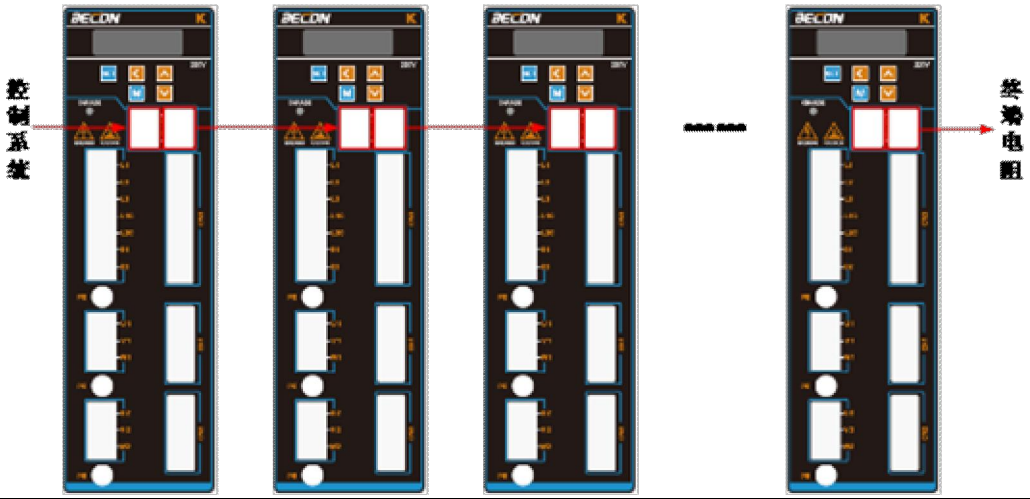
6.1 Communication Wiring

Signal name and functions of communication connector are as follows:

Terminal No.		1	2	3	4	5	6	7	8
Name	CN4	CANH-	CANL	GND	GND	RS485+	RS485-	Reserved	Reserved
	CN5	CANH-	CANL	GND	GND	RS485+	RS485-	Built-in 120 ohm resistance	



Servo drive CN4 always acts as communication cable input terminal and CN5 always as communication cable output terminal. Wiring diagram of several servo drives are as follows:



控制系统	Control system
终端电阻	Terminal resistance

6.2 User Parameter

User Parameter		Meanings
P□600	H.□□□0	RS485 communication baud rate: 4800 bps
	H.□□□1	RS485 communication baud rate: 9600 bps
	H.□□□2	RS485 communication baud rate: 19200 bps
	H.□□□3	RS485 communication baud rate: 384600 bps
P□600	H.□□0□	ASCII, 7 data bits, no parity, 2 stop bits
	H.□□1□	ASCII, 7 data bits, even parity bit, 2 stop bits
	H.□□2□	ASCII, 7 data bits, odd parity bit, 2 stop bits
	H.□□3□	ASCII, 8 data bits, no parity, 1 stop bits
	H.□□4□	ASCII, 8 data bits, even parity bit, 1 stop bits
	H.□□5□	ASCII, 8 data bits, odd parity bit, 1 stop bits
	H.□□6□	RTU, 8 data bits, no parity, 1 stop bit
	H.□□7□	RTU, 8 data bits, even parity bit, 1 stop bit
	H.□□8□	RTU, 8 data bits, odd parity bit, 1 stop bit

RS-485 通讯轴地址	RS-485 communication axis address
速度	Speed

位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
1（A 轴）	1 (A axis)
2（b 轴）	2 (b axis)
需要	Required
RS-485 通讯超时	RS-485 communication timeout
速度	Speed
位置	Position
扭矩	Torque
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
· P 602 设置为零时，关闭通讯超时检测；	When P 602 is set to be zero, shut down communication timeout detection;
· P 602 设置为大于零时，表示必须在设定的时间内通讯，否则将出现通讯错误。举例，P 602 设置成 50 时，表示必须每 5 秒与伺服驱动器通讯 1 次。	When P 602 is set to be larger than zero, indicate that communication shall be done within a set time, or else communication error will appear. For example, if P 602 is set to be 50, indicate that one time of communication with servo drive every 5 seconds is necessary.

6.3 MODBUS Communication Protocol

In case of RS-485 communication, every servo drive must have parameters □600 ~ P□601 preset. In case of MODBUS protocol for communication, the following two modes are available:

ASCII mode

RTU mode.

The following is the description of MODBUS communication.

■ Code meaning

ASCII mode:

Every 8-bit datum consists of two ASCII characters. For example, one 1-byte datum 64_H (sexadecimal notation). ASCII code "64" indicates it includes ASCII code (36_H) of '6' and ASCII code (34_H) of '4'. ASCII codes of digits 0-9 and alphabets A-F are as shown in the table below:

Character symbol	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'

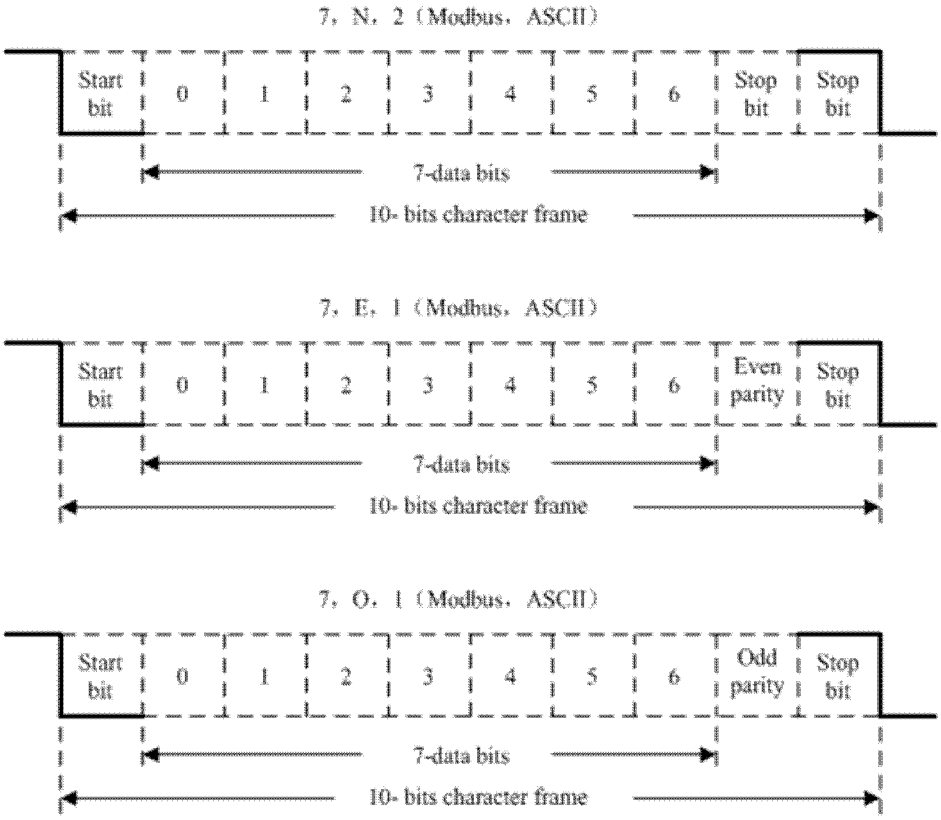
Corresponding ASCII code	30 H	31 H	32 H	33 H	34 H	35 H	36 H	37 H
Character symbol	'8'	'9'	'A'	'B'	'C'	'D'	'E'	'F'
Corresponding ASCII code	38 H	39 H	41 H	42 H	43 H	44 H	45 H	46 H

RTU mode:

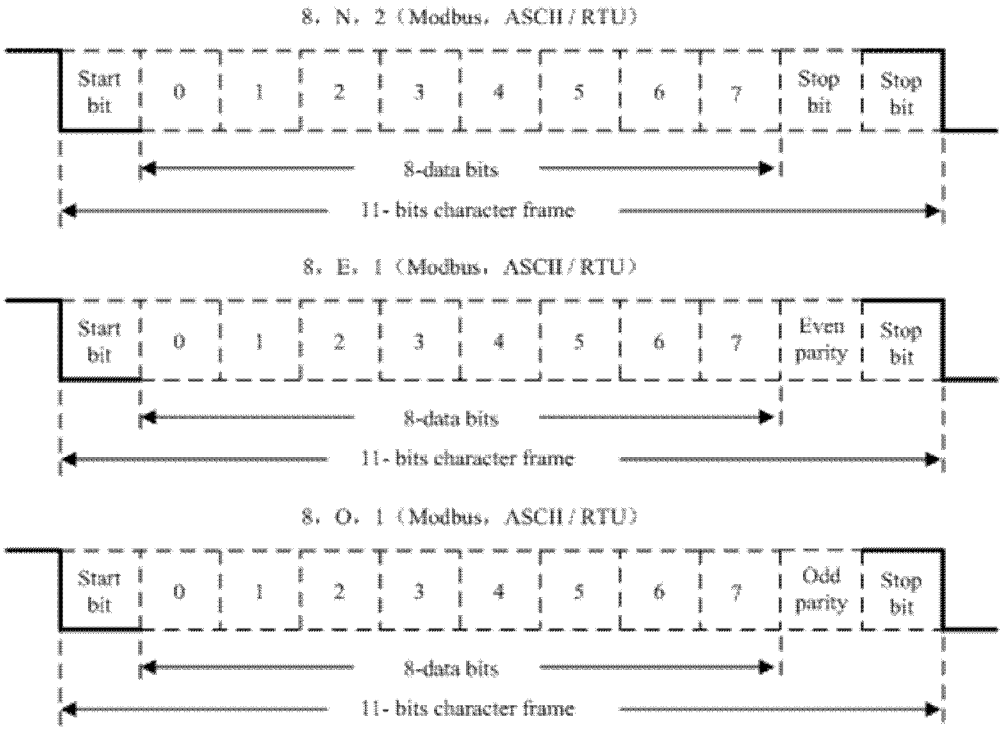
Every 8-bit datum consists of two 4-bit sexadecimal data. For instance, decimal 100 presents to be 64 H when using 1-byte RTU data.

■ Character structure

10 bit character format (for 7-bit data)



11 bit character format (for 8-bit data)



■ Communication data structure

Communication data structure:

ASCII mode:

STX	Beginning character ':' =>($3A_H$)
ADR	Communication address => 1-byte includes 2 ASCII codes
CMD	Command code => 1-byte includes 2 ASCII codes
DATA(n-1)	Data content => n-word=2n-byte includes 4n ASCII codes (n not larger than 12)
...	
DATA(0)	
LRC	Check code => 1-byte includes 2 ASCII codes
End 1	End code 1 => ($0D_H$) (CR)
End 0	End code 0 => (0A H) (LF)

RTU mode:

STX	Rest time of at least four-byte transmission time
ADR	Communication address => 1-byte
CMD	Command code => 1-byte
DATA(n-1)	Data content => n-word=2n-byte, n not larger than 12
...	
DATA(0)	
CRC	CRC code => 1-byte
End 1	Rest time of at least four-byte transmission time

Data format of communication protocol is described as follows:

STX (Communication starting)

ASCII mode: ':' character.

RTU mode: rest time of communication time (automatically changed based on different communication speed) for more than 4 bytes.

ADR (Communication address)

Legal communication address ranges from 1 to 254.

For example, communication for servo with address of 32 (sexadecimal 20):

ASCII mode: ADR='2', '0'=>'2'=32_H, '0'=30_H

RTU mode: ADR=20_H

CMD (Command) and DATA (Data)

Data format is determined based on command code. Common command codes are as follows:

Command code: 03_H, read N word (maximum of N is 20).

For example: Read 2 words from the starting address 0200_H in the servo with address of 01_H.

ASCII mode:

Command information:

STX	':'
ADR	'0'
	'1'
CMD	'0'
	'3'
起始数据位置	'0'
	'2'
	'0'
	'0'
数据数目	'0'
	'0'
	'0'
	'2'
LRC Check	'F'
	'8'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

Reply information:

STX	':'
ADR	'0'
	'1'
CMD	'0'
	'3'
数据数（以 byte 计算）	'0'
	'4'
起始数据地址 0200H 的内容	'0'
	'0'
	'B'
	'1'
第二笔数据地址 0201H 的内容	'1'
	'F'
	'4'
	'0'
LRC Check	'E'
	'8'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

起始数据位置	Starting data position
数据数目	Data number
数据数（以 byte）计算	Number of data (based on byte) calculation
起始数据地址 0200H 的内容	Content of starting data address 0200H
第二笔数据地址 0201H 的内容	Content of second data address 0201H

RTU mode:

Command information:

Reply information:

ADR	01H
CMD	03H
起始数据位置	02H（高字节）
	00H（低字节）
数据数（以 word 计算）	00H
	02H
CRC Check Low	C5H（低字节）
CRC Check High	B3H（高字节）

ADR	01H
CMD	03H
数据数（以 byte 计算）	04H
起始数据地址 0200H 的内容	00H（高字节）
	B1H（低字节）
第二笔数据地址 0201H 的内容	1FH（高字节）
	40H（低字节）
CRC Check Low	A3H（低字节）
CRC Check High	D4H（高字节）

起始数据位置	Starting data position
数据数（以 word 计算）	Number of data (calculated by word)
02H（高字节）	02H (high byte)
00H（低字节）	00H (low byte)
C5H（低字节）	C5H (low byte)
B3H（高字节）	B3H (high byte)
数据数（以 byte）计算	Number of data (based on byte) calculation
起始数据地址 0200H 的内容	Content of starting data address 0200H
第二笔数据地址 0201H 的内容	Content of second data address 0201H
00H（高字节）	00H（高字节）
B1H（低字节）	B1H (low byte)
1FH（高字节）	1FH (high byte)
40H（低字节）	40H（低字节）
A3H（低字节）	A3H (low byte)
D4H（高字节）	D4H (high byte)

Command code: 06_H, write in 1 word

For example: write 100(0064_H) in address 0200_H of servo with office number 01_H.

ASCII mode:

Command information:

STX	':'
ADR	'0'
	'1'
CMD	'0'
	'6'
起始数据地址	'0'
	'2'
	'0'
	'0'
数据内容	'0'
	'0'
	'6'
	'4'
LRC Check	'9'
	'3'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

Reply information:

STX	':'
ADR	'0'
	'1'
CMD	'0'
	'6'
起始数据地址	'0'
	'2'
	'0'
	'0'
数据内容	'0'
	'0'
	'6'
	'4'
LRC Check	'9'
	'3'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

起始数据地址	Starting data address
数据内容	Data content
起始数据地址	Starting data address
数据内容	Data content

RTU mode:

Command information:

ADR	01H
CMD	06H
起始数据地址	02H（高字节）
	00H（低字节）
数据内容	00H（高字节）
	64H（低字节）
CRC Check Low	89H（低字节）
CRC Check High	99H（高字节）

Reply information:

ADR	01H
CMD	06H
起始数据地址	02H（高字节）
	00H（低字节）
数据内容	00H（高字节）
	64H（低字节）
CRC Check Low	89H（低字节）
CRC Check High	99H（高字节）

起始数据地址	Starting data address
数据内容	Data content
（高字节）	(High byte)
（低字节）	(Low byte)
（高字节）	(High byte)
（低字节）	(Low byte)
（低字节）	(Low byte)
（高字节）	(High byte)
起始数据地址	Starting data address

数据内容	Data content
（高字节）	(High byte)
（低字节）	(Low byte)
（高字节）	(High byte)
（低字节）	(Low byte)
（低字节）	(Low byte)
（高字节）	(High byte)

Calculation of detection error values of LRC (ASCII mode) and CRC (RTU mode):

LRC calculation of ASCII mode:

ASCII mode adopts LRC (Longitudinal Redunancy Check) detection error value. LRC detection error value is the sum of contents from ADR to the last data and the result is in the unit of 256 and removes exceeding part (for example, the result after totaling is sexadecimal 128_H and 28_H is then obtained), and then calculates its complement; thus the obtained results is the LRC detection error value.

For example, read 1 word from 0201 address of servo with official number 01_H.

STX	':'
ADR	'0'
	'1'
CMD	'0'
	'3'
起始数据地址	'0'
	'2'
	'0'
	'1'
数据数	'0'
	'0'
	'0'
	'1'
LRC Check	'F'
	'8'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

起始数据地址	Starting data address
数据数	Data number

Add from ADR data to the last data:

$01_H + 03_H + 02_H + 01_H + 00_H + 01_H = 08_H$, 08_H becomes $F8_H$ after applying complement of 2, so LRC is 'F', '8'.

CRC calculation of RTU mode:

RTU mode adopts CRC (Cyclical Redundancy Check) detection error value.

Steps for calculation of CRC detection error value are as follows:

Step 1: download a 16-bit register with content of $FFFF_H$ (called as "CRC" register).

Step 2: conduct XOR operation on the first bit (bit0) of command massage and the low order bit (LSB) of 16-bit CRC register, and save the result to CRC register;

Step 3: check the lowest order (LSB) of CRC register; if it is 0, right shift CRC register value a bit; if it is 1, right shift CRC register value a bit and then conduct XOR operation with $A001_H$;

Step 4: return to Step 3, until 8 times of execution of Step 3, and then move to Step 5;

Step 5: repeat Step 2-4 for the next bit of the command massage, until all bits are processed; the content of CRC register now is CRC detection error value.

Note: after CRC detection error value is calculated, it is necessary to fill the CRC low order in the command massage and then CRC high order. Please refer to the following example.

For example: read 2 words from 0101_H address of servo with official number of 01_H. The final content of CRC register calculated from ADR to the last bit of the data number is 3794_H, and then its command massage is as shown below. Note that 94_H is transmitted prior to 37_H.

ADR	01_H
CMD	03_H
Starting data address	01_H (address high order)
	01_H (address low order)
Data number (Calculated based on word)	00_H (high order)
	02_H (low order)
CRC check low order	94_H (check low order)
CRC check high order	37_H (check high order)

End1, End0 (communication detection completed)

ASCII mode:

($0D_H$) (i.e. character '\r' 『carriage return』) and ($0A_H$) (i.e. '\n' 『new line』) indicate end of communication.

RTU mode:

Exceeding the rest time of 4-byte communication time at the current communication rate indicates the end of communication.

Example:

The following uses C programming language to generate CRC value. The function needs two parameters:

unsigned char * data;

unsigned char length;

The function will pass back the CRC value in unsigned integer type.

```
unsigned int crc_chk(unsigned char * data,unsigned char length){
    int i,j;
    unsigned int crc_reg = 0xFFFF;
    while(length- -){
        crc_ reg ^=*data++;
        for(j=0;j<8;j++){
            if(crc_reg & 0x01){
                crc_reg=( crc_reg >>1)^0xA001;
```

```
                }
                Else
                {
                    crc_reg＝crc_reg >>1;
                }
            }
        }
        return crc_reg;
    }
```

- Communication error

During communication, errors are possible, and common error sources are as follows:

- During parameters reading and writing, data address is wrong;
- During writing of a parameter, the data exceed the maximum of the parameter or are smaller than the parameter;
- Communication is interrupted, data transmission is wrong or check code is wrong.

In case of the first two communication errors, operation of servo drive will not be affected and meanwhile the servo drive will feedback an error frame. In case of the third error, transmitted data will be considered to be invalid and abandoned, without feedback of frame.

Error frame format is as follows:

Upper computer data frame:

start	Slave station address	Command	Data address, data, etc.	Check
		Command		

Servo drive feedbacks error frame:

start	Slave station address	Response code	Error code	Check
		Command + 80_H		

Where the error frame response code = command + 80_H;

Error code = 00_H; communication is normal;

= 01_H: servo drive fails to identify the requested function;

= 02_H: data address given in request does not exist in servo drive;

= 03_H: data address given in request is not allowed in servo drive (due to exceeding the maximum or minimum value of parameter);

= 04_H: servo drive has started to execute request, but fails to complete the request;

For example: the axis number of servo drive is 03_H and datum 06_H is written in parameter Pn100; since the range of parameter Pn100 is 0-6, the written data will not be allowed and the servo drive will return a error frame, with error code of 03_H (exceeding the maximum or minimum value of parameter) and the structure as below:

Upper computer data frame:

start	Slave station address	Command	Data address, data, etc.	Check
	03_H	06_H	0002_H 0006_H	

Servo drive feedbacks error frame:

start	Slave station address	Response code	Error code	Check
	03_H	86_H	03_H	

In addition, if the slave station address in data frame sent by upper computer is 00_H, indicate that the data of the frame are broadcast data and the servo drive will not return any frame.

6.4 MODBUS Communication Address

Communication data address Hexadecimal system	Meaning	Instruction	Operation
0000_h ~ $03FF_h$	Parameter area	Correspond to parameters in parameter table	Read and write
0400_h ~0409_h	Alarm information storage area	10 history alarms	RO
0410_h	Speed command zero offset		RO
0411_h	Torque command zero offset		RO
0412_h	Iu zero offset		RO
0413_h	Iv zero offset		RO
0420_h ~ 0437_h	Monitoring data		RO
0420_h	Motor speed	Unit: 1 r/min	RO
0422_h	Rotation angle (electric angle)	Unit: 1deg	RO
0424_h	Input command pulse speed	Unit: 1kHz	RO
0426_h	Busbar voltage	Unit: 1 V	RO
0428_h	Speed command value of analogue input	Unit: 1 r/min	RO
$042A_h$	Analog input torque command percent	Unit: 1%	RO
$042C_h$	Internal torque command percent	Unit: 1% or 0.1A	RO
$042E_h$	Input signal monitoring	——	RO

0430$_h$	Output signal monitoring	——	RO
0432$_h$	Encoder signal monitoring	——	RO
0434$_h$	Input command pulse counter	Unite: 1 command pulse	RO
0436$_h$	Feedback pulse counter	Unite: 1 command pulse	RO
0438$_h$	Position deviation counter	Unite: 1 command pulse	RO
043A$_h$	Accumulated load	Unit: 1%	RO
043C$_h$	Rotational inertia percent	Unit: 1%	RO
043E$_h$	Actual angle of encoder	Unite: 1 command pulse	RO
0440$_h$	Encoder multi-coil position	Unit: 1 coil	RO
044A$_h$	Current alarm		RO
0451$_h$	Communication IO signal *1	Power failure not saved	Read and write
0452$_h$	Communication output port negation	Power failure not saved	Read and write
0457$_h$	Servo operation status *2		RO
045E$_h$	Software version		RO
045F$_h$	FPGA version number		RO
0520$_h$	Clear history alarm	1: Clear history alarm	Read and write
0521$_h$	Clear current alarm	1: Clear current alarm	Read and write
0522$_h$	Clear bus encoder alarm	1: Clear bus encoder alarm	Read and write
0523$_h$	Clear bus encoder multi-coil data	1: Clear bus encoder multi-coil data	Read and write
0528$_h$	Speed JOG (speed as set in P□304)	BIT15:1 JOG servo enable BIT01:1 JOG- (JOG positive) BIT00:1 JOG+ (JOG negative)	Read and write
0529$_h$	Position JOG (speed as set in P□304)	BIT15:1 Enter position jog mode BIT01:1 JOG- BIT00:1 JOG+	Read and write
0540$_h$	Factory reset	1: Factory reset	Writable
0541$_h$	Reset	1: Reset	Writable
05F0$_h$	Number of data set under operation		RO
05F1$_h$	Number of data set to be operated		RO
05F2$_h$	Actual position is 16 bits lower	Position contacts position after electronic gear	RO
05F3$_h$	Actual position is 16 bits		RO

	higher		
05F4$_h$	Position node manner	0: Task 1: External	RO
05F5$_h$	Acceleration	10rpm/s/s	Read and write
05F6$_h$	Deceleration	10rpm/s/s	Read and write
05F7$_h$	Emergency deceleration	10rpm/s/s	Read and write
05F8$_h$	Position contact electronic gear numerator		Read and write
05F9$_h$	Position contact electronic gear denominator		Read and write
05FA$_h$	Reference point seeking manner		Read and write
05FB$_h$	Reference point seeking on-off speed	0~6000 rpm	Read and write
05FC$_h$	On-off speed to leave reference point	0~6000 rpm	Read and write
05FD$_h$	Demonstration position low order		Read and write
05FE$_h$	Demonstration position high order		Read and write
Data set 0 parameter:			
0600 h	Destination position low order		Read and write
0601 h	Destination position high order		Read and write
0602 h	Target speed	rpm	Read and write
0603 h	Step change attribute [*3]		Read and write
0604 h	Step change condition 1 value		Read and write
0605 h	Step change condition 2 value		Read and write
0606 h	Subsequent data set number		Read and write
0607 h	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 1 parameter:			
0608$_h$	Destination position low order		Read and write
0609$_h$	Destination position high order		Read and write
060A$_h$	Target speed	rpm	Read and write
060B$_h$	Step change condition attribute		Read and write
060C$_h$	Step change condition 1		Read and write

	value		
060D$_h$	Step change condition 2 value		Read and write
060E$_h$	Subsequent data set number		Read and write
060F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 2 parameter:			
0610 h	Destination position low order		Read and write
0611 h	Destination position high order		Read and write
0612 h	Target speed	rpm	Read and write
0613 h	Step change condition attribute		Read and write
0614 h	Step change condition 1 value		Read and write
0615 h	Step change condition 2 value		Read and write
0616 h	Subsequent data set number		Read and write
0617 h	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 3 parameter:			
0618$_h$	Destination position low order		Read and write
0619$_h$	Destination position high order		Read and write
061A$_h$	Target speed	rpm	Read and write
061B$_h$	Step change condition attribute		Read and write
061C$_h$	Step change condition 1 value		Read and write
061D$_h$	Step change condition 2 value		Read and write
061E$_h$	Subsequent data set number		Read and write
061F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 4 parameter:			
0620$_h$	Destination position low order		Read and write
0621$_h$	Destination position high order		Read and write
0622$_h$	Target speed	rpm	Read and write
0623$_h$	Step change condition		Read and write

	attribute		
0624$_h$	Step change condition 1 value		Read and write
0625$_h$	Step change condition 2 value		Read and write
0626$_h$	Subsequent data set number		Read and write
0627$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 5 parameter:			
0628$_h$	Destination position low order		Read and write
0629$_h$	Destination position high order		Read and write
062A$_h$	Target speed	rpm	Read and write
062B$_h$	Step change condition attribute		Read and write
062C$_h$	Step change condition 1 value		Read and write
062D$_h$	Step change condition 2 value		Read and write
062E$_h$	Subsequent data set number		Read and write
062F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 6 parameter:			
0630$_h$	Destination position low order		Read and write
0631$_h$	Destination position high order		Read and write
0632$_h$	Target speed	rpm	Read and write
0633$_h$	Step change condition attribute		Read and write
0634$_h$	Step change condition 1 value		Read and write
0635$_h$	Step change condition 2 value		Read and write
0636$_h$	Subsequent data set number		Read and write
0637$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 7 parameter:			
0638$_h$	Destination position low order		Read and write
0639$_h$	Destination position high order		Read and write

063A$_h$	Target speed	rpm	Read and write
063B$_h$	Step change condition attribute		Read and write
063C$_h$	Step change condition 1 value		Read and write
063D$_h$	Step change condition 2 value		Read and write
063E$_h$	Subsequent data set number		Read and write
063F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 8 parameter:			
0640$_h$	Destination position low order		Read and write
0641$_h$	Destination position high order		Read and write
0642$_h$	Target speed	rpm	Read and write
0643$_h$	Step change condition attribute		Read and write
0644$_h$	Step change condition 1 value		Read and write
0645$_h$	Step change condition 2 value		Read and write
0646$_h$	Subsequent data set number		Read and write
0647$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 9 parameter:			
0648$_h$	Destination position low order		Read and write
0649$_h$	Destination position high order		Read and write
064A$_h$	Target speed	rpm	Read and write
064B$_h$	Step change condition attribute		Read and write
064C$_h$	Step change condition 1 value		Read and write
064D$_h$	Step change condition 2 value		Read and write
064E$_h$	Subsequent data set number		Read and write
064F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 10 parameter:			
0650$_h$	Destination position low order		Read and write

0651$_h$	Destination position high order		Read and write
0652$_h$	Target speed	rpm	Read and write
0653$_h$	Step change condition attribute		Read and write
0654$_h$	Step change condition 1 value		Read and write
0655$_h$	Step change condition 2 value		Read and write
0656$_h$	Subsequent data set number		Read and write
0657$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 11 parameter:			
0658$_h$	Destination position low order		Read and write
0659$_h$	Destination position high order		Read and write
065A$_h$	Target speed	rpm	Read and write
065B$_h$	Step change condition attribute		Read and write
065C$_h$	Step change condition 1 value		Read and write
065D$_h$	Step change condition 2 value		Read and write
065E$_h$	Subsequent data set number		Read and write
065F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 12 parameter:			
0660$_h$	Destination position low order		Read and write
0661$_h$	Destination position high order		Read and write
0662$_h$	Target speed	rpm	Read and write
0663$_h$	Step change condition attribute		Read and write
0664$_h$	Step change condition 1 value		Read and write
0665$_h$	Step change condition 2 value		Read and write
0666$_h$	Subsequent data set number		Read and write
0667$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 13 parameter:			

0668$_h$	Destination position low order		Read and write
0669$_h$	Destination position high order		Read and write
066A$_h$	Target speed	rpm	Read and write
066B$_h$	Step change condition attribute		Read and write
066C$_h$	Step change condition 1 value		Read and write
066D$_h$	Step change condition 2 value		Read and write
066E$_h$	Subsequent data set number		Read and write
066F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 14 parameter:			
0670$_h$	Destination position low order		Read and write
0671$_h$	Destination position high order		Read and write
0672$_h$	Target speed	rpm	Read and write
0673$_h$	Step change condition attribute		Read and write
0674$_h$	Step change condition 1 value		Read and write
0675$_h$	Step change condition 2 value		Read and write
0676$_h$	Subsequent data set number		Read and write
0677$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 15 parameter:			
0678$_h$	Destination position low order		Read and write
0679$_h$	Destination position high order		Read and write
067A$_h$	Target speed	rpm	Read and write
067B$_h$	Step change condition attribute		Read and write
067C$_h$	Step change condition 1 value		Read and write
067D$_h$	Step change condition 2 value		Read and write
067E$_h$	Subsequent data set number		Read and write
067F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write

Data set 16 parameter:			
0680$_h$	Destination position low order		Read and write
0681$_h$	Destination position high order		Read and write
0682$_h$	Target speed	rpm	Read and write
0683$_h$	Step change condition attribute		Read and write
0684$_h$	Step change condition 1 value		Read and write
0685$_h$	Step change condition 2 value		Read and write
0686$_h$	Subsequent data set number		Read and write
0687$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 17 parameter:			
0688$_h$	Destination position low order		Read and write
0689$_h$	Destination position high order		Read and write
068A$_h$	Target speed	rpm	Read and write
068B$_h$	Step change condition attribute		Read and write
068C$_h$	Step change condition 1 value		Read and write
068D$_h$	Step change condition 2 value		Read and write
068E$_h$	Subsequent data set number		Read and write
068F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 18 parameter:			
0690$_h$	Destination position low order		Read and write
0691$_h$	Destination position high order		Read and write
0692$_h$	Target speed	rpm	Read and write
0693$_h$	Step change condition attribute		Read and write
0694$_h$	Step change condition 1 value		Read and write
0695$_h$	Step change condition 2 value		Read and write

0696$_h$	Subsequent data set number		Read and write
0697$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 19 parameter:			
0698$_h$	Destination position low order		Read and write
0699$_h$	Destination position high order		Read and write
069A$_h$	Target speed	rpm	Read and write
069B$_h$	Step change condition attribute		Read and write
069C$_h$	Step change condition 1 value		Read and write
069D$_h$	Step change condition 2 value		Read and write
069E$_h$	Subsequent data set number		Read and write
069F$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 20 parameter:			
06A0$_h$	Destination position low order		Read and write
06A1$_h$	Destination position high order		Read and write
06A2$_h$	Target speed	rpm	Read and write
06A3$_h$	Step change condition attribute		Read and write
06A4$_h$	Step change condition 1 value		Read and write
06A5$_h$	Step change condition 2 value		Read and write
06A6$_h$	Subsequent data set number		Read and write
06A7$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 21 parameter:			
06A8$_h$	Destination position low order		Read and write
06A9$_h$	Destination position high order		Read and write
06AA$_h$	Target speed	rpm	Read and write
06AB$_h$	Step change condition attribute		Read and write
06AC$_h$	Step change condition 1 value		Read and write

06AD$_h$	Step change condition 2 value		Read and write
06AE$_h$	Subsequent data set number		Read and write
06AF$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 22 parameter:			
06B0$_h$	Destination position low order		Read and write
06B1$_h$	Destination position high order		Read and write
06B2$_h$	Target speed	rpm	Read and write
06B3$_h$	Step change condition attribute		Read and write
06B4$_h$	Step change condition 1 value		Read and write
06B5$_h$	Step change condition 2 value		Read and write
06B6$_h$	Subsequent data set number		Read and write
06B7$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 23 parameter:			
06B8$_h$	Destination position low order		Read and write
06B9$_h$	Destination position high order		Read and write
06BA$_h$	Target speed	rpm	Read and write
06BB$_h$	Step change condition attribute		Read and write
06BC$_h$	Step change condition 1 value		Read and write
06BD$_h$	Step change condition 2 value		Read and write
06BE$_h$	Subsequent data set number		Read and write
06BF$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 24 parameter:			
06C0$_h$	Destination position low order		Read and write
06C1$_h$	Destination position high order		Read and write
06C2$_h$	Target speed	rpm	Read and write
06C3$_h$	Step change condition attribute		Read and write

06C4$_h$	Step change condition 1 value		Read and write
06C5$_h$	Step change condition 2 value		Read and write
06C6$_h$	Subsequent data set number		Read and write
06C7$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 25 parameter:			
06C8$_h$	Destination position low order		Read and write
06C9$_h$	Destination position high order		Read and write
06CA$_h$	Target speed	rpm	Read and write
06CB$_h$	Step change condition attribute		Read and write
06CC$_h$	Step change condition 1 value		Read and write
06CD$_h$	Step change condition 2 value		Read and write
06CE$_h$	Subsequent data set number		Read and write
06CF$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 26 parameter:			
06D0$_h$	Destination position low order		Read and write
06D1$_h$	Destination position high order		Read and write
06D2$_h$	Target speed	rpm	Read and write
06D3$_h$	Step change condition attribute		Read and write
06D4$_h$	Step change condition 1 value		Read and write
06D5$_h$	Step change condition 2 value		Read and write
06D6$_h$	Subsequent data set number		Read and write
06D7$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 27 parameter:			
06D8$_h$	Destination position low order		Read and write
06D9$_h$	Destination position high order		Read and write
06DA$_h$	Target speed	rpm	Read and write

06DB$_h$	Step change condition attribute		Read and write
06DC$_h$	Step change condition 1 value		Read and write
06DD$_h$	Step change condition 2 value		Read and write
06DE$_h$	Subsequent data set number		Read and write
06DF$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 28 parameter:			
06E0$_h$	Destination position low order		Read and write
06E1$_h$	Destination position high order		Read and write
06E2$_h$	Target speed	rpm	Read and write
06E3$_h$	Step change condition attribute		Read and write
06E4$_h$	Step change condition 1 value		Read and write
06E5$_h$	Step change condition 2 value		Read and write
06E6$_h$	Subsequent data set number		Read and write
06E7$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 29 parameter:			
06E8$_h$	Destination position low order		Read and write
06E9$_h$	Destination position high order		Read and write
06EA$_h$	Target speed	rpm	Read and write
06EB$_h$	Step change condition attribute		Read and write
06EC$_h$	Step change condition 1 value		Read and write
06ED$_h$	Step change condition 2 value		Read and write
06EE$_h$	Subsequent data set number		Read and write
06EF$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 30 parameter:			
06F0$_h$	Destination position low order		Read and write
06F1$_h$	Destination position high		Read and write

	order		
06F2$_h$	Target speed	rpm	Read and write
06F3$_h$	Step change condition attribute		Read and write
06F4$_h$	Step change condition 1 value		Read and write
06F5$_h$	Step change condition 2 value		Read and write
06F6$_h$	Subsequent data set number		Read and write
06F7$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 31 parameter:			
06F8$_h$	Destination position low order		Read and write
06F9$_h$	Destination position high order		Read and write
06FA$_h$	Target speed	rpm	Read and write
06FB$_h$	Step change condition attribute		Read and write
06FC$_h$	Step change condition 1 value		Read and write
06FD$_h$	Step change condition 2 value		Read and write
06FE$_h$	Subsequent data set number		Read and write
06FF$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write
Data set 32 parameter (next data set of operating data set):			
0700$_h$	Destination position low order		Read and write
0701$_h$	Destination position high order		Read and write
0702$_h$	Target speed	rpm	Read and write
0703$_h$	Step change condition attribute		Read and write
0704$_h$	Step change condition 1 value		Read and write
0705$_h$	Step change condition 2 value		Read and write
0706$_h$	Subsequent data set number		Read and write
0707$_h$	Data set type	0: NULL; 1: Absolute; 2: Relative	Read and write

Address description:

*1. Communication IO input (**0451h**)

Input signal can be given through communication IO input (0451h) register of MODBUS communication. The definition of the register is as follows:

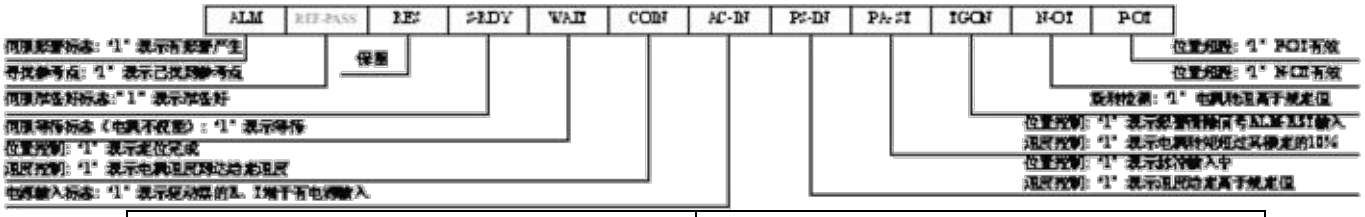
bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
/START-HOME	/POS-STEP	/POS-START	/POS-REF	/POS2	/POS1	/POS0	/G-SEL

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
/N-CL	/P-CL	/CLR	/ALM-RST	N-OT	P-OT	/P-CON	/SON

Signal input in the register is valid only when the signal is not input from CN3 (signal distribution parameter is set to be "Null").

For example: to input /POS-START through communication IO input register, it is necessary to first set P□512.1=0 to make bit13 of communication IO input (0451h) register valid.

*2. Servo operation status （**0456h**）



伺服报警标志:‘1’表示有报警产生	Servo alarm sign: '1' indicates alarm
寻找参考点:‘1’表示已找到参考点	Reference point seeking: '1' indicates reference point is found
保留	Reserved
伺服准备好标志:”1”表示准备好	Servo ready sign: '1' indicates it is ready
伺服等待标志（电机不使能）:‘1’表示等待	Servo waiting sign (motor disable): '1' indicates waiting
位置控制:‘1’表示定位完成	Position control: '1' indicates positioning is completed
速度控制:‘1’表示电机速度到达给定速度	Speed control: '1' indicates motor speed reaches given speed
电源输入标志:‘1’表示驱动器的 R、T 端子有电源输入	Power supply input sign: '1' indicates power input at R and T terminals of drive
位置超程:‘1’P-OT 有效	Position overtravel: '1' indicates P-OT is valid
位置超程:‘1’N-OT 有效	Speed overtravel: '1' indicates N-OT is valid
旋转检测:‘1’电机转速高于规定值	Rotation detection: '1' indicates motor speed is higher than specified value
位置控制:‘1’表示报警清除信号 ALM-RST 输入	Position control: '1' indicates alarm clear signal ALM-RST input
速度控制:‘1’表示电机转矩超过其额定的 10%	Speed control: '1' indicates motor torque is 10% larger than its rated value
位置控制:‘1’表示脉冲输入中	Position control: '1' indicates pulse input is performing
速度控制:‘1’表示速度给定高于规定值	Speed control: '1' indicates given speed is higher than its specified value

*3. Step change condition attribute

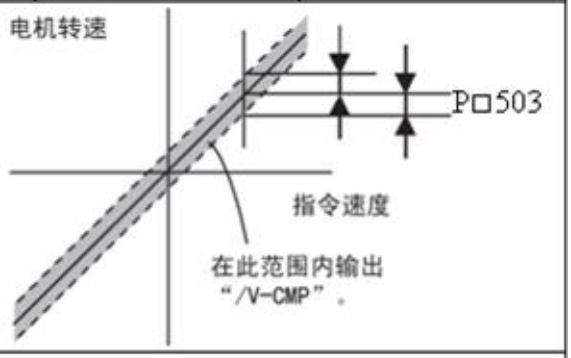
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

P□503	同速检测信号宽度		速度	
	设定范围	设定单位	出厂设定	电源重起
	0～100	1r/min	10	不需要

如果电机转速与指令速度之差低于P□503 的设定值，则输出“/V-CMP”信号。

■例

P□503=100、指令速度为2000r/min 时，如果电机转速处在1900 ～ 2100r/min之间，则将“/V-CMP”置为ON。



■补充

“/VCMP”信号是速度控制时的输出信号。如果是位置控制，则功能自动地变为“/COIN”，如果是扭矩控制，则自动地变为“OFF(H 电平)”。

同速检测信号宽度	Same-speed detection signal width
速度	Speed
设定范围	Setting range
设定单位	Setting unit
出厂设定	Factory setting
电源重起	Power reboot
不需要	Not required
如果电机转速与指令速度之差低于 P□503 的设定值，则输出“/V-CMP”信号。	If the difference between motor speed and command speed is smaller than the set value of P□503, then "/V-CMP" signal is output.
例	For example,
P□503=100、指令速度为 2000r/min 时，如果电机转速处在 1900 ～ 2100r/min 之间，则将“/V-CMP”置为 ON。	At P□503=100 and command speed of 2000 r/min, if motor speed ranges from 1900 to 2100r/min, "/V-CMP" is set to be ON.
电机转速	Motor speed
指令速度	Command speed
在此范围内输出“/V-CMP”	"/V-CMP" is output at the range.
补充	Supplement
“/VCMP”信号是速度控制时的输出信号。如果是位置控制，则功能自动地变为“/COIN”，如果是扭矩控制，则自动地变为“OFF(H 电平)”。	"/V-CMP" signal is the output signal under speed control. In case of position control, then the function will automatically change to "/COIN"; in case of torque control, it will automatically change to "OFF(H level)".

Chapter VII Maintenance and Inspection

7.1 Abnormality Diagnosis and Treatment Methods

7.1.1 Overview of Alarm Display

Relationship between alarm display and alarm code output ON/OFF is as shown in the table below. The method to stop motor in case of alarm: free-running stop: without braking, natural stop by friction resistance at the time of motor rotation.

Alarm display	ALM output	Alarms	Alarm contents	Clear or not
□01	H	Encoder PA, PB, PC disconnection	Encoder disconnection or cable welding problem.	Clear
□02	H	Encoder PU, PV, PW disconnection	Encoder disconnection or cable welding problem.	Clear
□03	H	Overload	Continuous running at a certain torque exceeding the rated value	Clear
□04	H	A/D switch channel abnormal	A/D switch channel abnormal	Clear
□05	H	PU, PV, PW false code	PU, PV, PW signals are all high or low	Clear
□06	H	PU, PV, PW phases incorrect	PU, PV, PW signals are all high or low	Clear
□10	H	Overcurrent	Servo drive IPM module current is overlarge.	Clear
□11	H	Overvoltage	Servo drive main circuit voltage is too high.	No
□12	H	Undervoltage	Servo drive main circuit voltage is too low.	No
□13	H	Parameter damage	EEROM data in servo drive is abnormal.	Clear
□14	H	Over-speed	Servo motor speed is extremely high	Clear
□15	H	Deviation counter overflow	Internal position deviation counter overflow	Clear
□16	H	Position deviation is overlarge	Position deviation pulse exceeds the set value of parameter P□504.	Clear
□17	H	Electronic gear fault	Electronic gear is unreasonably set or pulse frequency is too high	Clear
□18	H	1st channel of current detection is abnormal	Current detection abnormal	Clear
□19	H	2nd channel of current detection is abnormal	Current detection abnormal	Clear
□22	H	Motor model is incorrect	Servo drive parameters do not match with those of motor	Clear
□23	H	Servo drive does not match with motor	Servo drive does not match with motor	Clear
□25	H	Bus encoder multi-coil information error	Multi-coil information error	Clear
□26	H	Bus encoder multi-coil information overflow	Multi-coil information overflow	Clear
□27	H	Bus encoder battery alarm 1	Battery voltage is lower than 2.5 V, multi-coil information is lost	Clear
□28	H	Bus encoder battery alarm 2	Battery voltage is lower than 3.1 V, battery voltage is relatively low	Clear

□30	H	Bleeder resistor disconnection alarm	Braking resistor damage.	Clear
□31	H	Regeneration overload	Regeneration processing circuit is abnormal.	No
□33	H	Momentary outage alarm.	There is outage of over one power cycle under AC current.	Clear
□34	H	Rotary transformer is abnormal	Rotary transformer communication is abnormal.	Clear
□40	H	Bus encoder communication is abnormal	Servo drive and encoder cannot realize communication.	Clear
□41	H	Bus encoder overspeed	When power is ON, encoder rotates at high speed	Clear
□42	H	Bus encoder absolute status error	Encoder damage or encoder decoding circuit damage	Clear
□43	H	Bus encoder counting error	Encoder damage or encoder decoding circuit damage	Clear
□44	H	Check error in bus encoder control field	Encoder signal is interrupted or encoder decoding circuit damage	Clear
□45	H	Check error in bus encoder communication data	Encoder signal is interrupted or encoder decoding circuit damage	Clear
□46	H	Stop bit error in bus encoder status field	Encoder signal is interrupted or encoder decoding circuit damage	Clear
□47	H	Stop bit error in bus encoder SFOME	Encoder signal is interrupted or encoder decoding circuit damage	Clear
□48	H	Bus encoder data are not initialized	Bus encoder SFOME data are null	Clear
□49	H	Sum check error in bus encoder data	Sum check in bus encoder EEPROM data is abnormal	Clear
□60	H	MODBUS communication timeout	Drive fails to accept data normally at the set time in P□602	Clear
□61	H	CANopen master station heartbeat timeout	Drive fails to accept master station heartbeat massage normally at the set time	Clear
□70	H	Drive overheat alarm	Drive internal IPM module temperature is too high	Clear
□90	H	Software does not match with hardware	Parameter is wrongly set or software does not match with hardware	No
□--	L	No error display	Display normal action status	Clear

Note:

1. "□" in alarm display may be "A" or "b", referring to A axis alarm or b axis alarm respectively.
2. Alarms of □25, □26, □27, □41 can be reset only after alarms in encoder is cleared through auxiliary function mode.

7.1.2 Alarm Displays and Their Causes and Treatment Measures

In case of abnormalities of the servo drive, the panel operator will display alarm information of A□□ or b□□. Alarm displays and their treatment measures are as follows:

It the abnormal condition still exists after treatment, please contact with service department of our company.

(1) List of alarm displays

Alarm	Alarm contents	Circumstance	Cause	Treatment measures
□01	Incremental encoder ABC disconnects	When power supply is on or during operation	Wiring of encoder is wrong	Correct wiring of encoder
			Encoder cables are interfered due to different specifications	Change cable specifications to stranded wire or stranded shielded wire with core wire over 0.12 mm^2 and stranded

				wire made of tined soft copper
			Encoder cables are interfered due to overlength	The max. wiring distance should be 20 m.
			Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
			Encoder cables are bound with high current line or their distance is too close	Lay encoder cables at places free from surge voltage
			Change in FG potential due to influence by motor side equipment (welding machine, etc.)	Connect equipment ground wire to prevent shunting to FG at PG side
			Signal line of encoder is interfered	Take anti-interference measures for encoder wiring.
			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□02	Incremental encoder UVW disconnects	When power supply is on or during operation	Wiring of encoder is wrong	Correct wiring of encoder
			Encoder cables are interfered due to different specifications	Change cable specifications to stranded wire or stranded shielded wire
			Encoder cables are interfered due to overlength	The max. wiring distance should be 20 m.
			Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
			Encoder cables are bound with high current line or their distance is too close	Lay encoder cables at places free from surge voltage
			Change in FG potential due to influence by motor side equipment (welding machine, etc.)	Connect equipment ground wire to prevent shunting to FG at PG side
			Signal line of encoder is interfered	Take anti-interference measures for encoder wiring.
			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□03	Overload	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
		During servo ON	Motor wiring is abnormal (poor condition in wiring and connection)	Revise motor wiring
			Encoder wiring is abnormal (poor wiring and connection)	Correct wiring of encoder
			Servo drive circuit board develops fault	Replace the servo drive
		When the servo motor fails to	Motor wiring is abnormal (poor condition in wiring and connection)	Revise motor wiring

		rotate during inputting of commands	Encoder wiring is abnormal (poor wiring and connection)	Correct wiring of encoder
			Starting torque exceeds the max. torque	Review loading condition, operation condition or motor capacity
			Servo drive circuit board develops fault	Replace the servo drive
		Normally during operation	Effective torque exceeds rated torque or starting torque exceeds rated torque substantially	Review loading condition, operation condition or motor capacity
			Temperature within storage tray of the servo drive is high	Reduce the temperature within storage tray below 55°°
			Servo drive circuit board develops fault	Replace the servo drive
□05	Incremental encoder UVW signal is abnormal	When control power supply is on	Wiring of encoder is wrong	Correct wiring of encoder
			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□10	Overcurrent	When control power supply is on	Overload alarm reset for several times due to power off	Change reset method of alarms
			Servo drive circuit board develops fault	Replace the servo drive
		When main power circuit is on or overcurrent during motor operation	A faulty connection occurs between U, V, W and ground wire.	Check wiring and connect correctly.
			Ground wire wraps around other terminals	
			A short circuit occurs between U, V, W used by main circuit of motor and ground wire	Revise or replace the cables used by main circuit of motor
			A short circuit occurs between U, V, and W used by main circuit of motor	
			An error occurs to regenerative resistor wiring.	Check wiring and connect correctly.
			A short circuit occurs between U, V, W of the servo drive and ground wire	Replace the servo drive
			Servo drive develops fault (current feedback circuit, power transistor or circuit board fault)	
			A short circuit occurs between U, V, W used by main circuit of motor and ground wire	Replace servo motor
			A short circuit occurs between U, V, and W used by main circuit of motor	
			Overload alarm reset for several times due to power off	Change reset method of alarms
			Position speed command changes violently	Re-evaluate command value.
			Whether the load is too much and whether regeneration handling capacity is exceeded	Review loading condition and operation condition
			The installation (direction, interval with other	Reduce ambient temperature

			parts) of servo drive is improper (whether there is storage disk is releasing heat while the surrounding is heating)	of the servo drive to below 55 ℃
			Encoder slips	Replace servo motor
			Servo unit fan stops rotating	Replace the servo drive
			Servo drive circuit board develops fault	
□11	Overvoltage * Detect when main circuit power is on	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
		When main circuit power is on	AC supply voltage is too high	Adjust AC supply voltage to normal range
			Servo drive circuit board develops fault	Replace the servo drive
		Normally during operation	Check AC supply voltage (whether voltage changes substantially)	Adjust AC supply voltage to normal range
			Number of turns is high and moment of inertia of load is too large (insufficient regeneration capacity)	Review loading condition and operation condition (check specifications of moment of inertia of load and negative load)
			Servo drive circuit board develops fault	Replace the servo drive
		When the servo motor decelerates Occurrence	Number of turns is high and moment of inertia of load is too large	Review loading condition and operation condition
□12	Undervoltage * Detect when main circuit power is on	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
		When main circuit power is on	AC supply voltage is too low	Adjust AC supply voltage to normal range
			Servo unit fuse burns out	Replace the servo drive
			Limiting resistor of surge current disconnects (whether power voltage is abnormal and whether limiting resistor of surge current is overload)	Replace servo unit (confirm power voltage and reduce frequency of main circuit ON/OFF)
			Servo drive circuit board develops fault	Replace the servo drive
		Normally during operation	AC supply voltage is low (whether there is oversized voltage drop)	Adjust AC supply voltage to normal range
			Power failure occurs instantaneously.	Restart operation through reset
			Cable short circuit of motor main circuit	Revise or replace the cables used by main circuit of motor
			Servo motor short circuit	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□13	Parameter damage	When control	Power is turned off when parameters are being	Execute user parameters

		power supply is on	set	initialization (F□011)
			Power is turned off when alarm is being entered	
			Servo drive circuit board develops fault	Replace the servo drive
□14	Over-speed	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
		During servo ON	The phase sequence of U, V and M of motor wiring is at fault	Correct motor wiring
			Wiring of encoder is wrong	Correct wiring of encoder
			Encoder wiring is malfunctioned due to interference	Take anti-interference measures for encoder wiring.
			Servo drive circuit board develops fault	Replace the servo drive
		When the servo motor starts operation or during high-speed rotation	The phase sequence of U, V and M of motor wiring is at fault	Correct motor wiring
			Wiring of encoder is wrong	Correct wiring of encoder
			Encoder wiring is malfunctioned due to interference	Take anti-interference measures for encoder wiring.
			Input value of position/speed command is too much	Lower command value
			Speed command input gain setting is wrong	Correct command input gain
			Servo drive circuit board develops fault	Replace the servo drive
□15	Position counter overflow	When the servo motor starts operation or during high-speed rotation	Motor stalling	Check the load
			Input command frequency is abnormal	Reduce frequency of upper computer
			Wiring is wrong	Correct wiring
□16	Position offset is too large (position offset with servo ON exceeds user parameter overflow level P□504 setting)	When control power supply is on	Excessive position offset alarm level (P□504) is incorrect	Set value of user parameter P□504 to any value other than 0
			Servo drive circuit board develops fault	Replace the servo drive
		During high-speed rotation	Wiring of U, V and W of the servo motor is abnormal (incomplete connection)	Revise motor wiring
				Correct wiring of encoder
			Servo drive circuit board develops fault	Replace the servo drive
		When the servo motor fails to rotate after sending position command	Wiring of U, V and W of the servo motor is poor	Revise motor wiring
			Servo drive circuit board develops fault	Replace the servo drive
		During long command with normal action	Gain adjustment of servo drive is poor	Increase speed loop gain (P□100) and position loop gain (P□102)

			Position command pulse frequency is too high	Slow reduce position command frequency
				Add smoothing function
				Reassess electronic gear ratio
			Excessive position offset alarm level (P□504) is incorrect	Set user parameter P□504 to correct value
			Load conditions (torque and moment of inertia) inconsistent with motor specifications	Review reassessed load or motor capacity
□17	Electronic gear fault	When control power supply is on	Setting of electronic gear is incorrect	Reset P□202 and P□203
		When the servo motor starts operation		
□18	1st channel of current detection is abnormal	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
		When the servo motor starts operation		
□19	1st channel of current detection is abnormal	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
		When the servo motor starts operation		
□22	Motor model is incorrect	When control power supply is on	Drive motor parameter setting is abnormal	Replace the servo drive
			Parameters written into encoder are abnormal	Replace the servo motor (encoder)
			Servo drive circuit board develops fault	Replace the servo drive
□23	Drive does not match with motor	When control power supply is on	Servo unit capacity and motor capacity are not suitable for motor capacity	Match servo unit capacity with servo motor capacity
			Parameters written into encoder are abnormal	Replace the servo motor (encoder)
			Drive motor parameter setting is abnormal	Replace the servo drive
			Servo drive circuit board develops fault	Replace the servo drive
□25	Multi-coil data of bus encoder goes wrong	When control power supply is on	Multi-coil data of absolute encoder is abnormal	Execute bus encoder multi-coil position cleanout (F□09) and bus encoder alarm register cleanout (F□010)
		During operation of servo motor		
□26	Bus encoder multi-coil data	When control power supply is	Multi-coil data of absolute encoder is abnormal	Execute bus encoder multi-coil position cleanout

	overflow	on		(F□09) and bus encoder alarm register cleanout (F□010)
		During operation of servo motor		
□27	Bus encoder battery alarm 1	When control power supply is on		
□28	Bus encoder battery alarm 2	When control power supply is on		
□30	Regeneration is abnormal	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
		When main circuit power is on	Circumscribed regenerative resistor is not connected	Connect circumscribed regenerative resistor
			Check whether the wiring of regenerative resistor is in good condition or broken	Revise the wiring of circumscribed regenerative resistor
			Jumper wire between B2 and B3 comes off (when using built-in regenerative resistor)	Correct wiring
		Normally during operation	Check whether the wiring of regenerative resistor is in good condition or comes off	Revise the wiring of circumscribed regenerative resistor
			Regenerative resistor disconnects (whether regeneration energy is too much)	Replace regenerative resistor or servo drive (review load and operation conditions)
			Servo drive develops fault (fault in regenerative transistor and voltage detecting part)	Replace the servo drive
□31	Regeneration overload	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
		When main circuit power is on	Power supply voltage exceeds 270 V	Correct voltage
		Normally during operation (regenerative resistor temperature increases significantly)	Regenerative energy is too much	Reselect regenerative resistor capacity or review load and operation conditions.
			Under continuous regeneration status	
		Normally during operation (regenerative	Servo drive circuit board develops fault	Replace the servo drive

		resistor temperature increases slightly)		
		When the servo motor decelerates	Regenerative energy is too much	Reselect regenerative resistor capacity or review load and operation conditions.
□32	Power supply has open phase (When main power supply is ON, any of L1, L2 and L3 phases is under low voltage for over 1 s) * Detect when main circuit power is on	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
		When main power supply is on	Three-phase electric wire has poor wiring	Correct wiring
			Three-phase electric wire is unbalanced	Correct unbalance of power supply (exchange of phase position)
			Servo drive circuit board develops fault	Replace the servo drive
		When the servo motor is actuated	Three-phase electric wire has poor wiring	Correct wiring
			Three-phase electric wire is unbalanced	Correct unbalance of power supply (exchange of phase position)
			Servo drive circuit board develops fault	Replace the servo drive
□33	Momentary outage alarm.	Normally during operation	There is outage of over one power cycle under AC current	Check supply circuit
□40	Bus encoder is abnormal	When control power supply is on	Wiring of encoder is wrong	Correct wiring of encoder
			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
		During operation	Wiring of encoder is wrong	Correct wiring of encoder
			Encoder cables are interfered due to different specifications	Change cable specifications to stranded wire or stranded shielded wire with core wire over 0.12 mm^2 and stranded wire made of tined soft copper
			Encoder cables are interfered due to overlength	The max. wiring distance should be 20 m.
			Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
			Encoder cables are bound with high current line or their distance is too close	Lay encoder cables at places free from surge voltage
			Change in FG potential due to influence by motor side equipment (welding machine, etc.)	Connect equipment ground wire to prevent shunting to FG at PG side
			Signal line of encoder is interfered	Take anti-interference measures for encoder wiring.

			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□41	Bus encoder overspeed	When control power supply is on	Servo motor rotates at a speed of over 100 r/min when PG power is on	PG power is set ON when servo rotating speed is less than 100 r/min
			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
		During operation	Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□42	Bus encoder FS status is wrong	Normally during operation	Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□43	Bus encoder counter goes wrong	Normally during operation	Servo drive circuit board develops fault	Replace the servo drive
□44	Checkout in bus encoder control field is wrong	When control power supply is on or during operation	Encoder cables are interfered due to different specifications	Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm^2 and stranded wire made of tined soft copper
			Encoder cables are interfered due to overlength	The max. wiring distance should be 20 m.
			Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
			Encoder cables are bound with high current line or their distance is too close	Lay encoder cables at places free from surge voltage
			Change in FG potential due to influence by motor side equipment (welding machine, etc.)	Connect equipment ground wire to prevent shunting to FG at PG side
			Signal line of encoder is interfered	Take anti-interference measures for encoder wiring.
□45	Bus encoder communication data checkout is wrong	When control power supply is on or during operation	Wiring of encoder is wrong	Correct wiring of encoder
			Encoder cables are interfered due to different specifications	Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm^2 and stranded wire made of tined soft copper
			Encoder cables are interfered due to overlength	The max. wiring distance should be 20 m.
			Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
			Encoder cables are bound with high current line or their distance is too close	Lay encoder cables at places free from surge voltage

			Change in FG potential due to influence by motor side equipment (welding machine, etc.)	Connect equipment ground wire to prevent shunting to FG at PG side
			Signal line of encoder is interfered	Take anti-interference measures for encoder wiring.
			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□46	Cut-off position in bus encoder status field is wrong	When control power supply is on or during operation	Wiring of encoder is wrong	Correct wiring of encoder
			Encoder cables are interfered due to different specifications	Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm^2 and stranded wire made of tined soft copper
			Encoder cables are interfered due to overlength	The max. wiring distance should be 20 m.
			Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
			Encoder cables are bound with high current line or their distance is too close	Lay encoder cables at places free from surge voltage
			Change in FG potential due to influence by motor side equipment (welding machine, etc.)	Connect equipment ground wire to prevent shunting to FG at PG side
			Signal line of encoder is interfered	Take anti-interference measures for encoder wiring.
			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□47	When control power supply is on or during operation	When control power supply is on or during operation	Wiring of encoder is wrong	Correct wiring of encoder
			Encoder cables are interfered due to different specifications	Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm^2 and stranded wire made of tined soft copper
			Encoder cables are interfered due to overlength	The max. wiring distance should be 20 m.
			Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
			Encoder cables are bound with high current line or their distance is too close	Lay encoder cables at places free from surge voltage
			Change in FG potential due to influence by motor side equipment (welding machine, etc.)	Connect equipment ground wire to prevent shunting to

				FG at PG side
			Signal line of encoder is interfered	Take anti-interference measures for encoder wiring.
			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□48	Bus encoder data is not initialized	When control power supply is on or during operation	Encoder EEROM is not initialized	Replace servo motor
□49	Sum check of bus encoder data is wrong	When control power supply is on or during operation	Wiring of encoder is wrong	Correct wiring of encoder
			Encoder cables are interfered due to different specifications	Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm^2 and stranded wire made of tined soft copper
			Encoder cables are interfered due to overlength	The max. wiring distance should be 20 m.
			Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
			Encoder cables are bound with high current line or their distance is too close	Lay encoder cables at places free from surge voltage
			Change in FG potential due to influence by motor side equipment (welding machine, etc.)	Connect equipment ground wire to prevent shunting to FG at PG side
			Signal line of encoder is interfered	Take anti-interference measures for encoder wiring.
			Encoder failure	Replace servo motor
			Servo drive circuit board develops fault	Replace the servo drive
□70	Overheating	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive
			Overload alarm reset for several times due to power off	Change reset method of alarms
		Cooling fin is overheated when main power supply is ON or during motor operation	Load exceeds rated load.	Review loading condition, operation condition or motor capacity
			Ambient temperature of the servo drive exceeds 55 ℃	Reduce ambient temperature of the servo drive to below 55 ℃
			Servo drive circuit board develops fault	Replace the servo drive
□90	Software does not match with hardware	When control power supply is on	Servo drive circuit board develops fault	Replace the servo drive

7.1.3 Causes and Treatment Measures of Other Abnormalities

See the following table for causes and proper treatment measures of other abnormalities without alarm display. In case such abnormalities cannot be resolved after treatment, please contact agents or service technicians of the Company.

Abnormalities	Cause	Check method	Treatment measures
		Note: Checking and treatment should only be made after power supply of servo system is set to OFF.	
Servo motor fails to start	Control power supply is not connected	Check voltage between control power supply terminals	Correct control power supply ON circuit
	Main circuit power is not connected	Check voltage between main circuit power terminals	Correct main circuit power ON circuit
	Input/Output (CN3 connector) wiring is wrong or comes off	Check installation and wiring of CN3 connector	Correctly wire CN3 connector
	Wiring of servo motor and encoder comes off	Inspect wiring	Connect wiring
	Overload occurs	Conduct no-load test run	Reduce load or replace with servo motor with larger capacity
	Speed/position command is not input	Check input pin	Correctly input speed/position command
	Setting of input signal selection P□509 - P□512 is wrong	Check setting of input signal selection P□509 - P□512	Correctly set input signal selection P□509 - P□512
	Servo ON (/S-ON) input remains OFF	Confirm set value of user parameter P□50A.0	Correctly set user and set servo ON (/S-ON) input to ON
	SEN input remains OFF	Check SEN signal input (when using absolute encoder)	Set SEN signal input to ON
	Mode selection for command pulse is wrong	Check use parameters setting and command pulse shape	Correctly set user parameter P□200.1
	Speed command input is improper during speed control	Confirm control method and input are consistent or check between V-REF and GND	Correctly set or input control parameter
	Torque command input is improper during torque control	Confirm control method and input are consistent or check between T-REF and GND	Correctly set or input control parameter
	Position command input is improper during position control	Check P□200.1 command pulse signal shape or sign or sign+ pulse signal	Correctly set or input control parameter
	Shift pulse cleanout input (CLR) remains ON	Check CLR input	Set CLR input signal to OFF
	Positive rotation drive prohibited (P-OT)and negative rotation drive prohibited (N-OT) input signal remains OFF	Check POT or NOT input signal	Set POT or NOT input signal to ON
	Servo drive fault	Servo drive circuit board develops	Replace the servo drive

		fault	
Servo motor stops after surge	Motor wiring is wrong	Check motor wiring	Correctly wire motor
	Encoder wiring is wrong	Check encoder wiring	Correctly wire encoder
Motor stops suddenly during operation and becomes motionless	Alarm reset (ALM-RST) signal remains ON and alarm goes off	Check alarm reset signal	Remove cause of alarm and set alarm reset signal from ON to OFF
Motor rotates unstably	Servo motor wiring is in bad contact	Power line (U, V and W phases) and encoder connector are in unstable connection	Tighten loose fastening part between treatment terminal and connector
Motor rotates when no command has been sent	Speed command input is improper during speed control	Confirm control method and input are consistent or check between V-REF and GND	Correctly set or input control parameter
	Torque command input is improper during torque control	Confirm control method and input are consistent or check between T-REF and GND	Correctly set or input control parameter
	Speed command offset	Offset adjustment of servo drive is poor	Adjust offset of servo drive
	Position command input is improper during position control	Check P□200.1 command pulse signal shape or sign or sign+ pulse signal	Correctly set or input control parameter
	Servo drive fault	Servo drive circuit board develops fault	Replace the servo drive
Motor sounds abnormally	Machines are improperly installed	Whether mounting screws of servo motor are loosed?	Tighten mounting screws
		Whether coupling core is aligned?	Align coupling core
		Whether coupling is unbalanced?	Restore coupling to balance
	Bearing is abnormal inside	Check sounds and vibration near bearing	Please contact service technicians of the Company in case of any abnormality
	Supporting machines have vibration source	Whether any moving part at machine side has foreign objects or is damaged or deformed?	Please inquire relevant manufacturers
	Input signal lines are interfered due to different specifications	Whether stranded wire or stranded shielded wire has core wire over 0.12 mm^2 and is made of tined soft copper?	Enable input signal line meet relevant specifications
	Input signal line is interfered due to length beyond range of application	Confirm that the max. wiring length is 3 m and its impedance is less than 100 Ω	Enable length of input signal line meet relevant specifications
	Encoder cables are interfered due to different specifications	Whether stranded wire or stranded shielded wire has core wire over 0.12 mm^2 and is made of tined soft copper?	Enable encoder cables meet relevant specifications

	Encoder cables are interfered due to length beyond range of application	The max. wiring distance should be 20 m.	Enable encoder cables meet relevant specifications
	Encoder cables are interfered due to damages	Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
	Interference to encoder cable is too great	Whether encoder cables are too close with high current line?	Lay encoder cables at places free from surge voltage
	Change in FG potential due to influence by servo motor side equipment (welding machine, etc.)	What is grounding state (not grounded or incomplete grounding) of welding machine, etc. at servo motor side?	Connect equipment ground wire to prevent shunting to FG at PG side
	Servo drive pulse counter goes wrong due to interference	Whether signal line of encoder is interfered?	Take anti-interference measures for encoder wiring.
	Encoder is affected by excessive vibration shock)	Mechanical vibration or motor installation is not in condition (Accuracy, fastening and core shift of mounting surface)	Reduce mechanical vibration or properly install servo motor
	Encoder failure	Encoder failure	Replace servo motor
Motor with frequency around 200 - 400 Hz vibrates	Speed gain P□100 is set too high	Factory setting: Kv = 40.0 Hz	Correctly set speed loop gain P□100
	Position loop gain P□102 is set too high	Factory setting: Kp = 40.0/s	Correctly set position loop gain P□102
	Speed loop integral time parameter P□101 is improperly set	Factory setting: Ti = 20.00 ms	Correctly set speed loop integral time parameter P□101
	Machine stiffness is improperly set during autotune	Reassess selection of machine stiffness setting	Correctly select machine stiffness setting
	Ratio of moment of inertia is inappropriate when not suing autotune	Check ratio f moment of inertia P□103	Correct ratio f moment of inertia P□103
Starting and stopping rotating overtravel is too large	Speed gain P□100 is set too high	Factory setting: Kv = 40.0 Hz	Correctly set speed loop gain P□100
	Position loop gain P□102 is set too high	Factory setting: Kp = 40.0/s	Correctly set position loop gain P□102
	Speed loop integral time parameter P□101 is improperly set	Factory setting: Ti = 20.00 ms	Correctly set speed loop integral time parameter P□101
	Machine stiffness is improperly set during autotune	Reassess selection of machine stiffness setting	Correctly select machine stiffness setting
	Ratio of moment of inertia is inappropriate when not suing autotune	Check ratio f moment of inertia P□103	Correct ratio f moment of inertia P□103 Use module switch function
Position offset of absolute encoder is wrong	Encoder cables are interfered due to different specifications	stranded wire or stranded shielded wire has core wire over 0.12 mm^2 and is made of tined soft copper	Enable encoder cables meet relevant specifications

(Position saved by command controller during outage is different from position when the power supply is on next time)	Encoder cables are interfered due to length beyond range of application	The max. wiring distance should be 20 m.	Enable encoder cables meet relevant specifications
	Encoder cables are interfered due to damages	Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
	Interference to encoder cable is too great	Whether encoder cables are bound with high current line or their distance is too close?	Lay encoder cables at places free from surge voltage
	Fluctuation of FG potential due to interference by motor side equipment (welding machine, etc.)	What is grounding state (not grounded or incomplete grounding) of welding machine, etc. at servo motor side?	Connect equipment ground wire to prevent shunting to FG at PG side
	Servo drive pulse counter goes wrong due to interference	Whether signal line of encoder is interfered?	Take anti-interference measures for encoder wiring.
	Encoder is affected by excessive vibration shock	Mechanical vibration or motor installation is not in condition (Accuracy, fastening and core shift of mounting surface)	Reduce mechanical vibration or properly install servo motor
	Encoder failure	Encoder failure (no change in pulse)	Replace servo motor
	Servo drive fault	Servo drive fails to send multi-turn data	Replace the servo drive
	Command controller multi-turn data read error	Check error detection of command controller	Restore error detection function of command controller
		Whether data (odd-even) check is executed on command controller?	Execute odd-even check of multi-turn data
		Signal line between servo drive and command controller is interfered	Interference effect occurs when no checkout is done (above)
Overtravel (OT) (Exceeding scope specified by command controller)	Positive/negative rotation drive prohibited input signal reaches (POT or NOT is at H level)	Whether external power supply (+24 V) of input signal is correct?	Correct external power supply of +24 V
		Whether action state of overtravel limit SW is correct?	Correct state of overtravel limit SW
		Whether wiring of overtravel limit SW is correct?	Correct wiring of overtravel limit SW
	Positive/negative rotation drive prohibited input signal is malfunctioning (POT or NOT changes constantly)	Whether external power supply (+24 V) of input signal changes?	Remove cause of change in external power supply of +24 V
		Whether action of overtravel limit SW is unstable?	Make action of overtravel limit SW unstable
		Whether wiring of overtravel limit SW is correct? (Cable damage and screw fastening)	Correct wiring of overtravel limit SW
	Positive/negative rotation drive	Check POT signal selection	Correct POT signal selection P□510.2

	prohibited input signal P-OT/N-OT signal selection is wrong	P□510.2	
		Check NOT signal selection P□510.3	Correct NOT signal selection P□510.3
	Motor stop method selection is wrong	What is the selection for inertial operation stop when servo is OFF?	Check P□000.2 and P□000.3
		What is the setting for inertial operation during torque control?	Check P□000.2 and P□000.3
	Overtravel position is not proper	OT position is shorter than internal operation distance	Properly set Ot position
	Encoder cables are interfered due to different specifications	Whether stranded wire or stranded shielded wire has core wire over 0.12 mm^2 and is made of tined soft copper?	Enable encoder cables meet relevant specifications
	Encoder cables are interfered due to length beyond range of application	The max. wiring distance should be 20 m.	Enable encoder cables meet relevant specifications
	Encoder cables are interfered due to damages	Signal lines are interfered due to engaging-in and damage in sheath of encoder cables	Correct layout of encoder cables
	Interference to encoder cable is too great	Whether encoder cables are bound with high current line or their distance is too close?	Lay encoder cables at places free from surge voltage
	Change in FG potential due to influence by servo motor side equipment (welding machine, etc.)	What is grounding state (not grounded or incomplete grounding) of welding machine, etc. at servo motor side?	Connect equipment ground wire to prevent shunting to FG at PG side
	Servo unit pulse counter goes wrong due to interference	Whether signal line of encoder is interfered?	Take anti-interference measures for encoder wiring.
	Encoder is affected by excessive vibration shock	Mechanical vibration or motor installation is not in condition (accuracy, fastening and core shift of mounting surface)	Reduce mechanical vibration or properly install servo motor
	Encoder failure	Encoder failure (no change in pulse)	Replace servo motor
	Servo drive fault	Servo drive fails to send multi-turn data	Replace the servo drive
Position offset (alarm fails and causes position offset)	Coupling between machine and servo motor is abnormal	Whether coupling between machine and servo motor has offset?	Correctly connect coupling between machine and servo motor
	Input signal lines are interfered due to different specifications	Whether stranded wire or stranded shielded wire has core wire over 0.12 mm^2 and is made of tined soft copper?	Enable input signal line meet relevant specifications
	Input signal line is interfered due to length beyond range of	Confirm that the max. wiring length is 3 m and its impedance is less	Enable length of input signal line meet relevant specifications

	application	than 100 Ω	
	Encoder failure (no change in pulse)	Encoder failure (no change in pulse)	Replace servo motor

7.2 Maintenance and Check of Servo Drive

7.2.1 Check of Servo Motor

Since AC servo motor is not equipped with electric brush, only simple daily check is required. The table above lists general standards of checking period which should be properly determined based on actual using conditions and environment.

Check item	Check period	Tips for check and maintenance	Remarks
Confirmation of vibration and sound	Everyday	Determine based on feeling and hearing	Compare with normal condition to detect any increase
Appearance inspection	Based on contamination	Clean up with brush or air gun	—
Measurement of insulation resistance	Once every year	Disconnect from servo unit and measure insulation resistance with 500 V megameter. Resistance over 10 MΩ is considered as normal.	Please contact local dealer in case the resistance is less than 10 MΩ.
Replacement of oil seal	Once at least every 5000 h	Please contact local dealer.	Only for servo motor with oil seal
Comprehensive check	Once every five years or at least every 20000 h	Please contact local dealer.	—

7.2.2 Check of Servo Drive

Daily check is not required, but more than one check is needed every year.

Check item	Check period	Tips for check and maintenance	Remarks
Cleaning of main body and circuit board	Once every year	Please contact local dealer.	
Loosening of screws		Mounting screws of terminal board and connector should be firmly secured without loosening.	Please further secure screws.

7.2.3 General Standards of Replacement of Internal Parts of Servo Drive

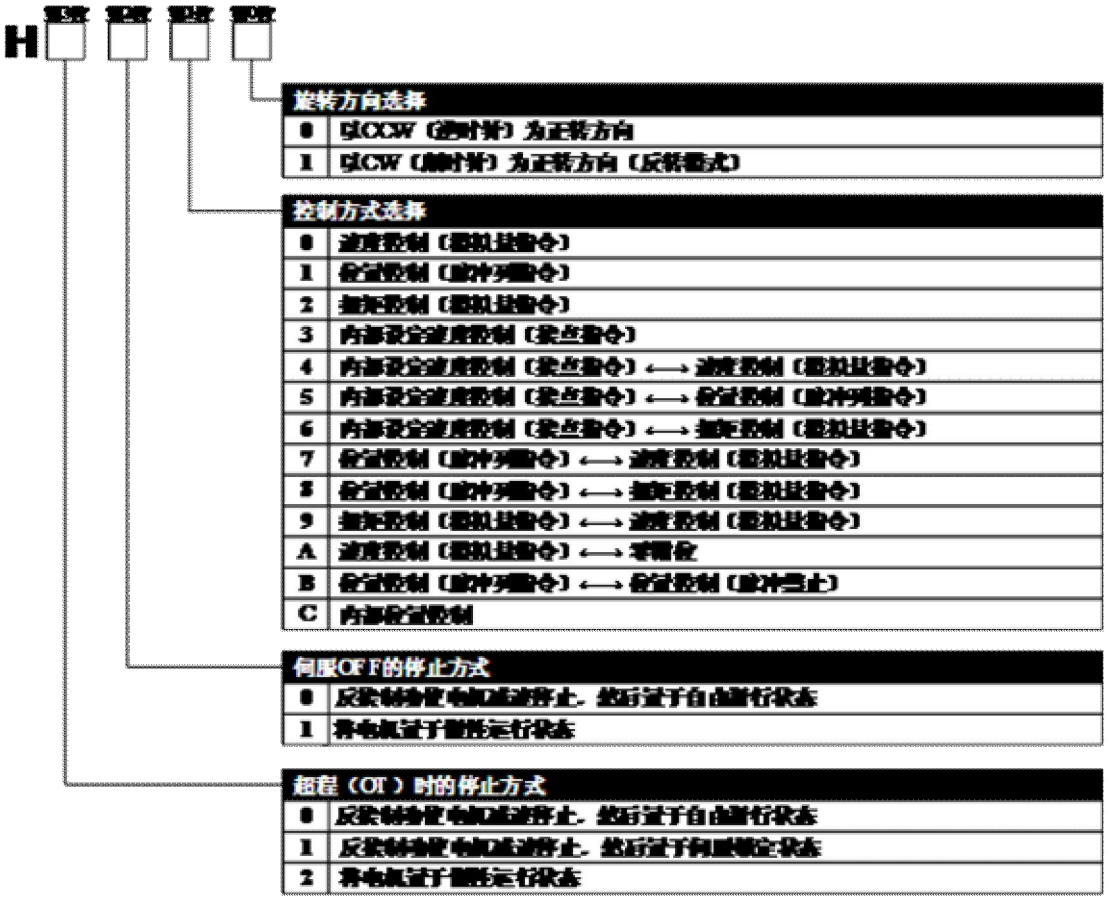
Mechanical abrasion and aging will occur to electric and electronic parts. Therefore, regular check is required for safety purpose. In need of replacement of parts, local dealer should be contacted. Use parameters of servo drives overhauled by the Company will be restored to factory setting and user parameters for using should be set before operation.

Part Name	Years of revision of standards	Use conditions
Cooling fan	4-5 years	Ambient temperature: annual

Smoothing capacitor	7 - 8 years	average of 30 °C Load rate: below 80% Operating ratio: less than 20 h every day
Relays	—	
Fuse	10 years	
Aluminium electrolytic capacitor on PCB	5 years	

Appendix A Summary of User Parameters

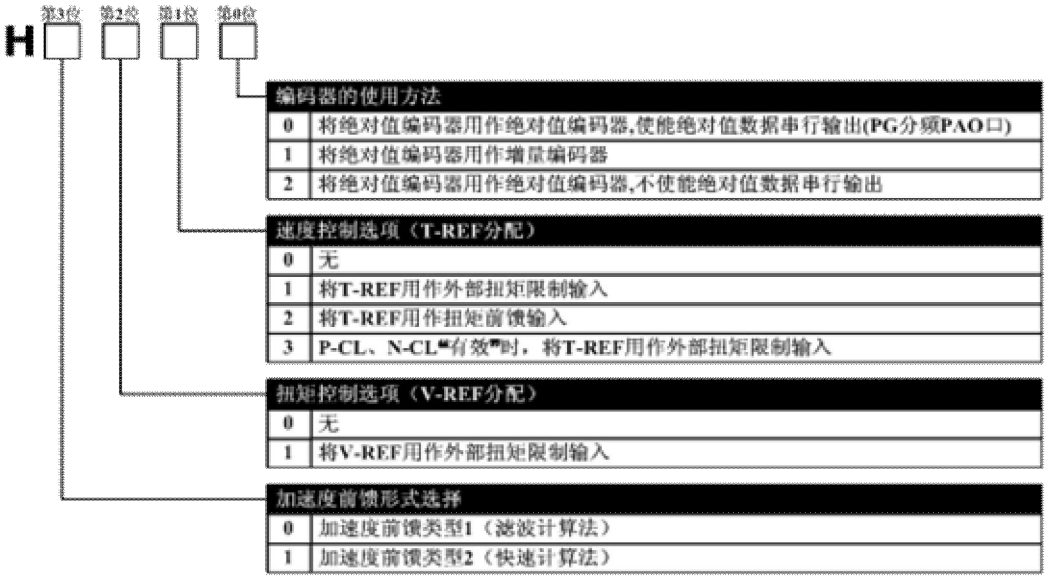
Parameter No.	Name	Setting range	Setting unit	Factory setting	Power reboot	Remarks
P□000	Basic function selection switch	——	——	0010	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
旋转方向选择	Rotation direction selection
以 CCW（逆时针）为正转方向	CCW (couterclockwise) is the positiverotation direction
以 CW（顺时针）为正转方向（反转模式）	CW (clockwise) is the positiverotation direction (in reserve mode)
控制方式选择	Control mode selection
速度控制（模拟量指令）	Speed control (analog command)
位置控制（脉冲列指令）	Position control (pulse train command)
扭矩控制（模拟量指令）	Torque control (analog command)
内部设定速度控制（接点指令）	Internal set speed control (contact command)
内部设定速度控制（接点指令）	Internal set speed control (contact command)

速度控制（模拟量指令）	Speed control (analog command)
内部设定速度控制（接点指令）	Internal set speed control (contact command)
位置控制（脉冲列指令）	Position control (pulse train command)
内部设定速度控制（接点指令）	Internal set speed control (contact command)
扭矩控制（模拟量指令）	Torque control (analog command)
位置控制（脉冲列指令）	Position control (pulse train command)
速度控制（模拟量指令）	Speed control (analog command)
位置控制（脉冲列指令）	Position control (pulse train command)
扭矩控制（模拟量指令）	Torque control (analog command)
扭矩控制（模拟量指令）	Torque control (analog command)
速度控制（模拟量指令）	Speed control (analog command)
速度控制（模拟量指令）	Speed control (analog command)
零钳位	Zero clamping
位置控制（脉冲列指令）	Position control (pulse train command)
位置控制（脉冲禁止）	Position control (pulse prohibited)
伺服 OFF 的停止方式	Stop method when servo is OFF
反接制动使电机减速停止，然后置于自由滑行状态	Activate reserve braking to decelerate motor to motionless and set it to free sliding state
将电机置于惯性运行状态	Set motor to inertial operation state
超程（OT）时的停止方式	Stop method during overtravel (OT)
反接制动使电机减速停止，然后置于自由滑行状态	Activate reserve braking to decelerate motor to motionless and set it to free sliding state
反接制动使电机减速停止，然后置于伺服锁定状态	Activate reserve braking to decelerate motor to motionless and set it to servo locking state
将电机置于惯性运行状态	Set motor to inertial operation state

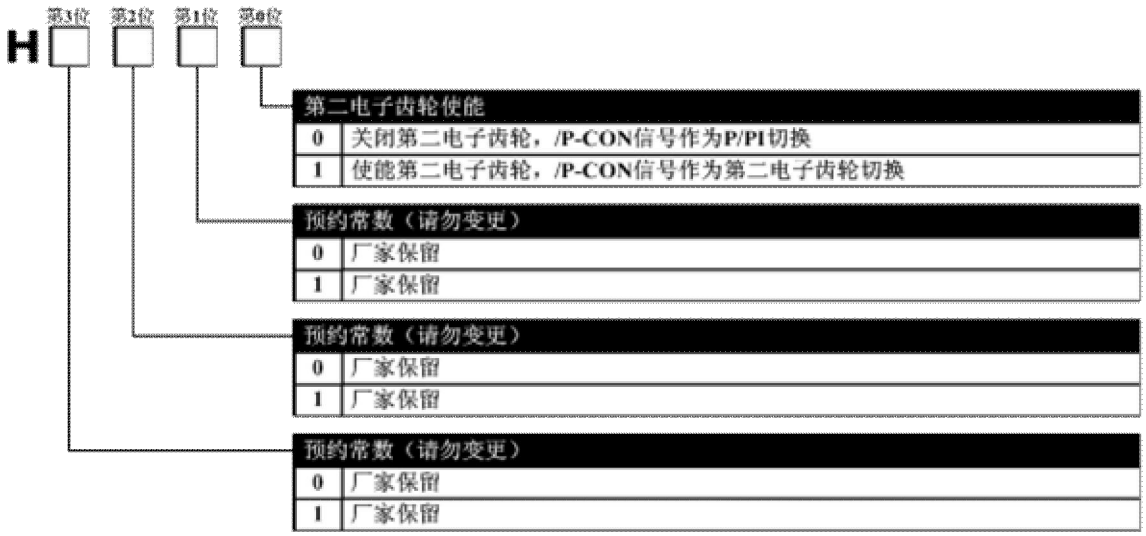
P□001	Basic function selection switch 1	——	——	0001	Y	



第 3 位	Bit 3

第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
编码器的使用方法	Use method of encoder
将绝对值编码器用作绝对值编码器,使能绝对值数据串行输出(PG 分频 PAO 口)	Use absolute encoder as absolute encoder and enable serial output of absolute data (PG frequency dividing PAO 口)
将绝对值编码器用作增量编码器	Use absolute encoder as incremental encoder
将绝对值编码器用作绝对值编码器,不使能绝对值数据串行输出	Use absolute encoder as absolute encoder and prevent serial output of absolute data
速度控制选项（T-REF 分配）	Speed control option (T-REF distribution)
无	N/A
将 T-REF 用作外部扭矩限制输入	Use T-REF as external torque limit input
将 T-REF 用作扭矩前馈输入	Use T-REF as torque feedforward input
P-CL、N-CL“有效”时，将 T-REF 用作外部扭矩限制输入	Use T-REF as external torque limit input when P-CL and N-CL are enabled
扭矩控制选项（V-REF 分配）	Torque control option (V-REF distribution)
无	N/A
将 V-REF 用作外部扭矩限制输入	Use V-REF as external torque limit input
加速度前馈形式选择	Accelerated speed feedforward mode selection
加速度前馈类型 1（滤波计算法）	Accelerated speed feedforward type 1 (filtering calculation)
加速度前馈类型 2（快速计算法）	Accelerated speed feedforward type 2 (rapid calculation)

Parameter No.	Name	Setting range	Setting unit	Factory setting	Power Restart	Remarks
P□002	Basic function selection switch 2	——	——	1100	Y	



	第 3 位	Bit 3				
	第 2 位	Bit 2				
	第 1 位	Bit 1				
	第 0 位	Bit 0				
	第二电子齿轮使能	Second electronic gear enabled				
	关闭第二电子齿轮，/P-CON 信号作为 P/PI 切换	Disable second electronic gear and use /P-CON signal as P/PI switch				
	使能第二电子齿轮，/P-CON 信号作为第二电子齿轮切换	Enable second electronic gear and use /P-CON signal as second electronic gear switch				
	预约常数（请勿变更）	Preset constant (do not change)				
	厂家保留	Reserved by manufacturer				
	厂家保留	Reserved by manufacturer				
	预约常数（请勿变更）	Preset constant (do not change)				
	厂家保留	Reserved by manufacturer				
	厂家保留	Reserved by manufacturer				
	预约常数（请勿变更）	Preset constant (do not change)				
	厂家保留	Reserved by manufacturer				
	厂家保留	Reserved by manufacturer				
P□003	Basic function selection switch 3	——	——	0000	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
普通编码器（非串行编码器）报警使能开关	Common encoder (non-serial encoder) alarm enable switch
关闭 A05~A08 或 b05~b08 报警检测	Disable A05 - A08 or b05 - b08 alarm detection
使能 A05~A08 或 b05~b08 报警检测	Enable A05 - A08 or b05 - b08 alarm detection
预约常数（请勿变更）	Preset constant (do not change)
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer

	瞬间停电报警使能开关	Momentary outage alarm enable switch				
	瞬间停电一个周期不报警	No alarm for momentary outage of one cycle				
	瞬间停电一个周期报警	Alarm for momentary outage of one cycle				
	过载增强使能开关	Overload enhancement enable switch				
	关闭过载增强功能	Disable overload enhancement function				
	使能过载增强功能（增强过载能力，适合用在频繁起停场合）	Enable overload enhancement function (enhance overload capacity, suitable for occasion with frequent start and stop)				
P□004	Basic function selection switch 4	——	——	0100	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
预约常数（请勿变更）	Preset constant (do not change)
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer
预约常数（请勿变更）	Preset constant (do not change)
厂家保留	Reserved by manufacturer
低频抖动抑制使能开关	Low-frequency jitter suppression enable switch
关闭低频抖动抑制	Disable low-frequency jitter suppression
使能低频抖动抑制	Enable low-frequency jitter suppression
超差报警使能开关	Out-of-tolerance alarm enable switch
关闭超差报警检测	Disable out-of-tolerance alarm detection
使能超差报警检测（偏差计数器值大于 P□504 时报警）	Enable out-of-tolerance alarm detection (alarm will be given when offset counter value exceeds P□504)

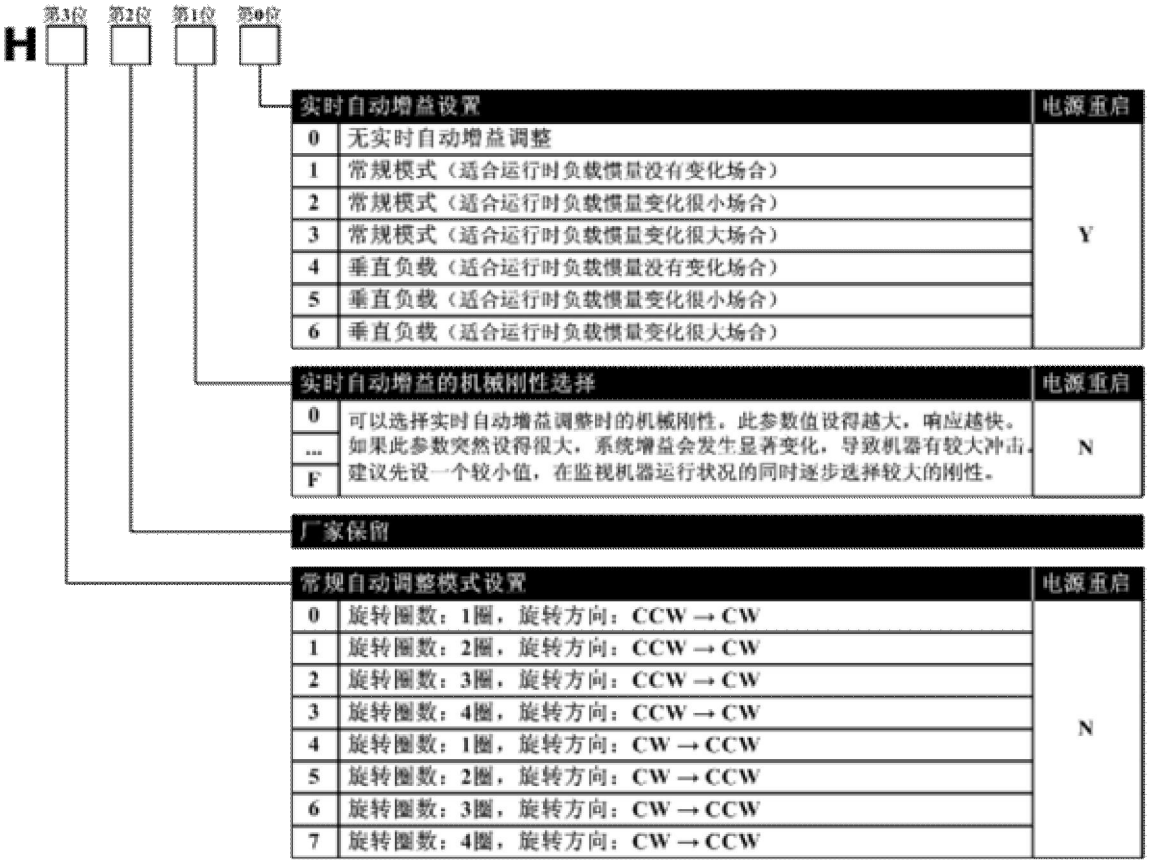
P□100	Speed loop gain	1 ~ 2500	0.1 Hz	400	N	
P□101	Speed loop integral time parameter	1 ~ 4000	0.01ms	2000	N	
P□102	Position loop gain	1 ~ 2000	0.1/s	400	N	
P□103	Ratio of moment of inertia	0 ~ 20000	1 %	0	N	
P□104	Second velocity loop gain	1 ~ 2500	0.1 Hz	400	N	

P□105	Second speed loop integral time parameter	1 ~ 4000	0.01ms	2000	N	
P□106	Second position loop gain	1 ~ 2000	0.1/s	400	N	
P□107	Offset (speed offset)	0 ~ 450	1r/min	0	N	
P□108	Scope of offset stack	0 ~ 5000	1-command pulse	10	N	
P□109	Feedforward	0 ~ 100	1 %	0	N	
P□110	Feedforward filtering time parameter	0 ~ 640	0.1ms	0	N	
P□111	Accelerated speed freeforward percentage	0 ~ 100	1 %	0	N	
P□112	Accelerated speed feedforward filtering time parameter	0 ~ 640	0.1ms	0	N	
P□113	Gain application switch	0000 ~ 0064	——	0000	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
模式开关选择	Module switch selection
以内部扭矩指令为条件（电平设定:P□114）	Based on internal torque command (electrical level setting: P□114)
以速度为条件（电平设定:P□115）	Based on internal speed (electrical level setting: P□115)
以加速度为条件（电平设定:P□116）	Based on accelerated speed (electrical level setting: P□116)
以偏移脉冲指令为条件（电平设定:P□117）	Based on offset pulse command (electrical level setting: P□117)
没有模式开关功能	Without module switch function
自动增益切换条件选择	Selection of auto gain switch conditions

	无自动增益切换（固定到第一组增益）	Non-auto gain switch (fixed to first group gain)
	外部开关增益切换（G-SEL 信号）	External switch gain switch (G-SEL signal)
	扭矩百分比切换	Torque percentage switch
	只在位置偏移条件下切换	Switch only under position offset
	给定加速度数值（10r/min/s）	Given accelerated speed value (10 r/min/s)
	给定速度数值	Given speed value
	有位置指令输入	With position command input
	厂家保留	Reserved by manufacturer
	厂家保留	Reserved by manufacturer

P□114	Module switch (torque command)	0 ~ 300	1 %	200	N	
P□115	Module switch (speed command)	0 ~ 10000	1r/min	0	N	
P□116	Module switch (accelerated speed command)	0 ~ 3000	10 r/min/s	0	N	
P□117	Module switch (offset pulse)	0 ~ 10000	1-command pulse	0	N	
P□118	Gain switch delay time	0 ~ 20000	0.1 ms (single axis)	0	N	0.2 ms (double axis)
P□119	Gain switch range	0 ~ 20000	free	0	N	
	When P□113.1 = 2, the unit is 1% When P□113.1 = 3, the unit is 1 command pulse When P□113.1 = 4, the unit is 10 r/min/s When P□113.1 = 5, the unit is 1 r/min When P□113.1 = 6, the unit is 1 command pulse					
P□120	Position gain switch time	0 ~ 20000	0.1 ms (single axis)	0	N	0.2 ms (double axis)
P□121	Gain switch hysteresis	0 ~ 20000	1-command pulse	0	N	
P□122	Friction load	0 ~ 3000	1‰	0	N	
P□123	Friction compensation speed hysteresis area	0 ~ 100	1r/min	0	Y	
P□124	Viscous friction load	0 ~ 20000	1 ‰/1 krpm	0	N	
P□125	Friction gain	0 ~ 30000		0	N	
P□126	Speed observer cycle	0 ~ 100	0.1ms	0/35/70	N	
P□127	Online autotune switches	——	——	1340	Y/N	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
实时自动增益设置	Real-time auto gain setting
电源重启	Power reboot
无实时自动增益调整	Non-real-time auto gain adjustment
常规模式（适合运行时负载惯量没有变化场合）	Normal mode (suitable for operations without change in load inertia)
常规模式（适合运行时负载惯量变化很小场合）	Normal mode (suitable for operations with little change in load inertia)
常规模式（适合运行时负载惯量变化很大场合）	Normal mode (suitable for operations with great change in load inertia)
垂直负载（适合运行时负载惯量没有变化场合）	Vertical load (suitable for operations without change in load inertia)
垂直负载（适合运行时负载惯量变化很小场合）	Vertical load (suitable for operations with little change in load inertia)
垂直负载（适合运行时负载惯量变化很大场合）	Vertical load (suitable for operations with great change in load inertia)
实时自动增益的机械刚性选择	Selection of machine stiffness for real-time auto gain
电源重启	Power reboot
可以选择实时自动增益调整时的机械刚性。此参数值设得越大，响应越快。	Machine stiffness during real-time auto gain adjustment may be selected. The larger the

		parameter value is, the quicker the response will be.
	如果此参数突然设得很大，系统增益会发生显著变化，导致机器有较大冲击。	If such parameter is set very high all at once, system gain will change significantly, leading to great shock to machine.
	建议先设一个较小值，在监视机器运行状况的同时逐步选择较大的刚性。	It is recommended to set a small value and gradually select larger stiffness while monitoring operating status of machine.
	厂家保留	Reserved by manufacturer
	常规自动调整模式设置	Normal auto adjustment mode setting
	电源重启	Power reboot
	旋转圈数：1 圈，旋转方向：CCW → CW	Rotating circles: 1; direction: CCW → CW
	旋转圈数：2 圈，旋转方向：CCW → CW	Rotating circles: 2; direction: CCW → CW
	旋转圈数：3 圈，旋转方向：CCW → CW	Rotating circles: 3; direction: CCW → CW
	旋转圈数：4 圈，旋转方向：CCW → CW	Rotating circles: 4; direction: CCW → CW
	旋转圈数：1 圈，旋转方向：CW → CCW	Rotating circles: 1; direction: CW → CCW
	旋转圈数：2 圈，旋转方向：CW → CCW	Rotating circles: 2; direction: CW → CCW
	旋转圈数：3 圈，旋转方向：CW → CCW	Rotating circles: 3; direction: CW → CCW
	旋转圈数：4 圈，旋转方向：CW → CCW	Rotating circles: 4; direction: CW → CCW

P□200	Position control command form selection switch	——	——	0000	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1

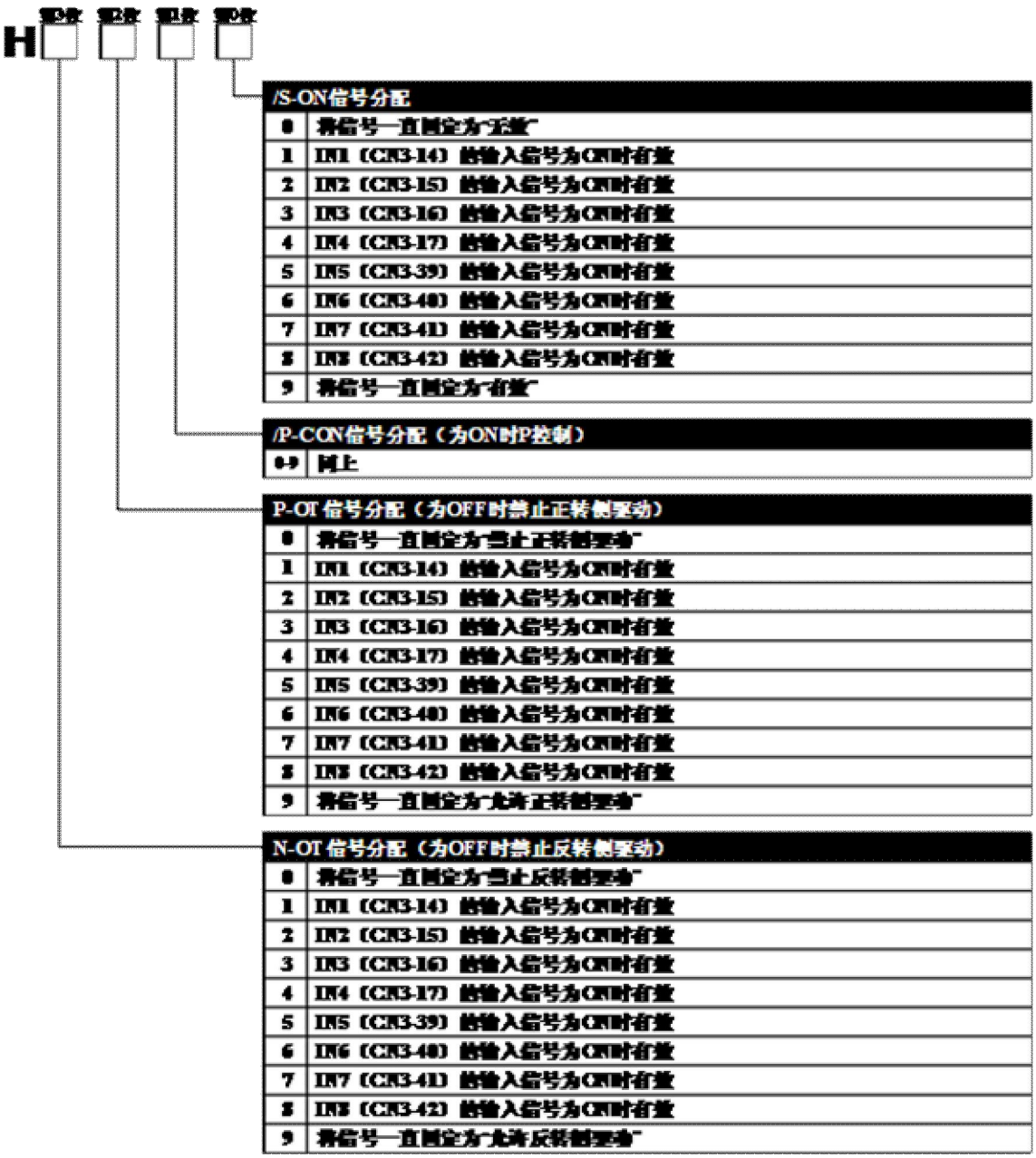
		第 0 位	Bit 0				
		偏移脉冲清除方式	Offset pulse clearing method				
		伺服 OFF 时清除偏移脉冲，超程时不清除偏移脉冲	Under servo OFF, clear offset pulse; under over travel, not clear offset pulse				
		伺服 OFF 或超程时，不清除偏移脉冲	Under servo OFF or over travel, not clear offset pulse				
		伺服 OFF 或超程时（零钳位除外）清除偏移脉冲	Clear offset pulse when servo is OFF or during overtravel (except for zero clamping position)				
		指令脉冲形态	Command pulse form				
		符号+脉冲	Sign + pulse				
		A 相+B 相（1 倍频）	A phase + B phase (1x frequency)				
		A 相+B 相（2 倍频）	A phase + B phase (2x frequency)				
		A 相+B 相（4 倍频）	A phase + B phase (4x frequency)				
		指令脉冲信号取反	Negation of command pulse signal				
		PULS 指令不取反，SIGN 指令不取反	No negation for pulse command and sign command				
		PULS 指令不取反，SIGN 指令取反	No negation for pulse command and negation for sign command				
		PULS 指令取反，SIGN 指令不取反	Negation for pulse command and no negation sign command				
		PULS 指令取反，SIGN 指令取反	No negation for pulse command and sign command				
		滤波器选择	Filter selection				
		总线驱动器信号指令输入滤波器	Bus drive signal command input filter				
		集电极开路信号指令输入滤波器	Collector open-circuit signal command input filter				
P□201	PG frequency dividing		16 ~ 32768	1 P/rev	2500	Y	
P□202	First electronic gear ratio (numerator)		1 ~ 65535	——	1	Y	
P□203	First electronic gear ratio (denominator)		1 ~ 65535	——	1	Y	
P□204	Second electronic gear ratio (numerator)		1 ~ 65535	——	1	Y	
P□205	Position command acceleration/deceleration time parameter		0 ~ 6400	0.1ms	0	N	
P□206	Position command filtering form selection		0 ~ 1	——	0	Y	
P□300	Speed command input gain		0 ~ 3000	(r/min)/V	150	N	
P□301	Internal speed 1		0 ~ 6000	1r/min	100	N	
P□302	Internal speed 2		0 ~ 6000	1r/min	200	N	
P□303	Internal speed 3		0 ~ 6000	1r/min	300	N	
P□304	Jogging (JOG) speed		0 ~ 6000	1r/min	500	N	
P□305	Acceleration time of soft start		0 ~ 10000	1 ms	0	N	
P□306	Deceleration time of soft start		0 ~ 10000	1 ms	0	N	
P□307	Speed command filtering constant		0 ~ 10000	1 ms	0	N	

P□308	Rise time of S curve	0 ~ 10000	1 ms	0	N	
P□309	Speed command curve form	——	——	0000	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
软启动方式	Soft start method
梯形	Trapezoid
S 曲线	S curve
加减速滤波	Acceleration and deceleration filtering
加减滤波形式	Acceleration and deceleration filtering form
一次滤波	First filtering
二次滤波	Second filtering
S 曲线比率选择	Selection of S curve ratio
接近线性	Close to linearity
低	Low
中	Central
高	Height
厂家保留	Reserved by manufacturer

P□400	Torque command input gain	10 ~ 100	0.1V/rated torque	30	N	
P□401	Torque command filter time parameter	0 ~ 250	0.1ms	4	N	
P□402	Second torque command filter time parameter	0 ~ 250	0.1ms	4	N	
P□403	Positive torque limit	0 ~ 300	1 %	300	N	
P□404	Negative torque limit	0 ~ 300	1 %	300	N	
P□405	External limit of forward torque	0 ~ 300	1 %	100	N	
P□406	External limit of reserve torque	0 ~ 300	1 %	100	N	
P□407	Limit of plug braking torque	0 ~ 300	1 %	300	N	

P□408	Speed limit under torque control	0 ~ 6000	1r/min	1500	N	
P□409	Frequency of notch filter section 1	50 ~ 5000	1Hz	5000	N	
P□410	Depth of notch filter section 1	0 ~ 100	——	10	N	
P□411	Frequency of notch filter section 2	50 ~ 5000	1 Hz	5000	N	
P□412	Depth of notch filter section 2	0 ~ 100	——	10	N	
P□413	B type vibration frequency	10 ~ 1000	0.1 Hz	1000	N	
P□414	B type vibration damping	0 ~ 200	——	25	N	
P□500	Positioning completion width	0 ~ 5000	1 command unit	10	N	
P□501	Zero clamping level	0 ~ 3000	1r/min	10	N	
P□502	Rotation detection of electric level	0 ~ 3000	1r/min	20	N	
P□503	Same-speed signal detection width	0 ~ 100	1r/min	10	N	
P□504	Offset pulse overflow level	1 ~ 32767	256 command unit	1024	N	
P□505	Latency time for servo to turn on	0 ~ 2000	ms	0	N	
P□506	Brake command - delay time for servo OFF	0 ~ 500	10ms	0	N	
P□507	Level for output speed of brake command	0 ~ 6000	1r/min	100	N	
P□508	Brake command latency time when servo is OFF	10 ~ 100	10ms	50	N	
P□509	Input signal selection 1	——	——	4321	Y	8765 (double axis/b)



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
/S-ON 信号分配	/S-ON signal distribution
将信号一直固定为“无效”	Set signal fixed to be "inactive"
IN1（CN3-14）的输入信号为 ON 时有效	Active when IN1 (CN3-14) input signal is ON
IN2（CN3-15）的输入信号为 ON 时有效	Active when IN2 (CN3-15) input signal is ON
IN3（CN3-16）的输入信号为 ON 时有效	Active when IN3 (CN3-16) input signal is ON
IN4（CN3-17）的输入信号为 ON 时有效	Active when IN4 (CN3-17) input signal is ON
IN5（CN3-39）的输入信号为 ON 时有效	Active when IN5 (CN3-39) input signal is ON
IN6（CN3-40）的输入信号为 ON 时有效	Active when IN6 (CN3-40) input signal is ON
IN7（CN3-41）的输入信号为 ON 时有效	Active when IN7 (CN3-41) input signal is ON

IN8（CN3-42）的输入信号为 ON 时有效	Active when IN8 (CN3-42) input signal is ON
将信号一直固定为“有效”	Set signal fixed to be "active"
/P-CON 信号分配（为 ON 时 P 控制）	/P-CON signal distribution (P control when input signal is ON)
同上	Ditto
P-OT 信号分配（为 OFF 时禁止正转侧驱动）	P-OT signal distribution (positive rotation side drive prohibited when input signal is OFF)
将信号一直固定为“禁止正转侧驱动”	Set signal fixed to be "positive rotation side drive prohibited"
IN1（CN3-14）的输入信号为 ON 时有效	Active when IN1 (CN3-14) input signal is ON
IN2（CN3-15）的输入信号为 ON 时有效	Active when IN2 (CN3-15) input signal is ON
IN3（CN3-16）的输入信号为 ON 时有效	Active when IN3 (CN3-16) input signal is ON
IN4（CN3-17）的输入信号为 ON 时有效	Active when IN4 (CN3-17) input signal is ON
IN5（CN3-39）的输入信号为 ON 时有效	Active when IN5 (CN3-39) input signal is ON
IN6（CN3-40）的输入信号为 ON 时有效	Active when IN6 (CN3-40) input signal is ON
IN7（CN3-41）的输入信号为 ON 时有效	Active when IN7 (CN3-41) input signal is ON
IN8（CN3-42）的输入信号为 ON 时有效	Active when IN8 (CN3-42) input signal is ON
将信号一直固定为“允许正转侧驱动”	Set signal fixed to be "positive rotation side drive enabled"
N-OT 信号分配（为 OFF 时禁止反转侧驱动）	N-OT signal distribution (negative side drive prohibited when input signal is OFF)
将信号一直固定为“禁止反转侧驱动”	Set signal fixed to be "negative side drive prohibited"
IN1（CN3-14）的输入信号为 ON 时有效	Active when IN1 (CN3-14) input signal is ON
IN2（CN3-15）的输入信号为 ON 时有效	Active when IN2 (CN3-15) input signal is ON
IN3（CN3-16）的输入信号为 ON 时有效	Active when IN3 (CN3-16) input signal is ON
IN4（CN3-17）的输入信号为 ON 时有效	Active when IN4 (CN3-17) input signal is ON
IN5（CN3-39）的输入信号为 ON 时有效	Active when IN5 (CN3-39) input signal is ON
IN6（CN3-40）的输入信号为 ON 时有效	Active when IN6 (CN3-40) input signal is ON
IN7（CN3-41）的输入信号为 ON 时有效	Active when IN7 (CN3-41) input signal is ON
IN8（CN3-42）的输入信号为 ON 时有效	Active when IN8 (CN3-42) input signal is ON
将信号一直固定为 允许反转侧驱动	Set signal fixed to be "negative rotation side drive enabled"

Parameter No.	Name	Setting range	Setting unit	Factory setting	Power reboot	Remarks
P□510	Input signal selection 2	——	——	8765 (single axis)	Y	0000 (double axis)

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
/ALM-RST 信号分配（从 OFF 变为 ON 时清除报警）	/ALM-RST signal distribution (remove alarm when turning from OFF to ON)
将信号一直固定为 OFF	Set signal fixed to be "OFF"
IN1（CN3-14）的输入信号为 ON 时有效	Active when IN1 (CN3-14) input signal is ON
IN2（CN3-15）的输入信号为 ON 时有效	Active when IN2 (CN3-15) input signal is ON
IN3（CN3-16）的输入信号为 ON 时有效	Active when IN3 (CN3-16) input signal is ON
IN4（CN3-17）的输入信号为 ON 时有效	Active when IN4 (CN3-17) input signal is ON
IN5（CN3-39）的输入信号为 ON 时有效	Active when IN5 (CN3-39) input signal is ON
IN6（CN3-40）的输入信号为 ON 时有效	Active when IN6 (CN3-40) input signal is ON
IN7（CN3-41）的输入信号为 ON 时有效	Active when IN7 (CN3-41) input signal is ON
IN8（CN3-42）的输入信号为 ON 时有效	Active when IN8 (CN3-42) input signal is ON
将信号一直固定为“ON”	Set signal fixed to be "ON"
/CLR 信号分配	/CLR signal distribution
与/S-ON 信号变换相同	Same with /S-ON signal conversion
/P-CL 信号分配	/P-CL signal distribution
同上	Ditto
/N-CL 信号分配	/N-CL signal distribution
同上	Ditto

P□511	Input signal selection 3	——	——	0000	Y	

第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
/G-SEL信号分配	/G-SEL signal distribution
与/S-ON信号变换相同	Same with /S-ON signal conversion
/POS0信号分配	/POS0 signal distribution
同上	Ditto
/POS1信号分配	/POS1 signal distribution
同上	Ditto
/POS2信号分配	/POS2 signal distribution
同上	Ditto

P□512	Input signal selection 4	——	——	0000	Y	

第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
与/S-ON信号变换相同	Same with /S-ON signal conversion
与/S-ON信号变换相同	Same with /S-ON signal conversion
与/S-ON信号变换相同	Same with /S-ON signal conversion
与/S-ON信号变换相同	Same with /S-ON signal conversion

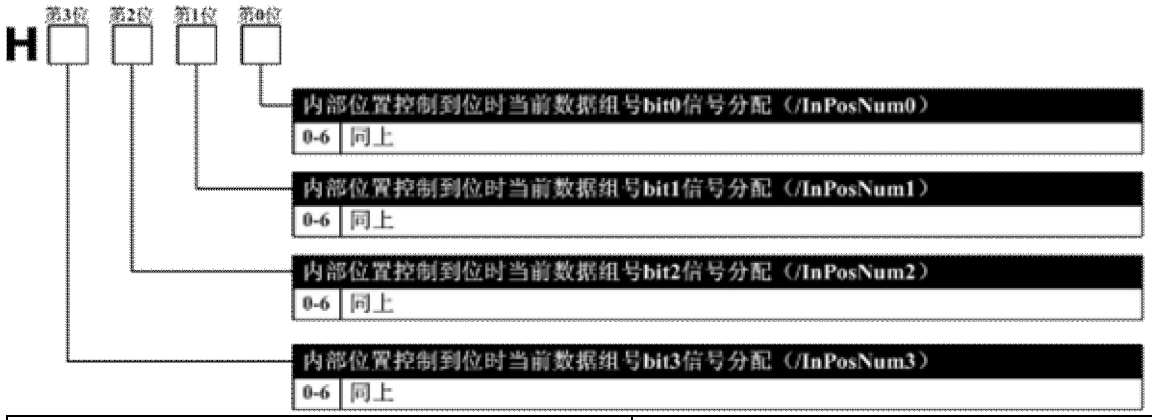
Parameter No.	Name	Setting range	Setting unit	Factory setting	Power reboot	Remarks
P□513	Output signal selection 1	——	——	4321	Y	0321 (double axis/A) 0654 (double axis/b)

第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
伺服报警信号分配（ALM）	Servo alarm signal distribution (ALM)
无效（不使用该信号）	Inactive (not using the signal)
通过OUT1（CN3-7、8）输出端子输出该上述信号	Output such signal via OUT1 (CN3-7 and CN3-8) output terminal
通过OUT2（CN3-9、10）输出端子输出该上述信号	Output such signal via OUT2 (CN3-9 and CN3-10) output terminal
通过OUT3（CN3-11、12）输出端子输出该上述信号	Output such signal via OUT3 (CN3-11 and CN3-12) output terminal
通过OUT4（CN3-32、33）输出端子输出该上述信号	Output such signal via OUT4 (CN3-32 and CN3-33) output terminal
通过OUT5（CN3-34、35）输出端子输出该上述信号	Output such signal via OUT5 (CN3-34 and CN3-35) output terminal
通过OUT6（CN3-36、37）输出端子输出该上述信号	Output such signal via OUT6 (CN3-36 and CN3-37) output terminal
定位完成信号分配（/COIN）/ 同速检测信号分配（/V-CMP）	Positioning completion signal distribution (/COIN)/same-speed detection signal distribution (/V-CMP)
同上	Ditto

	电机旋转检测信号分配（/TGON）	Motor rotation detection signal distribution (/TGON)				
	同上	Ditto				
	伺服准备就绪信号分配（/S-RDY）	Servo ready signal distribution (/S-RDY)				
	同上	Ditto				
P□514	Output signal selection 2	——	——	0065	Y	0000 (double axis)

第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
扭矩限制输出信号分配（/CLT）	Torque limit output signal distribution (/CLT)
与ALM信号变换相同	Same with ALM signal conversion
制动器信号分配（/BK）	Brake signal distribution (/BK)
同上	Ditto
编码器原点信号分配（/PGC）	Encoder origin signal distribution (/PGC)
同上	Ditto
厂家保留	Reserved by manufacturer

P□515	Output signal selection 3	——	——	0000	Y	

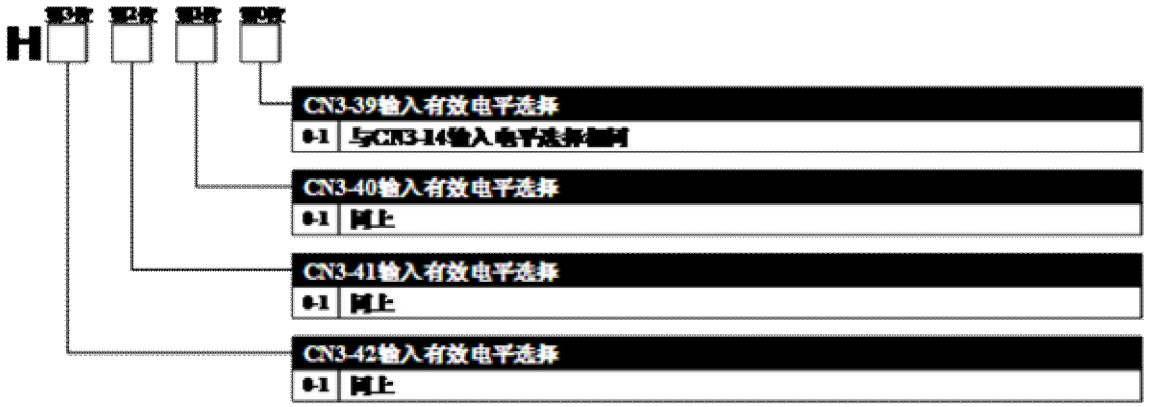


第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
内部位置控制到位时当前数据组号bit0信号分配	Current data set number bit 0 signal distribution

	（/InPosNum0）		when internal position control is in place (/InPosNum0)			
	同上		Ditto			
	内部位置控制到位时当前数据组号bit1信号分配（/InPosNum1）		Current data set number bit 1 signal distribution when internal position control is in place (/InPosNum1)			
	同上		Ditto			
	内部位置控制到位时当前数据组号bit2信号分配（/InPosNum2）		Current data set number bit 2 signal distribution when internal position control is in place (/InPosNum2)			
	同上内部位置控制到位时当前数据组号bit3信号分配（/InPosNum3）		Current data set number bit 3 signal distribution when internal position control is in place (/InPosNum3)			
	同上		Ditto			
P□516	Reserved by manufacturer	——	——	——	N	
P□517	Input port filtering time parameter	0 ~ 1000	0.1ms	1	N	
P□518	Alarm input filtering time parameter	0 ~ 3	0.1ms	1	N	
P□519	Active input port signal level selection 1	——	——	0000	N	

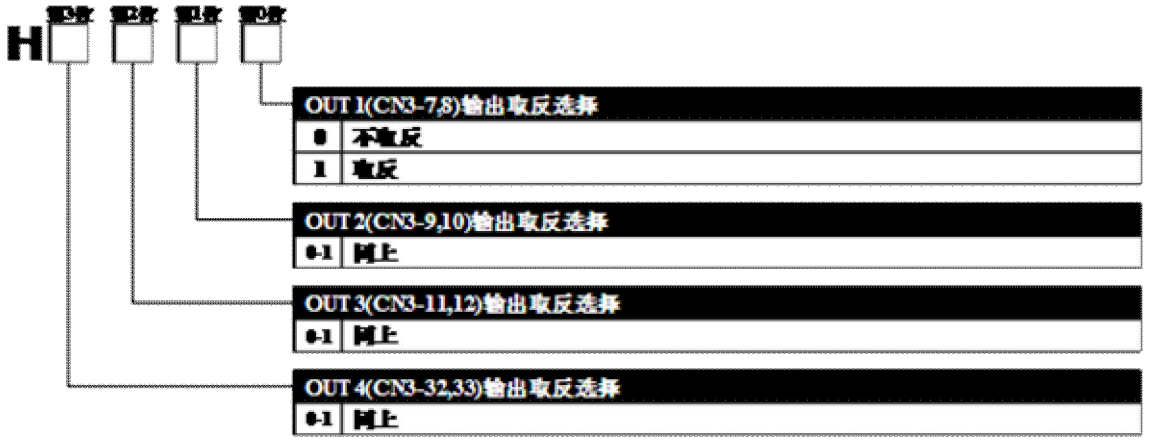
第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
CN3-14输入有效电平选择	CN3-14 active input level selection
输入信号ON（L电平）时有效	Active when input signal is ON (L level)
输入信号OFF（H电平）时有效	Active when input signal is OFF (H level)
CN3-15输入有效电平选择	CN3-15 active input level selection
同上	Ditto
CN3-16输入有效电平选择	CN3-16 active input level selection
同上	Ditto
CN3-17输入有效电平选择	CN3-17 active input level selection

	同上		Ditto			
P□520	Input port signal logic selection 2	——	——	0000	N	



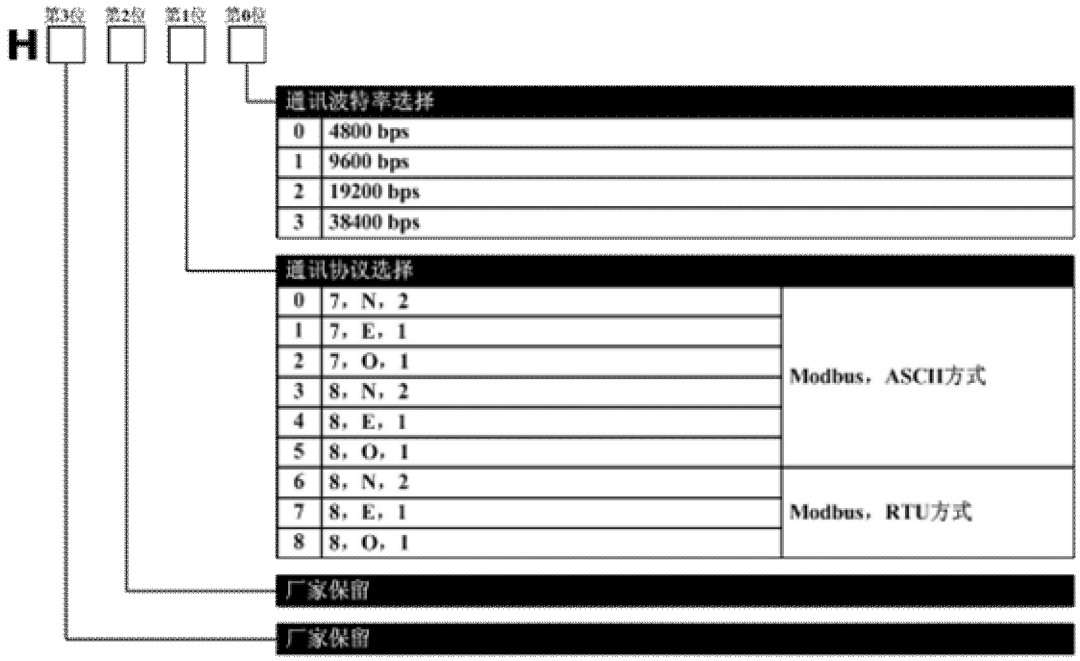
第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
CN3-39输入有效电平选择	CN3-39 active input level selection
与CN3-14输入电平选择相同	Same with CN3-14 input level selection
CN3-40输入有效电平选择	CN3-40 active input level selection
同上	Ditto
CN3-41输入有效电平选择	CN3-41 active input level selection
同上	Ditto
CN3-42输入有效电平选择	CN3-42 active input level selection
同上	Ditto

P□521	Output port signal negation selection 1	——	——	0000	N	



第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
OUT1(CN3-7,8)输出取反选择	OUT1 (CN3-7 and CN3-8) output negation selection
不取反	Not negation

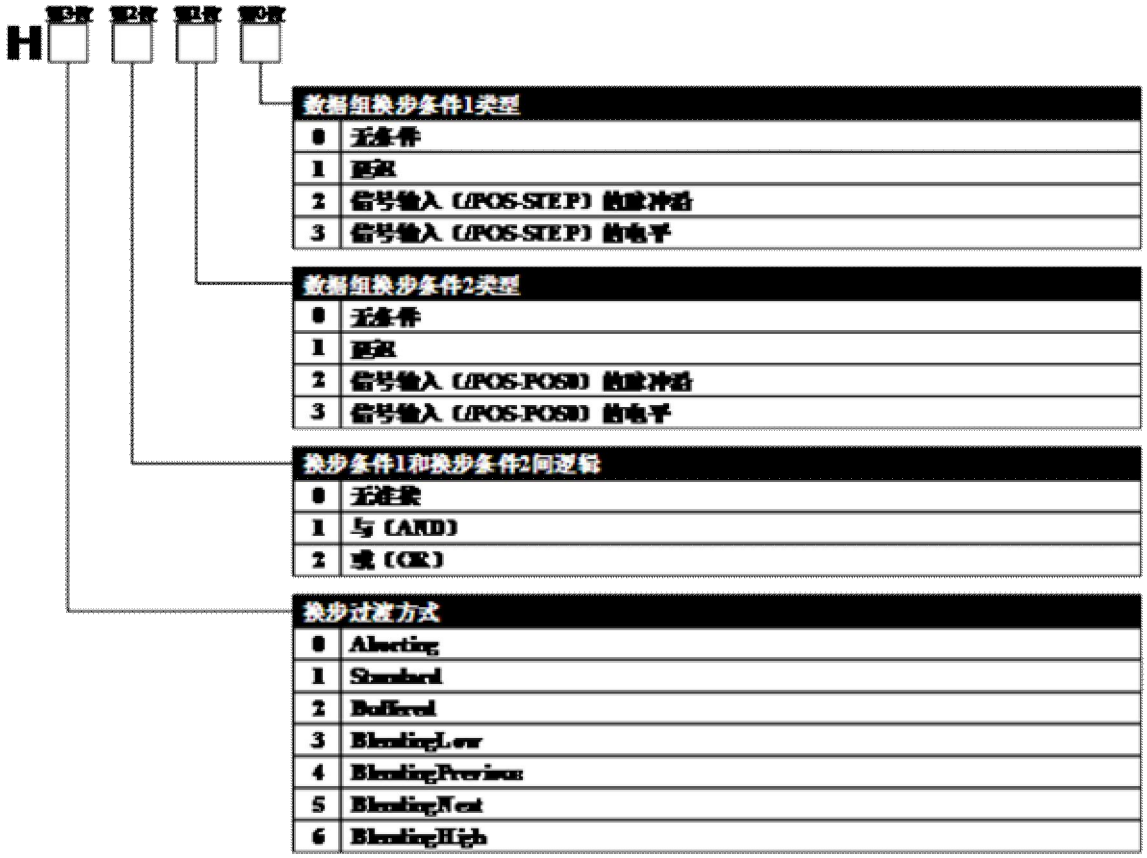
	取反	Negation				
	OUT2(CN3-9,10)输出取反选择	OUT2 (CN3-9 and CN3-10) output negation selection				
	同上	Ditto				
	OUT3(CN3-11,12)输出取反选择	OUT3 (CN3-11 and CN3-12) output negation selection				
	同上	Ditto				
	OUT4(CN3-32,33)输出取反选择	OUT4 (CN3-32 and CN3-33) output negation selection				
	同上	Ditto				
P□522	Output port signal negation selection 2	——	——	0000	N	
						
	第3位	Bit 3				
	第2位	Bit 2				
	第1位	Bit 1				
	第0位	Bit 0				
	OUT5(CN3-34,35)输出取反选择	OUT5 (CN3-34 and CN3-35) output negation selection				
	同上	Ditto				
	OUT6(CN3-36,37)输出取反选择	OUT6 (CN3-36 and CN3-37) output negation selection				
	同上	Ditto				
	厂家保留	Reserved by manufacturer				
P□600	RS-485 communication parameter selection switch	——	——	0151	Y	



第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
通讯波特率选择	Communication baud rate selection
通讯协议选择	Communication protocol selection
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer

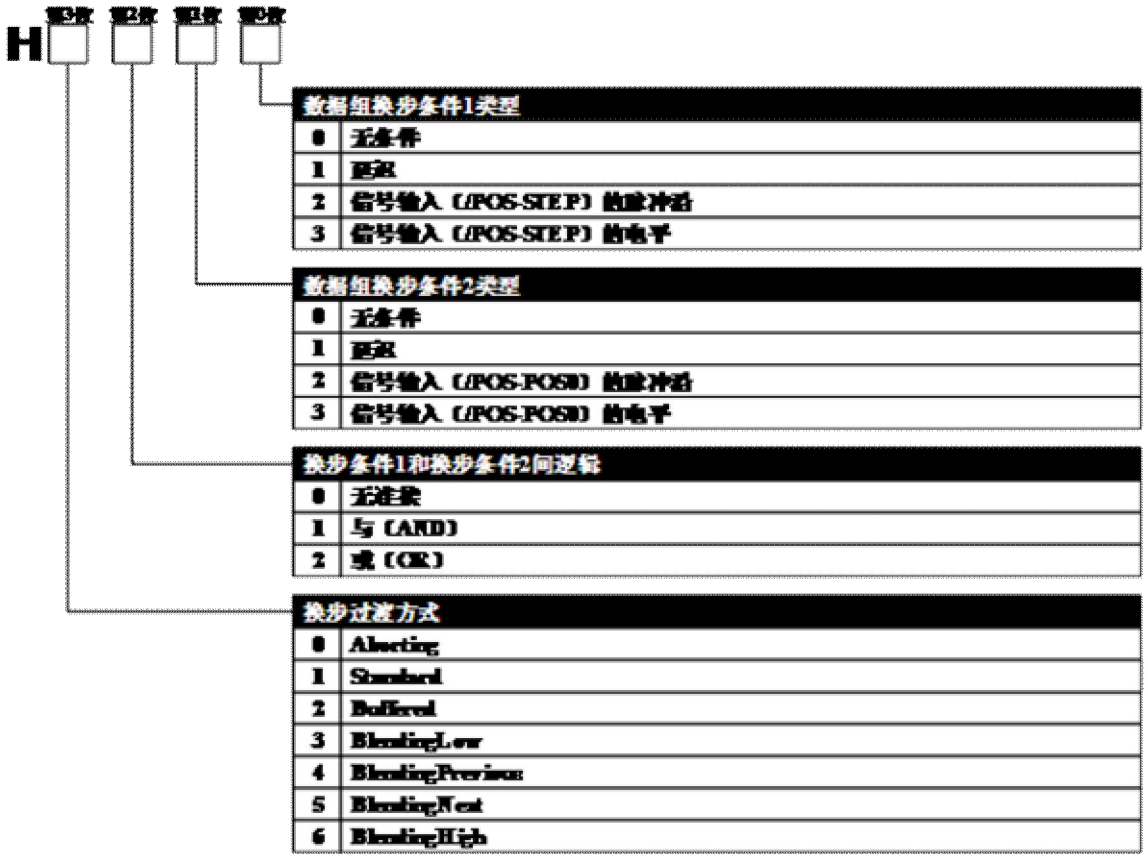
P□601	RS-485 communication axis address	1 ~ 127	——	1 (A axis)	Y	2 (b axis)
P□602	RS-485 communication timeout parameter	0 ~ 1000	100 ms	0	N	
P□603	Reserved by manufacturer	——	——	0000	N	
P□604	Reserved by manufacturer	——	——	0000	N	
P□605	Reserved by manufacturer	——	——	0000	N	
P□606	Reserved by manufacturer	——	——	0000	N	
P□607	Reserved by manufacturer	——	——	0000	N	
P□608	Reserved by manufacturer	——	——	0000	N	
P□609	Reserved by manufacturer	——	——	0000	N	
P□610	Type of data set 8	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□611	Low position value of Data Set 8	-9999~+9999	1-command pulse	0	Y	
P□612	High position value of Data Set 8	-9999~+9999	10000-command pulse	0	Y	
P□613	Speed of data set 8	0 ~ 6000	rpm	100	Y	

P□614	Step change attribute in Data Set 8	——	——	0000	Y	



第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
数据组换步条件1类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件2类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件1和换步条件2间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

P□615	Step change condition value 1 in data set 8	0 ~ 65535	——	0	Y	

	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□616	Step change condition value 2 in data set 8	0 ~ 65535	——	0	Y	
	Ditto					
P□617	Subsequent data set number after data set 8	0 ~ 14	——	9	Y	
P□618	Type of data set 9	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□619	Low position value of Data Set 9	-9999~+9999	1-command pulse	0	Y	
P□620	High position value of Data Set 9	-9999~+9999	10000-command pulse	0	Y	
P□621	Speed of data set 9	0 ~ 6000	rpm	100	Y	
P□622	Step change attribute in Data Set 9	——	——	0000	Y	
						

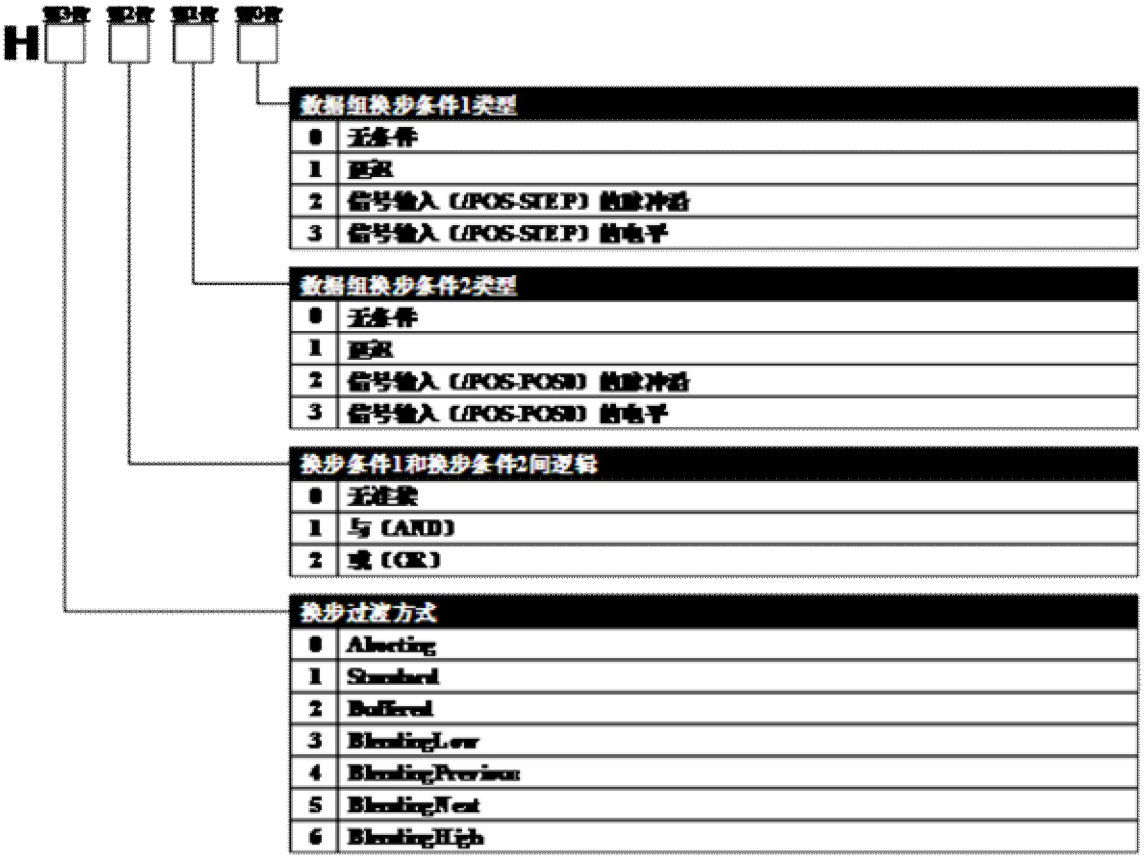
第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

P□623	Step change condition value 1 in data set 9	0 ~ 65535	——	0	Y	
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□624	Step change condition value 2 in data set 9	0 ~ 65535	——	0	Y	
	Ditto					
P□625	Subsequent data set number after data set 9	0 ~ 14	——	10	Y	
P□626	Type of data set 10	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□627	Low position value of Data Set 10	-9999~+9999	1-command pulse	0	Y	
P□628	High position value of Data Set 10	-9999~+9999	10000-command	0	Y	

			pulse			
P□629	Speed of data set 10	0 ~ 6000	rpm	100	Y	
P□630	Step change attribute in Data Set 10	——	——	0000	Y	

第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
数据组换步条件1类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件2类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件1和换步条件2间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

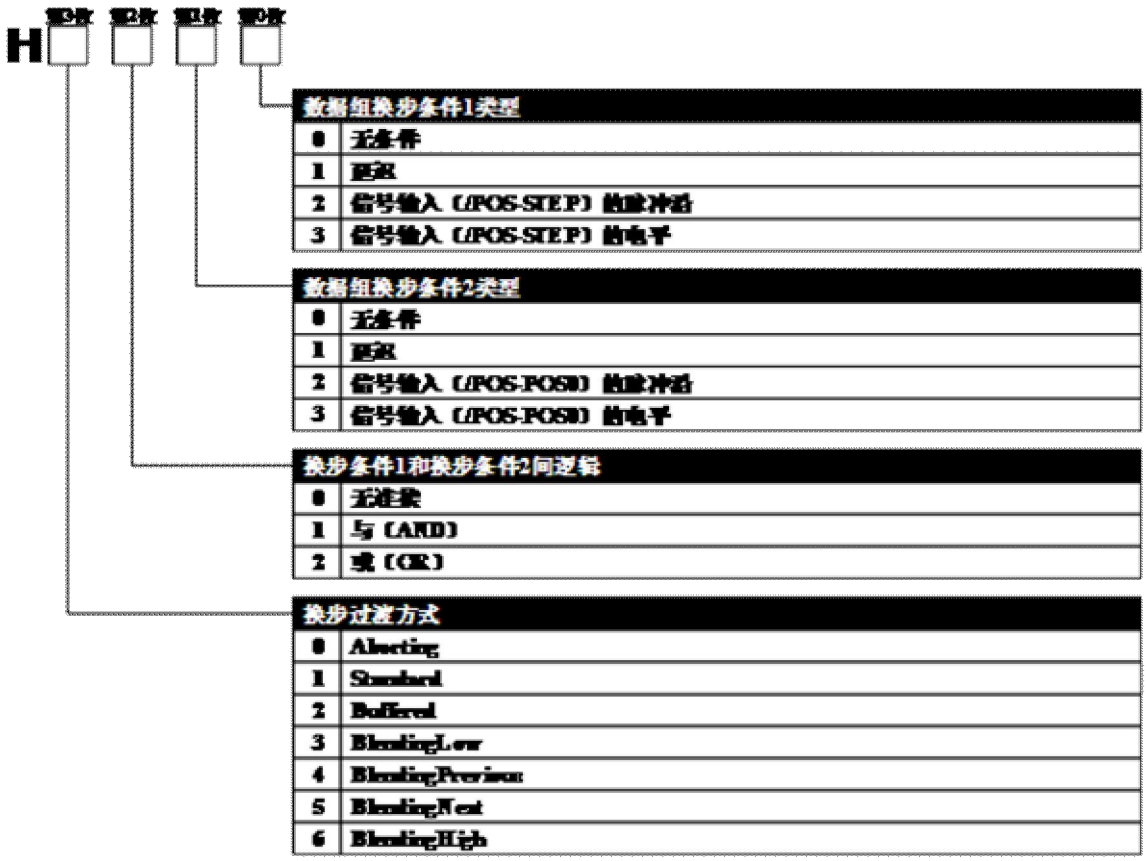
P□631	Step change condition value 1 in data set 10	0 ~ 65535	——	0	Y	
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□632	Step change condition value 2 in data set 10	0 ~ 65535	——	0	Y	
	Ditto					
P□633	Subsequent data set number after data set 10	0 ~ 14	——	11	Y	
P□634	Type of data set 11	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□635	Low position value of Data Set 11	-9999~+9999	1-command pulse	0	Y	
P□636	High position value of Data Set 11	-9999~+9999	10000-command pulse	0	Y	
P□637	Speed of data set 11	0 ~ 6000	rpm	100	Y	
P□638	Step change attribute in Data Set 11	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

P□639	Step change condition value 1 in data set 11	0 ~ 65535	——	0	Y	

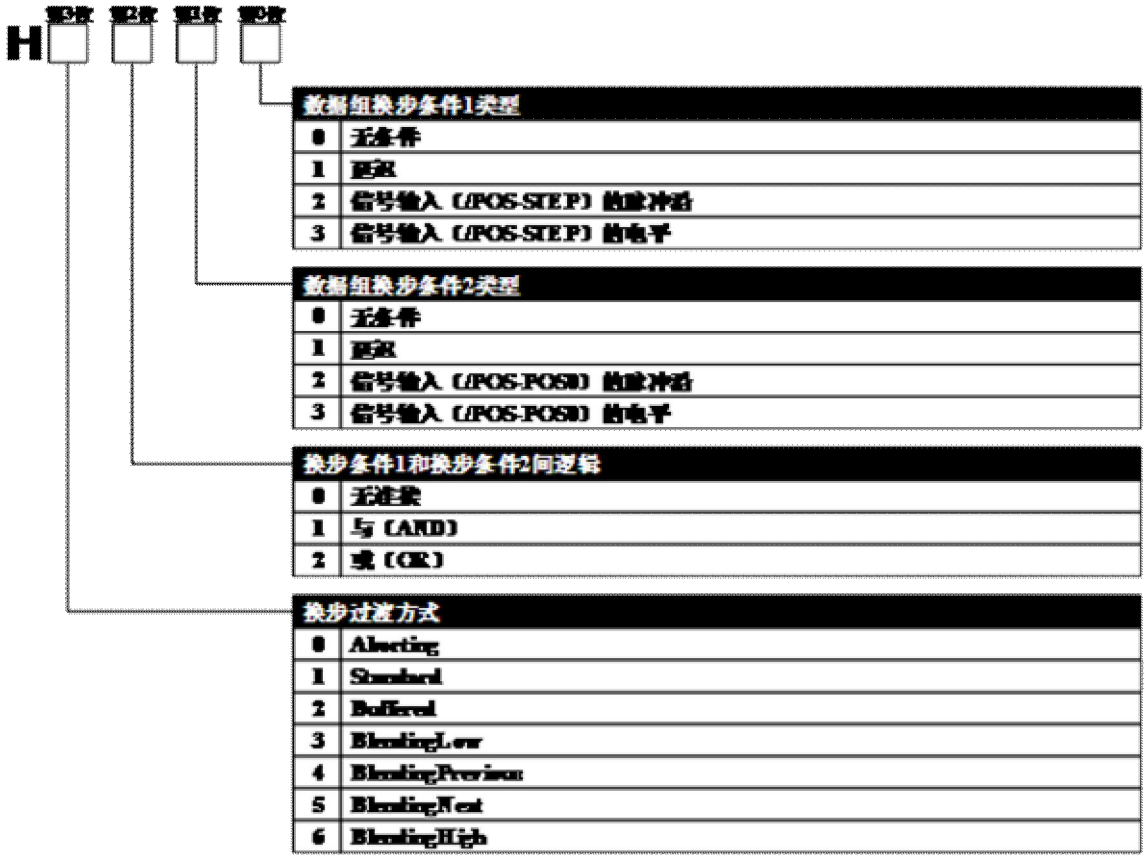
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□640	Step change condition value 2 in data set 11	0 ~ 65535	——	0	Y	
	Ditto					
P□641	Subsequent data set number after data set 11	0 ~ 14	——	12	Y	
P□642	Type of data set 12	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□643	Low position value of Data Set 12	-9999~+9999	1-command pulse	0	Y	
P□644	High position value of Data Set 12	-9999~+9999	10000-command pulse	0	Y	
P□645	Speed of data set 12	0 ~ 6000	rpm	100	Y	
P□646	Step change attribute in Data Set 12	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

P□647	Step change condition value 1 in data set 12	0 ~ 65535	——	0	Y	

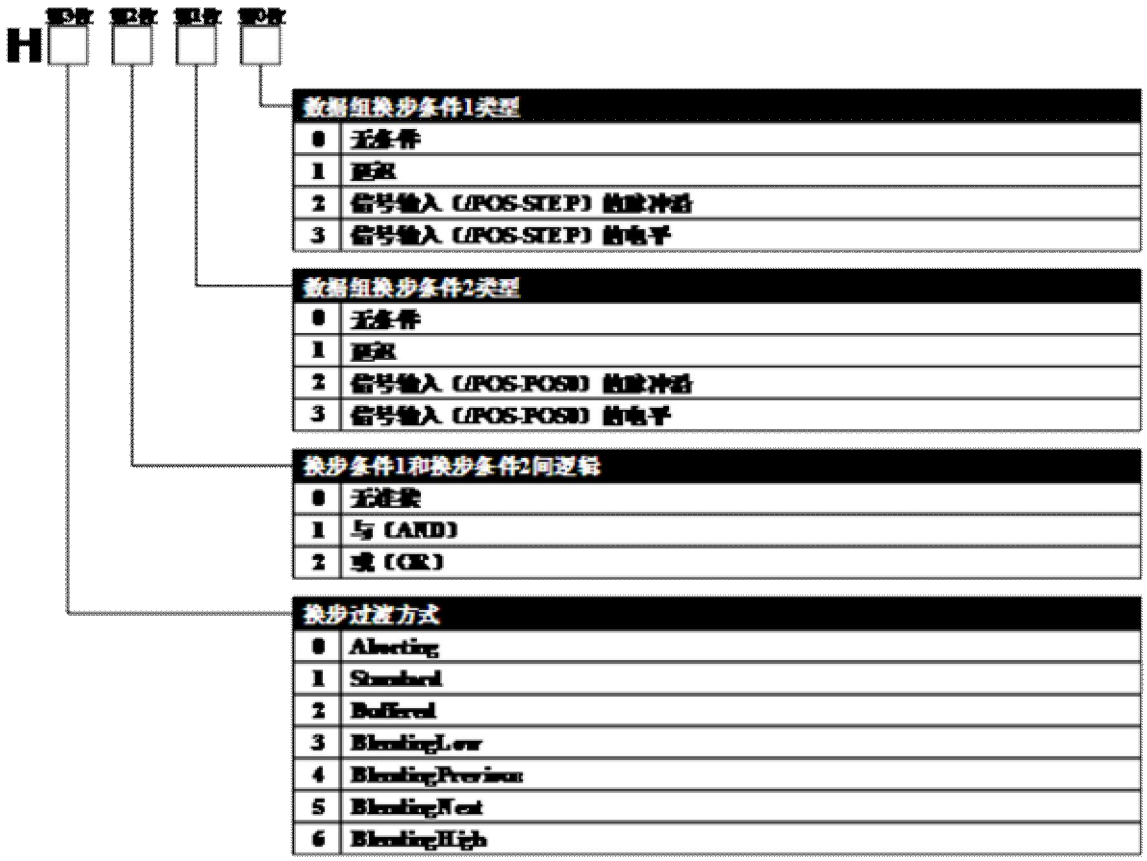
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□648	Step change condition value 2 in data set 12	0 ~ 65535	——	0	Y	
	Ditto					
P□649	Subsequent data set number after data set 12	0 ~ 14	——	13	Y	
P□650	Type of data set 13	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□651	Low position value of Data Set 13	-9999~+9999	1-command pulse	0	Y	
P□652	High position value of Data Set 13	-9999~+9999	10000-command pulse	0	Y	
P□653	Speed of data set 13	0 ~ 6000	rpm	100	Y	
P□654	Step change attribute in Data Set 13	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

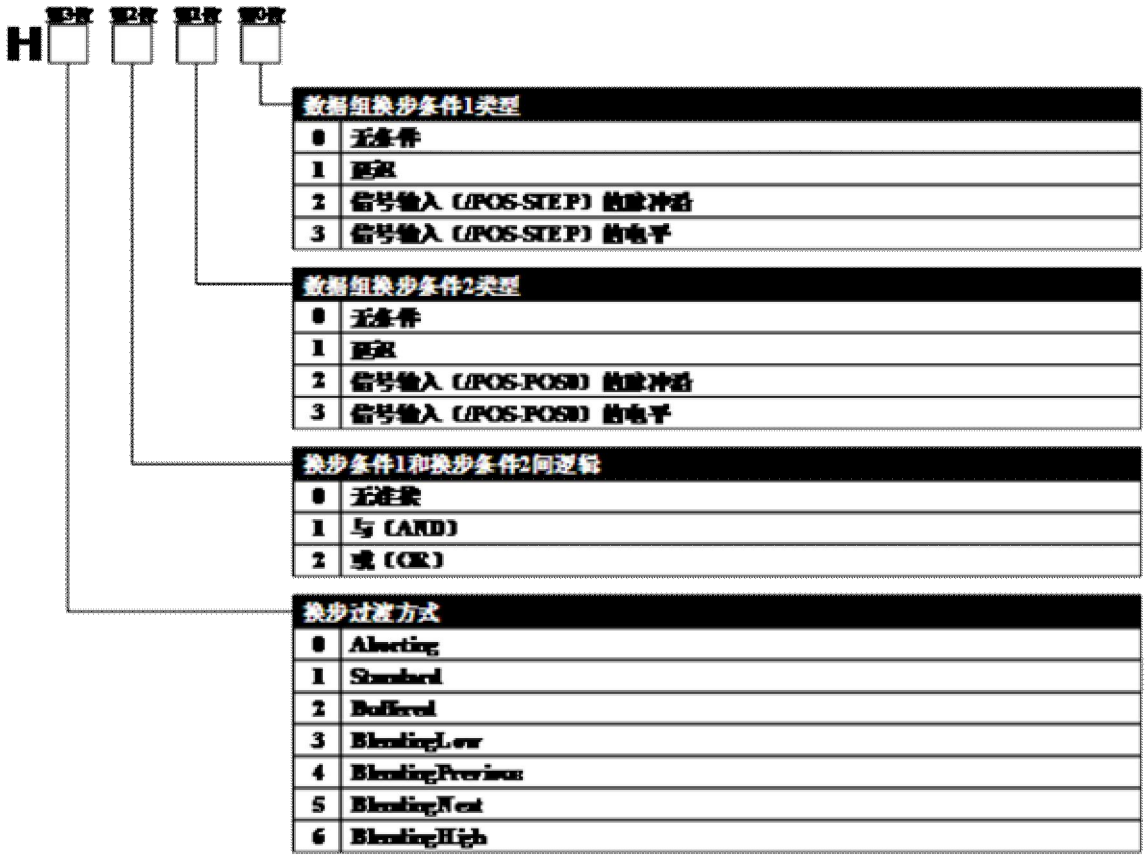
P□655	Step change condition value 1 in data set 13	0 ~ 65535	——	0	Y	

	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□656	Step change condition value 2 in data set 13	0 ~ 65535	——	0	Y	
	Ditto					
P□657	Subsequent data set number after data set 13	0 ~ 14	——	14	Y	
P□658	Type of data set 14	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□659	Low position value of Data Set 14	-9999~+9999	1-command pulse	0	Y	
P□660	High position value of Data Set 14	-9999~+9999	10000-command pulse	0	Y	
P□661	Speed of data set 14	0 ~ 6000	rpm	100	Y	
P□662	Step change attribute in Data Set 14	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

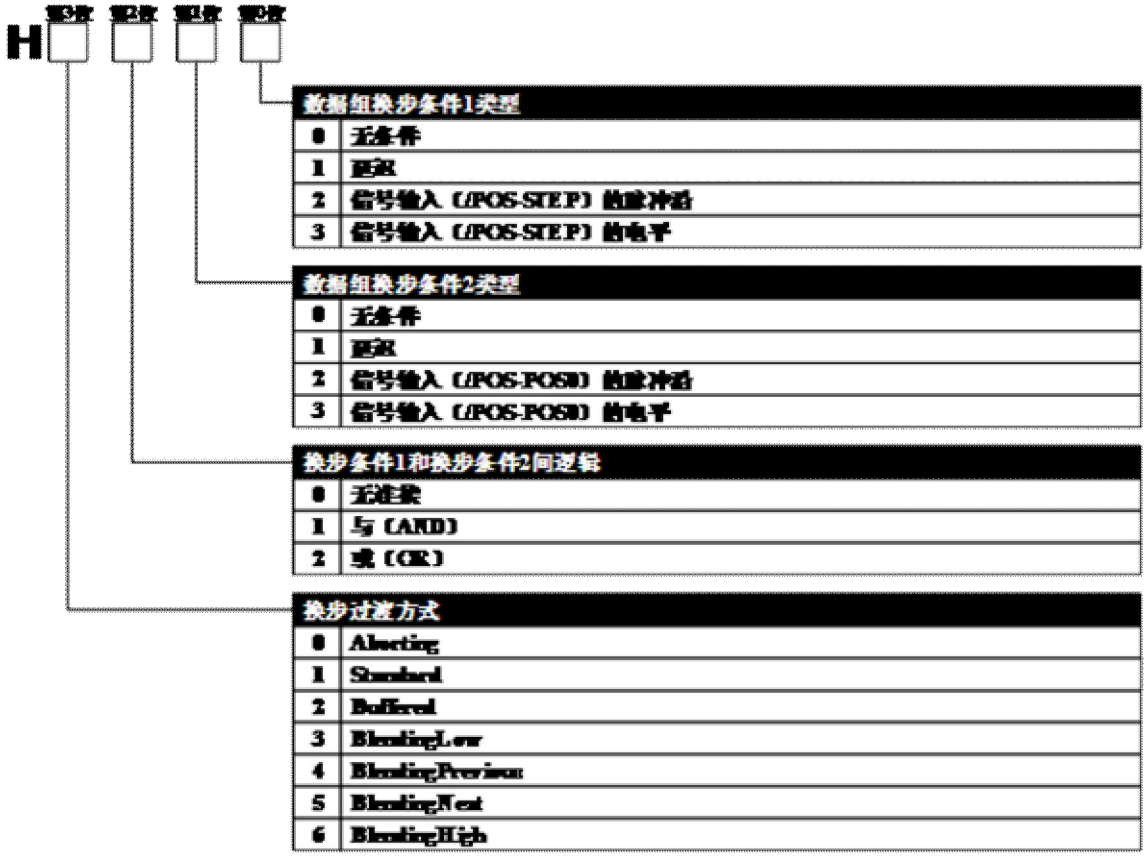
P□663	Step change condition value 1 in data set 14	0 ~ 65535	——	0	Y	

	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□664	Step change condition value 2 in data set 14	0 ~ 65535	——	0	Y	
	Ditto					
P□665	Subsequent data set number after data set 14	0 ~ 14	——	0	Y	
P□700	Type of data set 0	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□701	Low position value of Data Set 0	-9999~+9999	1-command pulse	0	Y	
P□702	High position value of Data Set 0	-9999~+9999	10000-command pulse	0	Y	
P□703	Speed of data set 0	0 ~ 6000	rpm	100	Y	
P□704	Step change attribute in Data Set 0	——	——	0000	Y	
						

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

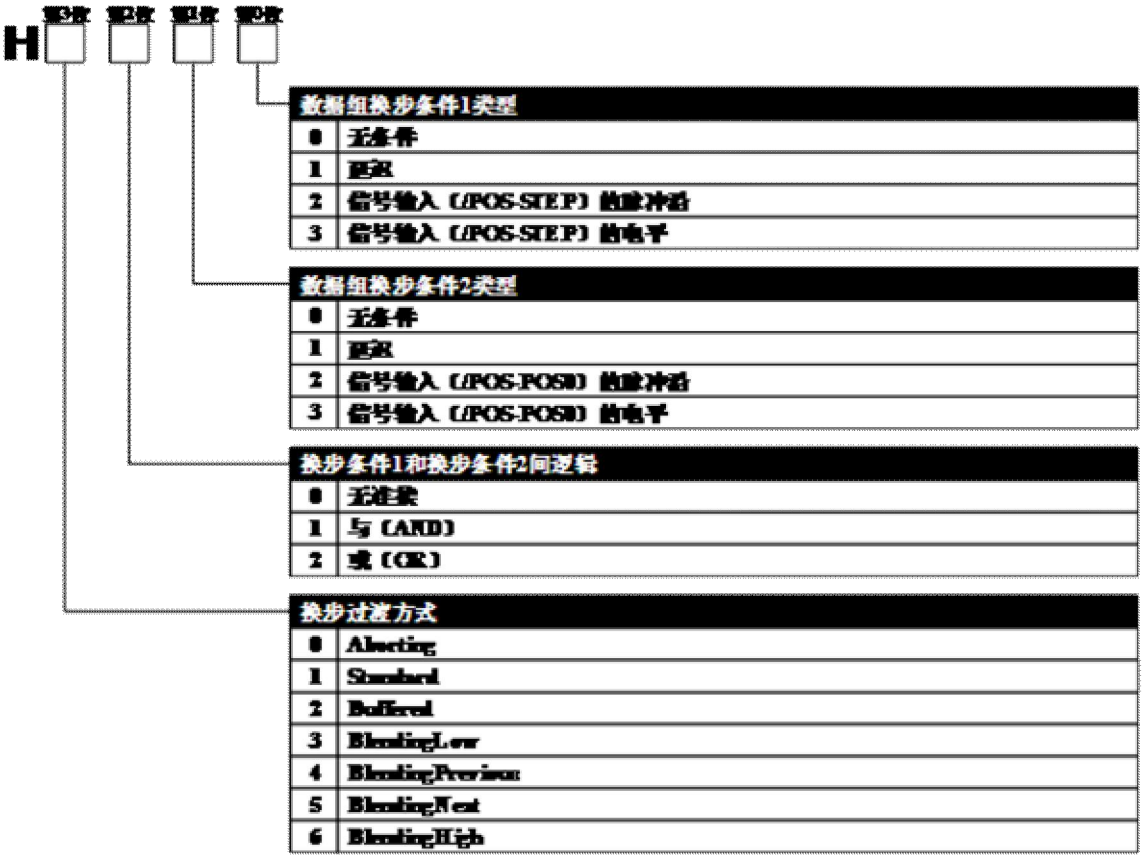
P□705	Step change condition value 1 in data set 0	0 ~ 65535	——	0	Y	
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□706	Step change condition value 2 in data set 0	0 ~ 65535	——	0	Y	
	Ditto					
P□707	Subsequent data set number after data set 0	0 ~ 14	——	1	Y	
P□708	Type of data set 1	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□709	Low position value of Data Set 1	-9999~+9999	1-command pulse	0	Y	
P□710	High position value of Data Set 1	-9999~+9999	10000-command	0	Y	

			pulse			
P□711	Speed of data set 1	0 ~ 6000	rpm	100	Y	
P□712	Step change attribute in Data Set 1	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

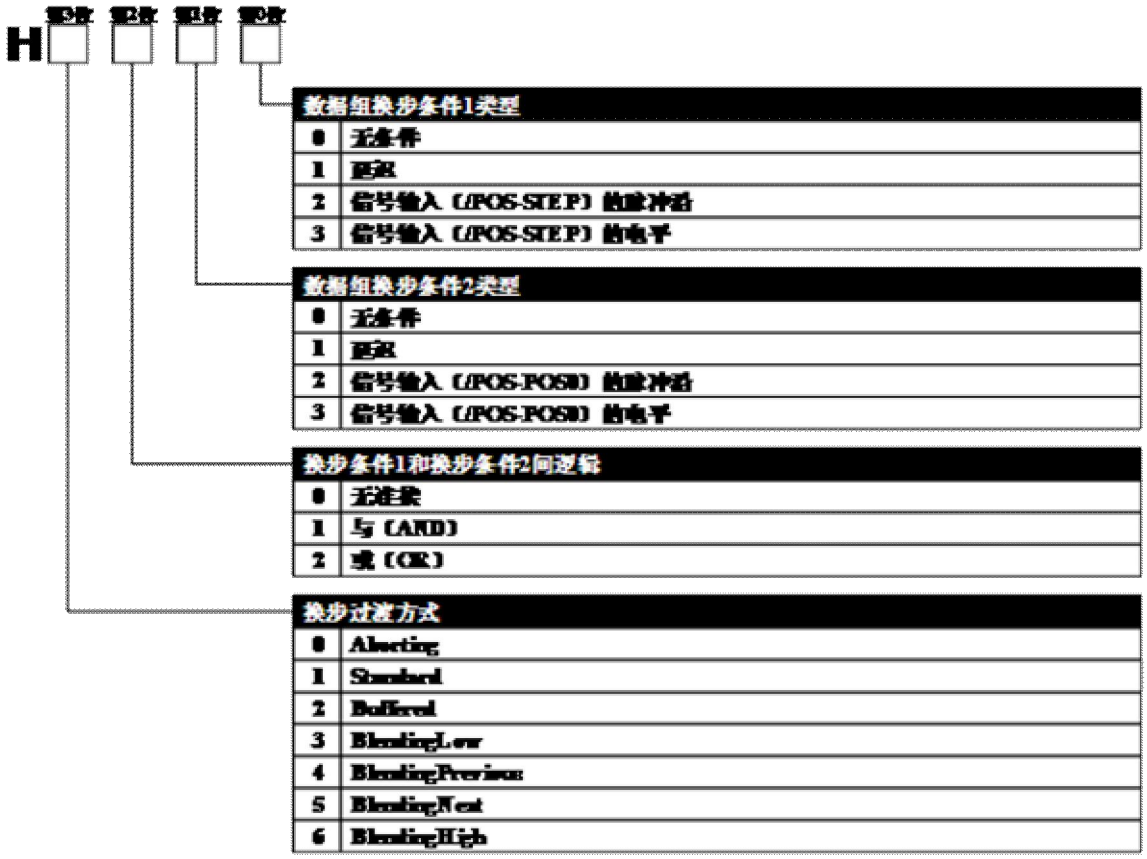
P□713	Step change condition value 1 in data set 1	0 ~ 65535	——	0	Y	
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□714	Step change condition value 2 in data set 1	0 ~ 65535	——	0	Y	
	Ditto					
P□715	Subsequent data set number after data set 1	0 ~ 14	——	2	Y	
P□716	Type of data set 2	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□717	Low position value of Data Set 2	-9999~+9999	1-command pulse	0	Y	
P□718	High position value of Data Set 2	-9999~+9999	10000-command pulse	0	Y	
P□719	Speed of data set 2	0 ~ 6000	rpm	100	Y	
P□720	Step change attribute in Data Set 2	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

P□721	Step change condition value 1 in data set 2	0 ~ 65535	——	0	Y	

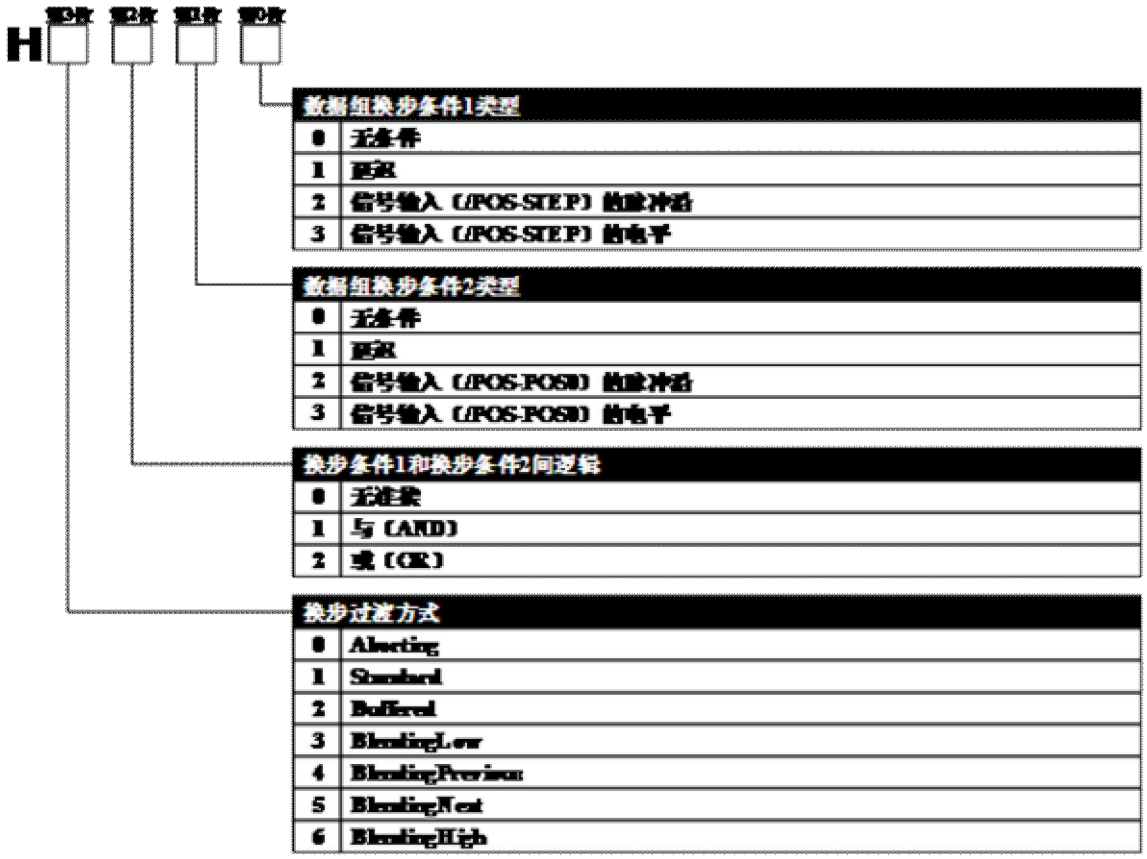
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□722	Step change condition value 2 in data set 2	0 ~ 65535	——	0	Y	
	Ditto					
P□723	Subsequent data set number after data set 2	0 ~ 14	——	3	Y	
P□724	Type of data set 3	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□725	Low position value of Data Set 3	-9999~+9999	1-command pulse	0	Y	
P□726	High position value of Data Set 3	-9999~+9999	10000-command pulse	0	Y	
P□727	Speed of data set 3	0 ~ 6000	rpm	100	Y	
P□728	Step change attribute in Data Set 3	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

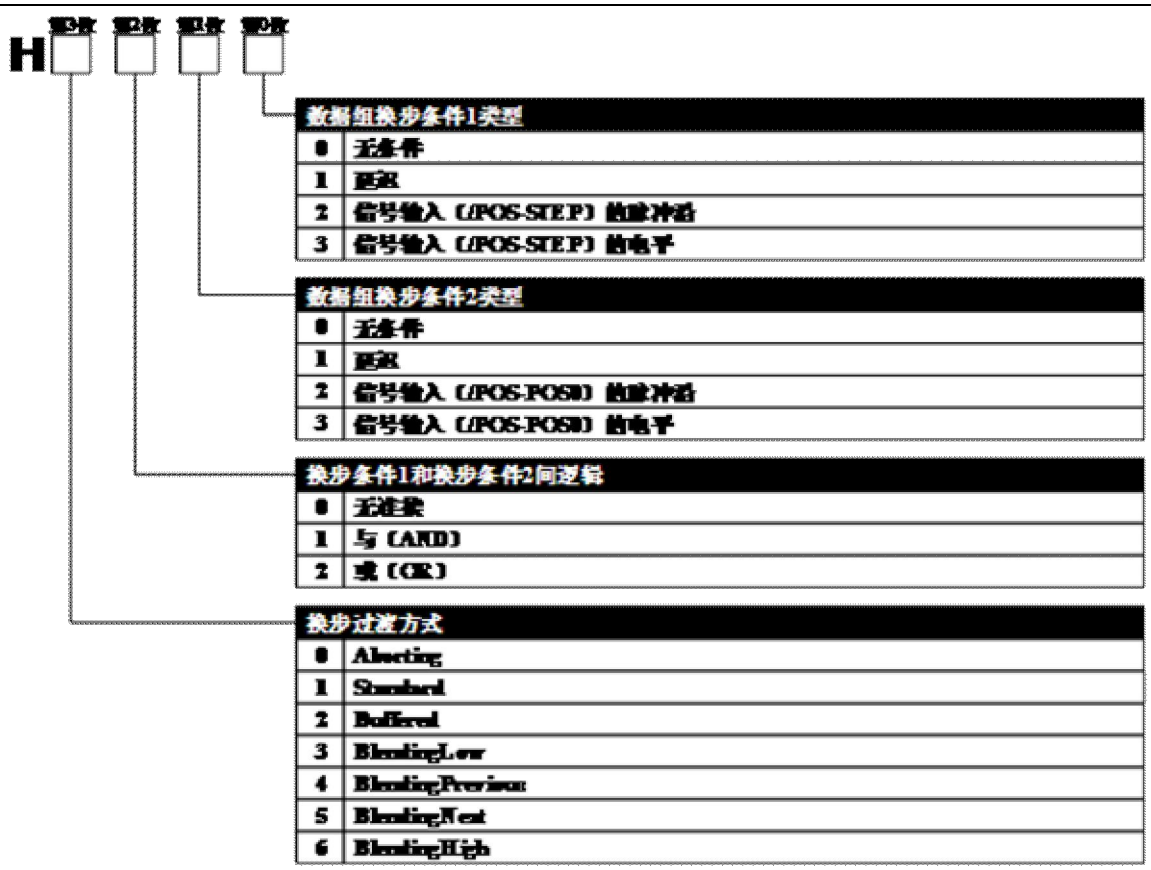
P□729	Step change condition value 1 in data set 3	0 ~ 65535	——	0	Y	
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□730	Step change condition value 2 in data set 3	0 ~ 65535	——	0	Y	
	Ditto					
P□731	Subsequent data set number after data set 3	0 ~ 14	——	4	Y	
P□732	Type of data set 4	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□733	Low position value of Data Set 4	-9999~+9999	1-command pulse	0	Y	
P□734	High position value of Data Set 4	-9999~+9999	10000-command	0	Y	

			pulse			
P□735	Speed of data set 4	0 ~ 6000	rpm	100	Y	
P□736	Step change attribute in Data Set 4	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

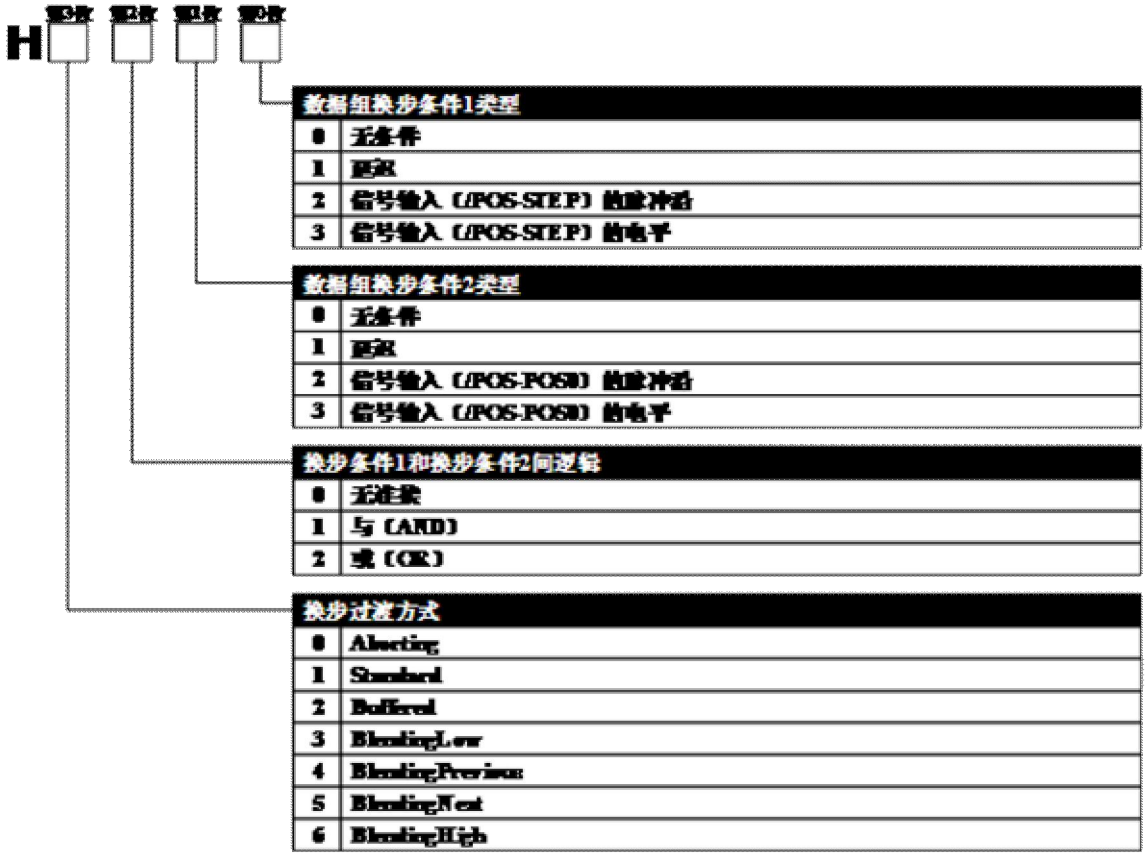
P□737	Step change condition value 1 in data set 4	0 ~ 65535	——	0	Y	
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□738	Step change condition value 2 in data set 4	0 ~ 65535	——	0	Y	
	Ditto					
P□739	Subsequent data set number after data set 4	0 ~ 14	——	5	Y	
P□740	Type of data set 5	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□741	Low position value of Data Set 5	-9999~+9999	1-command pulse	0	Y	
P□742	High position value of Data Set 5	-9999~+9999	10000-command pulse	0	Y	
P□743	Speed of data set 5	0 ~ 6000	rpm	100	Y	
P□744	Step change attribute in Data Set 5	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

P□745	Step change condition value 1 in data set 5	0 ~ 65535	——	0	Y	
	- Unconditional: no transitional condition value					

	- Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□746	Step change condition value 2 in data set 5	0 ~ 65535	——	0	Y	
	Ditto					
P□747	Subsequent data set number after data set 5	0 ~ 14	——	6	Y	
P□748	Type of data set 6	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□749	Low position value of Data Set 6	-9999~+9999	1-command pulse	0	Y	
P□750	High position value of Data Set 6	-9999~+9999	10000-command pulse	0	Y	
P□751	Speed of data set 6	0 ~ 6000	rpm	100	Y	
P□752	Step change attribute in Data Set 6	——	——	0000	Y	

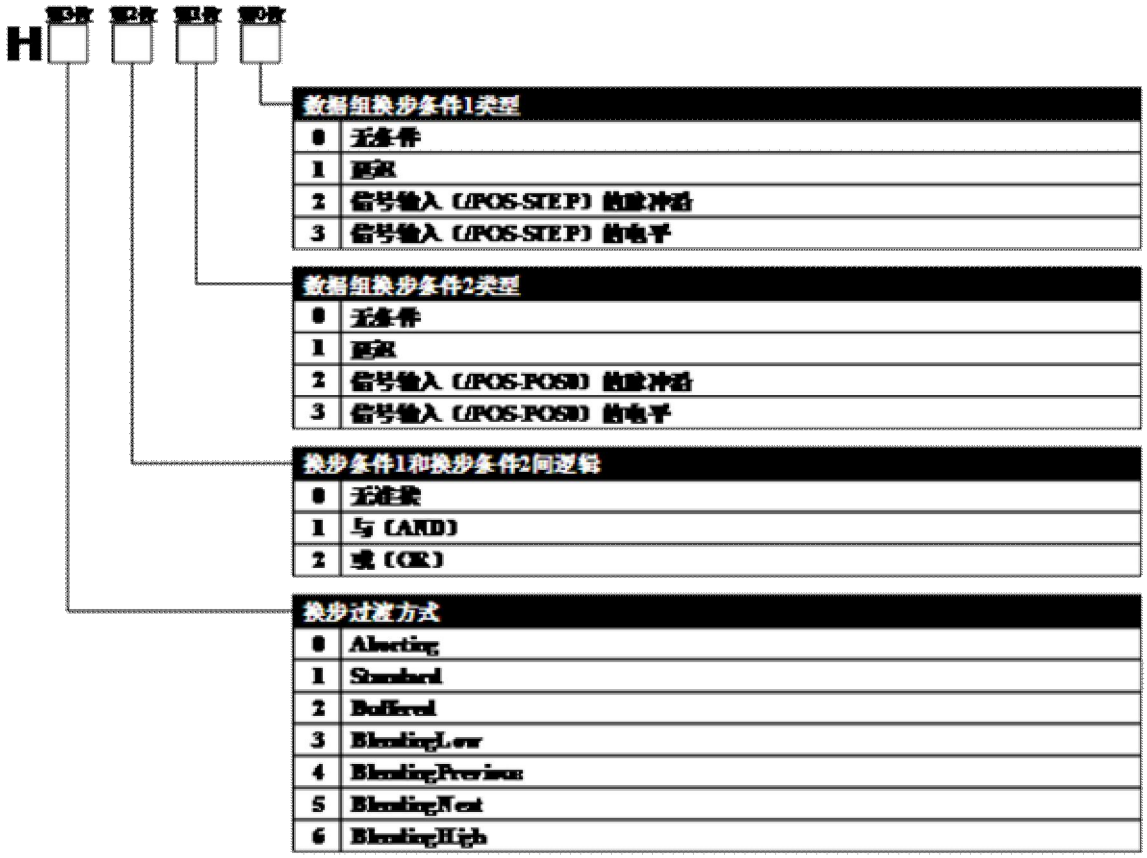


第 3 位	Bit 3

第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

P□753	Step change condition value 1 in data set 6	0 ~ 65535	——	0	Y	
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□754	Step change condition value 2 in data set 6	0 ~ 65535	——	0	Y	
	Ditto					
P□755	Subsequent data set number after data set 6	0 ~ 14	——	7	Y	
P□756	Type of data set 7	0 ~ 2	——	0	Y	
	0: data set is null 1: data set is in absolute motion 2: data set is in relative motion					
P□757	Low position value of Data Set 7	-9999~+9999	1-command pulse	0	Y	
P□758	High position value of Data Set 7	-9999~+9999	10000-command pulse	0	Y	

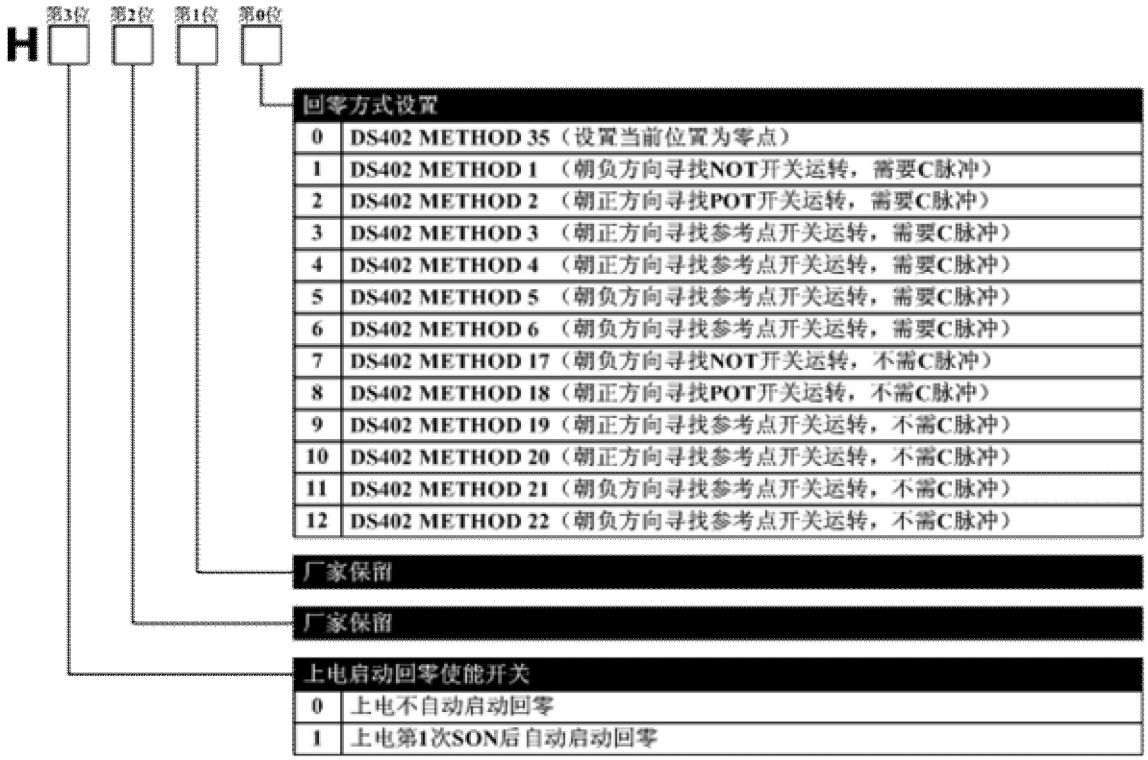
P□759	Speed of data set 7	0 ~ 6000	rpm	100	Y	
P□760	Step change attribute in Data Set 7	——	——	0000	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
数据组换步条件 1 类型	Data set step change condition 1 type
无条件	No condition
延迟	Delay
信号输入（/POS-STEP）的脉冲沿	Pulse edge of signal input (/POS-STEP)
信号输入（/POS-STEP）的电平	Level of signal input (/POS-STEP)
数据组换步条件 2 类型	Data set step change condition 2 type
无条件	No condition
延迟	Delay
信号输入（/POS-POS0）的脉冲沿	Pulse edge of signal input (/POS-POS0)
信号输入（/POS-POS0）的电平	Level of signal input (/POS-POS0)
换步条件 1 和换步条件 2 间逻辑	Logic between step change condition 1 and 2
无连接	No conjunction
与（AND）	And (AND)
或（OR）	Or (OR)
换步过渡方式	Step change transitional manner

P□761	Step change condition value 1 in	0 ~ 65535	——	0	Y	

	data set 7					
	- Unconditional: no transitional condition value - Delay: value 0 65535: latency time 0 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level					
P□762	Step change condition value 2 in data set 7	0 ~ 65535	——	0	Y	
	Ditto					
P□763	Subsequent data set number after data set 7	0 ~ 14	——	0	Y	
P□764	Data set start method	0 ~ 1	——	0	Y	
	0: internal method (single data set method) 1: task mode (data set sequence)					
P□765	Acceleration of data set	0 ~ 60000	10 rpm/s	10000	Y	
P□766	Deceleration of data set	0 ~ 60000	10 rpm/s	10000	Y	
P□767	Emergency deceleration of data set	0 ~ 60000	10 rpm/s	60000	Y	
P□768	Data set position electronic gear ratio (numerator)	1 ~ 65535	——	1	Y	
P□769	Data set position electronic gear ratio (denominator)	1 ~ 65535	——	1	Y	
P□770	Zero returning method selection switch	——	——	0000	Y	

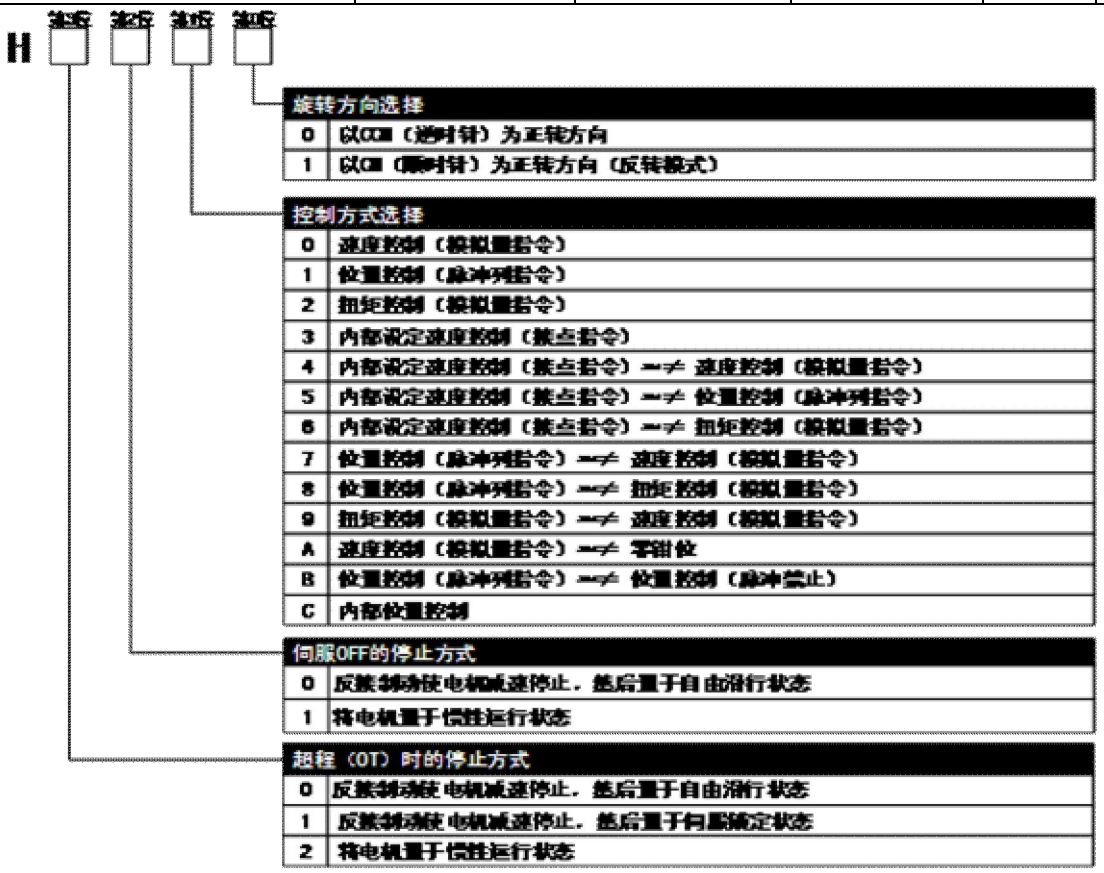


第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
回零方式设置	Zero returning method setting
DS402 METHOD 35（设置当前位置为零点）	DS402 METHOD 35 (set current position as zero point)
DS402 METHOD 1 （朝负方向寻找NOT开关运转，需要C脉冲）	DS402 METHOD 1 (for on-off operation of seeking for NOT switch in the reverse direction, C pulse is required)
DS402 METHOD 2 （朝正方向寻找POT开关运转，需要C脉冲）	DS402 METHOD 2 (for on-off operation of seeking for POT switch in the forward direction, C pulse is required)
DS402 METHOD 3 （朝正方向寻找参考点开关运转，需要C脉冲）	DS402 METHOD 3 (for on-off operation of seeking for reference point switch in the forward direction, C pulse is required)
DS402 METHOD 4 （朝正方向寻找参考点开关运转，需要C脉冲）	DS402 METHOD 4 (for on-off operation of seeking for reference point switch in the forward direction, C pulse is required)
DS402 METHOD 5 （朝负方向寻找参考点开关运转，需要C脉冲）	DS402 METHOD 5 (for on-off operation of seeking for reference point switch in the reverse direction, C pulse is required)
DS402 METHOD 6 （朝负方向寻找参考点开关运转，需要C脉冲）	DS402 METHOD 6 (for on-off operation of seeking for reference point switch in the reverse direction, C pulse is required)

		DS402 METHOD 17（朝负方向寻找NOT开关运转，不需C脉冲）	DS402 METHOD 17 (for on-off operation of seeking for NOT switch in the reverse direction, C pulse is not required)				
		DS402 METHOD 18（朝正方向寻找POT开关运转，不需C脉冲）	DS402 METHOD 18 (for on-off operation of seeking for POT switch in the forward direction, C pulse is not required)				
		DS402 METHOD 19（朝正方向寻找参考点开关运转，不需C脉冲）	DS402 METHOD 19 (for on-off operation of seeking for reference point switch in the forward direction, C pulse is not required)				
		DS402 METHOD 20（朝正方向寻找参考点开关运转，不需C脉冲）	DS402 METHOD 20 (for on-off operation of seeking for reference point switch in the forward direction, C pulse is not required)				
		DS402 METHOD 21（朝负方向寻找参考点开关运转，不需C脉冲）	DS402 METHOD 21 (for on-off operation of seeking for reference point switch in the reverse direction, C pulse is not required)				
		DS402 METHOD 22（朝负方向寻找参考点开关运转，不需C脉冲）	DS402 METHOD 22 (for on-off operation of seeking for reference point switch in the reverse direction, C pulse is not required)				
		厂家保留	Reserved by manufacturer				
		厂家保留	Reserved by manufacturer				
		上电启动回零使能开关	Energizing zero returning starting enable switch				
		上电不自动启动回零	Zero returning will not start automatically when energizing				
		上电第1次SON后自动启动回零	Auto zero returning starting after first SON after energizing				
P□771	On-off speed to meet reference point		0 ~ 6000	rpm	100	Y	
P□772	On-off speed to leave reference point		0 ~ 6000	rpm	30	Y	
P□773	Low position of speed/position switching reference point		0 ~ 9999	1-command pulse	0	N	
P□774	High position of speed/position switching reference point		0 ~ 9999	10000-command pulse	0	N	

Appendix B Table of iK Series M2 Drive Parameters

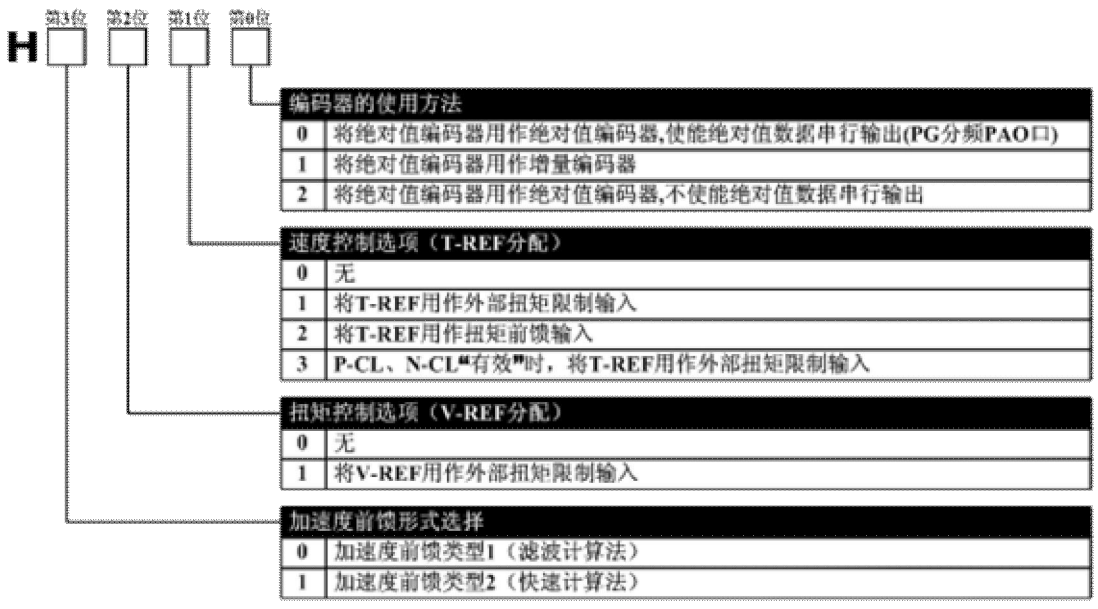
Parameter No.	Name	Setting range	Setting unit	Factory setting	Power reboot	Remarks
P□000	Basic function selection switch	——	——	0010	Y	



第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
旋转方向选择	Rotation direction selection
以CCW（逆时针）为正转方向	CCW (couterclockwise) is the positive rotation direction
以CW（顺时针）为正转方向（反转模式）	CW (clockwise) is the positive rotation direction (in reserve mode)
控制方式选择	Control mode selection
速度控制（模拟量指令）	Speed control (analog command)
位置控制（脉冲列指令）	Position control (pulse train command)
扭矩控制（模拟量指令）	Torque control (analog command)
内部设定速度控制（接点指令）	Internal set speed control (contact command)

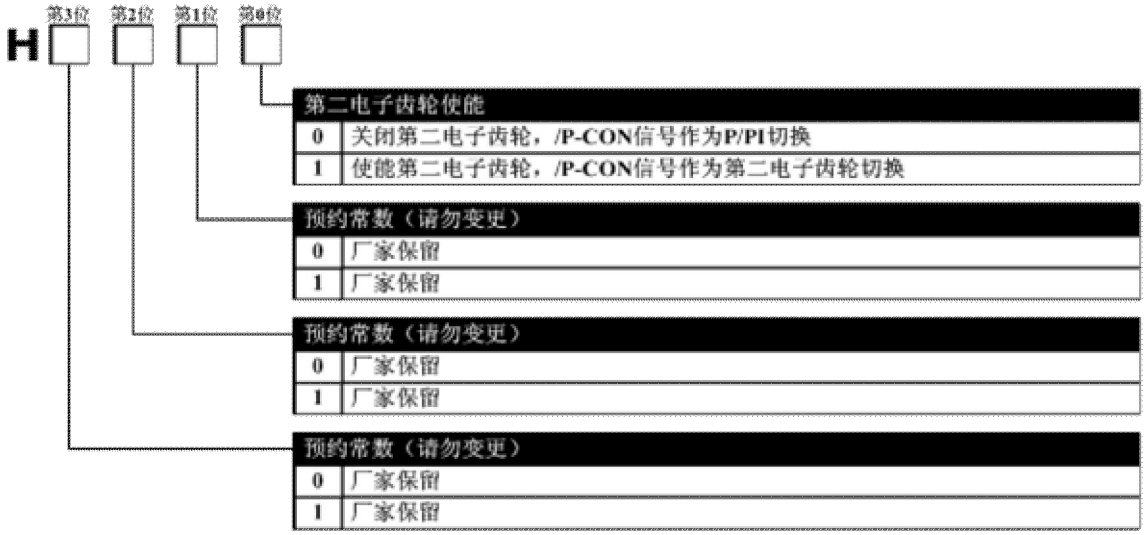
	内部设定速度控制（接点指令）≈≠ 速度控制（模拟量指令）	Internal set speed control (contact command) ≈≠ Speed control (analog command)
	内部设定速度控制（接点指令）≈≠ 位置控制（脉冲列指令）	Internal set speed control (contact command) ≈≠ Position control (pulse train command)
	内部设定速度控制（接点指令）≈≠ 扭矩控制（模拟量指令）	Internal set speed control (contact command) ≈≠ Torque control (analog command)
	位置控制（脉冲列指令）≈≠ 速度控制（模拟量指令）	Position control (pulse train command) ≈≠ Speed control (analog command)
	位置控制（脉冲列指令）≈≠ 扭矩控制（模拟量指令）	Position control (pulse train command) ≈≠ Torque control (analog command)
	扭矩控制（模拟量指令）≈≠ 速度控制（模拟量指令）	Torque control (analog command) ≈≠ Speed control (analog command)
	速度控制（模拟量指令）≈≠ 零钳位	Speed control (analog command) ≈≠ Zero clamping
	位置控制（脉冲列指令）≈≠ 位置控制（脉冲禁止）	Position control (pulse train command) ≈≠ Torque control (pulse prohibited)
	内部位置控制	Internal position control
	伺服OFF的停止方式	Stop method when servo is OFF
	反接制动使电机减速停止，然后置于自由滑行状态	Activate reserve braking to decelerate motor to motionless and set it to free sliding state
	将电机置于惯性运行状态	Set motor to inertial operation state
	超程（OT）时的停止方式	Stop method during overtravel (OT)
	反接制动使电机减速停止，然后置于自由滑行状态	Activate reserve braking to decelerate motor to motionless and set it to free sliding state
	反接制动使电机减速停止，然后置于伺服锁定状态	Activate reserve braking to decelerate motor to motionless and set it to servo locking state
	将电机置于惯性运行状态	Set motor to inertial operation state

P□001	Basic function selection switch 1	——	——	0001	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
编码器的使用方法	Use method of encoder
将绝对值编码器用作绝对值编码器,使能绝对值数据串行输出(PG 分频 PAO 口)	Use absolute encoder as absolute encoder and enable serial output of absolute data (PG frequency dividing PAO 口)
将绝对值编码器用作增量编码器	Use absolute encoder as incremental encoder
将绝对值编码器用作绝对值编码器,不使能绝对值数据串行输出	Use absolute encoder as absolute encoder and prevent serial output of absolute data
速度控制选项（T-REF 分配）	Speed control option (T-REF distribution)
无	N/A
将 T-REF 用作外部扭矩限制输入	Use T-REF as external torque limit input
将 T-REF 用作扭矩前馈输入	Use T-REF as torque feedforward input
P-CL、N-CL“有效”时，将 T-REF 用作外部扭矩限制输入	Use T-REF as external torque limit input when P-CL and N-CL are enabled
扭矩控制选项（V-REF 分配）	Torque control option (V-REF distribution)
无	N/A
将 V-REF 用作外部扭矩限制输入	Use V-REF as external torque limit input
加速度前馈形式选择	Accelerated speed feedforward mode selection
加速度前馈类型 1（滤波计算法）	Accelerated speed feedforward type 1 (filtering calculation)
加速度前馈类型 2（快速计算法）	Accelerated speed feedforward type 2 (rapid calculation)

P□002	Basic function selection switch 2	——	——	1100	Y	



第 3 位	Bit 3
第 2 位	Bit 2

第 1 位	Bit 1
第 0 位	Bit 0
第二电子齿轮使能	Second electronic gear enabled
关闭第二电子齿轮，/P-CON 信号作为 P/PI 切换	Disable second electronic gear and use /P-CON signal as P/PI switch
使能第二电子齿轮，/P-CON 信号作为第二电子齿轮切换	Enable second electronic gear and use /P-CON signal as second electronic gear switch
预约常数（请勿变更）	Preset constant (do not change)
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer
预约常数（请勿变更）	Preset constant (do not change)
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer
预约常数（请勿变更）	Preset constant (do not change)
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer

P□003	Basic function selection switch 3	——	——	0000	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
普通编码器（非串行编码器）报警使能开关	Common encoder (non-serial encoder) alarm enable switch
关闭 A05~A08 或 b05~b08 报警检测	Disable A05 - A08 or b05 - b08 alarm detection
使能 A05~A08 或 b05~b08 报警检测	Enable A05 - A08 or b05 - b08 alarm detection
预约常数（请勿变更）	Preset constant (do not change)
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer

瞬间停电报警使能开关	Momentary outage alarm enable switch
瞬间停电一个周期不报警	No alarm for momentary outage of one cycle
瞬间停电一个周期报警	Alarm for momentary outage of one cycle
过载增强使能开关	Overload enhancement enable switch
关闭过载增强功能	Disable overload enhancement function
使能过载增强功能（增强过载能力，适合用在频繁起停场合）	Enable overload enhancement function (enhance overload capacity, suitable for occasion with frequent start and stop)

P□004	Basic function selection switch 4	——	——	0100	Y	

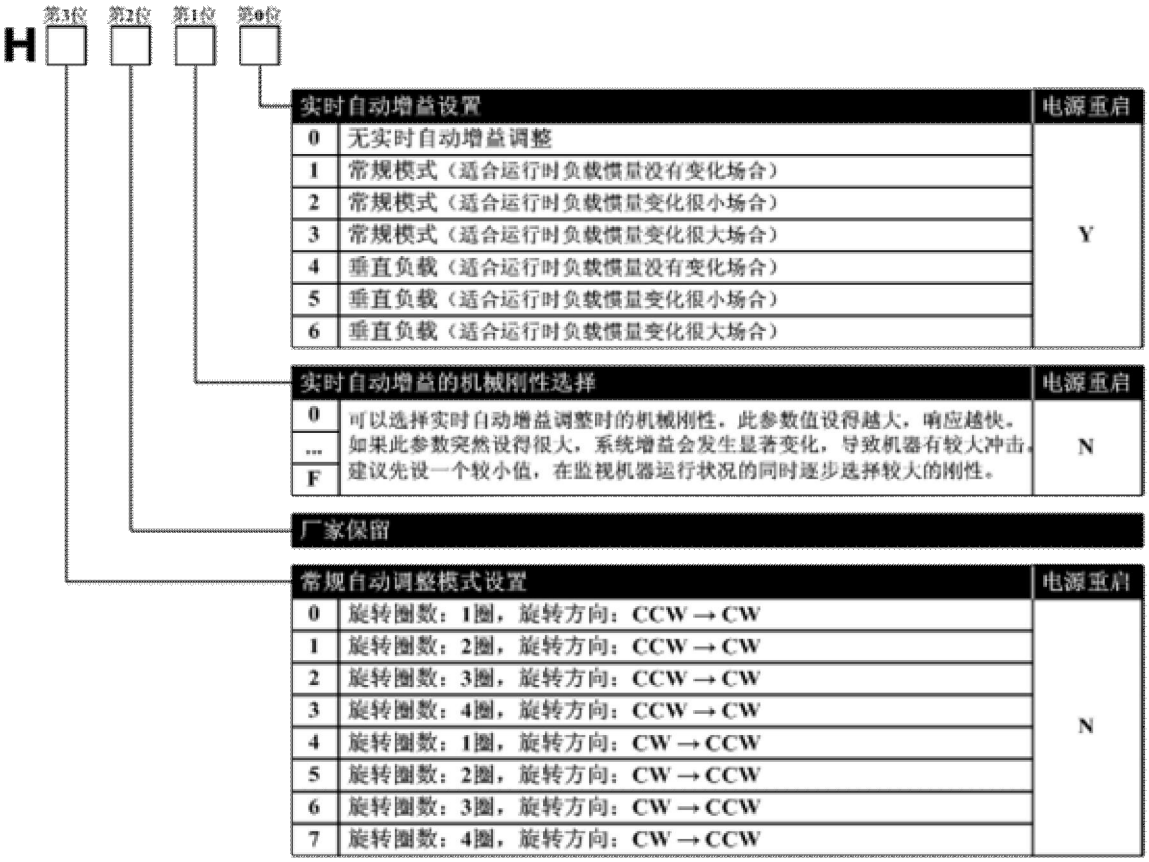
第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
预约常数（请勿变更）	Preset constant (do not change)
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer
预约常数（请勿变更）	Preset constant (do not change)
厂家保留	Reserved by manufacturer
低频抖动抑制使能开关	Low-frequency jitter suppression enable switch
关闭低频抖动抑制	Disable low-frequency jitter suppression
使能低频抖动抑制	Enable low-frequency jitter suppression
超差报警使能开关	Out-of-tolerance alarm enable switch
关闭超差报警检测	Disable out-of-tolerance alarm detection
使能超差报警检测（偏差计数器值大于 P□504 时报警）	Enable out-of-tolerance alarm detection (alarm will be given when offset counter value exceeds P□504)

P□100	Speed loop gain	1 ~ 2500	0.1 Hz	400	N	

P□101	Speed loop integral time parameter	1 ~ 4000	0.01 ms	2000	N	
P□102	Position loop gain	1 ~ 2000	0.1/s	400	N	
P□103	Ratio of moment of inertia	0 ~ 20000	1 %	0	N	
P□104	Second velocity loop gain	1 ~ 2500	1 Hz	40	N	
P□105	Second speed loop integral time parameter	1 ~ 4000	0.1ms	200	N	
P□106	Second position loop gain	1 ~ 2000	1/s	40	N	
P□107	Offset (speed offset)	0 ~ 450	1r/min	0	N	
P□108	Scope of offset stack	0 ~ 5000	1-command pulse	10	N	
P□109	Feedforward	0 ~ 100	1 %	0	N	
P□110	Feedforward filtering time parameter	0 ~ 640	0.1ms	0	N	
P□111	Accelerated speed freeforward percentage	0 ~ 100	1 %	0	N	
P□112	Accelerated speed feedforward filtering time parameter	0 ~ 640	0.1ms	0	N	
P□113	Gain application switch	0000 ~ 0064	——	0000	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
模式开关选择	Module switch selection
以内部扭矩指令为条件（电平设定:P□114）	Based on internal torque command (electrical level setting: P□114)
以速度为条件（电平设定:P□115）	Based on internal speed (electrical level setting: P□115)

	以偏移脉冲指令为条件（电平设定:P□117）	Based on offset pulse command (electrical level setting: P□117)				
	没有模式开关功能	Without module switch function				
	自动增益切换条件选择	Selection of auto gain switch conditions				
	无自动增益切换（固定到第一组增益）	Non-auto gain switch (fixed to first group gain)				
	外部开关增益切换（G-SEL 信号）	External switch gain switch (G-SEL signal)				
	扭矩百分比切换	Torque percentage switch				
	只在位置偏移条件下切换	Switch only under position offset				
	给定加速度数值（10r/min/s）	Given accelerated speed value (10 r/min/s)				
	给定速度数值	Given speed value				
	有位置指令输入	With position command input				
	厂家保留	Reserved by manufacturer				
	厂家保留	Reserved by manufacturer				
P□114	Module switch (torque command)	0 ~ 300	1 %	200	N	
P□115	Module switch (speed command)	0 ~ 10000	1r/min	0	N	
P□116	Module switch (accelerated speed command)	0 ~ 3000	10 r/min/s	0	N	
P□117	Module switch (offset pulse)	0 ~ 10000	1-command pulse	0	N	
P□118	Gain switch delay time	0 ~ 20000	0.1 ms (single axis)	0	N	0.2 ms (double axis)
P□119	Gain switch range	0 ~ 20000	free	0	N	
	When P□113.1 = 2, the unit is 1% When P□113.1 = 3, the unit is 1 command pulse When P□113.1 = 4, the unit is 10 r/min/s When P□113.1 = 5, the unit is 1 r/min When P□113.1 = 6, the unit is 1 command pulse					
P□120	Position gain switch time	0 ~ 20000	0.1 ms (single axis)	0	N	0.2 ms (double axis)
P□121	Gain switch hysteresis	0 ~ 20000	1-command pulse	0	N	
P□122	Friction load	0 ~ 3000	1‰	0	N	
P□123	Friction compensation speed hysteresis area	0 ~ 100	1r/min	0	Y	
P□124	Viscous friction load	0 ~ 20000	1 ‰/1 krpm	0	N	
P□125	Friction gain	0 ~ 30000		0	N	
P□126	Speed observer cycle	0 ~ 100	0.1ms	0/35/70	N	
P□127	Online autotune switches	——	——	1340	Y/N	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
实时自动增益设置	Real-time auto gain setting
电源重启	Power reboot
无实时自动增益调整	Non-real-time auto gain adjustment
常规模式（适合运行时负载惯量没有变化场合）	Normal mode (suitable for operations without change in load inertia)
常规模式（适合运行时负载惯量变化很小场合）	Normal mode (suitable for operations with little change in load inertia)
常规模式（适合运行时负载惯量变化很大场合）	Normal mode (suitable for operations with great change in load inertia)
垂直负载（适合运行时负载惯量没有变化场合）	Vertical load (suitable for operations without change in load inertia)
垂直负载（适合运行时负载惯量变化很小场合）	Vertical load (suitable for operations with little change in load inertia)
垂直负载（适合运行时负载惯量变化很大场合）	Vertical load (suitable for operations with great change in load inertia)
实时自动增益的机械刚性选择	Selection of machine stiffness for real-time auto gain
电源重启	Power reboot
可以选择实时自动增益调整时的机械刚性。此参数值设得越大，响应越快。	Machine stiffness during real-time auto gain adjustment may be selected. The larger the

		parameter value is, the quicker the response will be.
	如果此参数突然设得很大，系统增益会发生显著变化，导致机器有较大冲击。	If such parameter is set very high all at once, system gain will change significantly, leading to great shock to machine.
	建议先设一个较小值，在监视机器运行状况的同时逐步选择较大的刚性。	It is recommended to set a small value and gradually select larger stiffness while monitoring operating status of machine.
	厂家保留	Reserved by manufacturer
	常规自动调整模式设置	Normal auto adjustment mode setting
	电源重启	Power reboot
	旋转圈数：1 圈，旋转方向：CCW → CW	Rotating circles: 1; direction: CCW → CW
	旋转圈数：2 圈，旋转方向：CCW → CW	Rotating circles: 2; direction: CCW → CW
	旋转圈数：3 圈，旋转方向：CCW → CW	Rotating circles: 3; direction: CCW → CW
	旋转圈数：4 圈，旋转方向：CCW → CW	Rotating circles: 4; direction: CCW → CW
	旋转圈数：1 圈，旋转方向：CW → CCW	Rotating circles: 1; direction: CW → CCW
	旋转圈数：2 圈，旋转方向：CW → CCW	Rotating circles: 2; direction: CW → CCW
	旋转圈数：3 圈，旋转方向：CW → CCW	Rotating circles: 3; direction: CW → CCW
	旋转圈数：4 圈，旋转方向：CW → CCW	Rotating circles: 4; direction: CW → CCW

P□200	Position control command form selection switch	——	——	0000	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1

第 0 位	Bit 0
偏移脉冲清除方式	Offset pulse clearing method
伺服 OFF 时清除偏移脉冲，超程时不清除偏移脉冲	Under servo OFF, clear offset pulse; under over travel, not clear offset pulse
伺服 OFF 或超程时，不清除偏移脉冲	Under servo OFF or over travel, not clear offset pulse
伺服 OFF 或超程时（零钳位除外）清除偏移脉冲	Clear offset pulse when servo is OFF or during overtravel (except for zero clamping position)
指令脉冲形态	Command pulse form
符号+脉冲	Sign + pulse
A 相+B 相（1 倍频）	A phase + B phase (1x frequency)
A 相+B 相（2 倍频）	A phase + B phase (2x frequency)
A 相+B 相（4 倍频）	A phase + B phase (4x frequency)
指令脉冲信号取反	Negation of command pulse signal
PULS 指令不取反，SIGN 指令不取反	No negation for pulse command and sign command
PULS 指令不取反，SIGN 指令取反	No negation for pulse command and negation for sign command
PULS 指令取反，SIGN 指令不取反	Negation for pulse command and no negation sign command
PULS 指令取反，SIGN 指令取反	No negation for pulse command and sign command
滤波器选择	Filter selection
总线驱动器信号指令输入滤波器	Bus drive signal command input filter
集电极开路信号指令输入滤波器	Collector open-circuit signal command input filter

P□201	PG frequency dividing	16 ~ 32768	1 P/rev	2500	Y	
P□202	First electronic gear ratio (numerator)	1 ~ 65535	——	1	Y	
P□203	First electronic gear ratio (denominator)	1 ~ 65535	——	1	Y	
P□204	Second electronic gear ratio (numerator)	1 ~ 65535	——	1	Y	
P□205	Position command acceleration/deceleration time parameter	0 ~ 6400	0.1ms	0	N	
P□206	Position command filtering form selection	0 ~ 1	——	0	Y	
P□300	Speed command input gain	0 ~ 3000	(r/min)/V	150	N	
P□301	Internal speed 1	0 ~ 6000	1r/min	100	N	
P□302	Internal speed 2	0 ~ 6000	1r/min	200	N	
P□303	Internal speed 3	0 ~ 6000	1r/min	300	N	
P□304	Jogging (JOG) speed	0 ~ 6000	1r/min	500	N	
P□305	Acceleration time of soft start	0 ~ 10000	1 ms	0	N	
P□306	Deceleration time of soft start	0 ~ 10000	1 ms	0	N	
P□307	Speed command filtering constant	0 ~ 10000	1 ms	0	N	

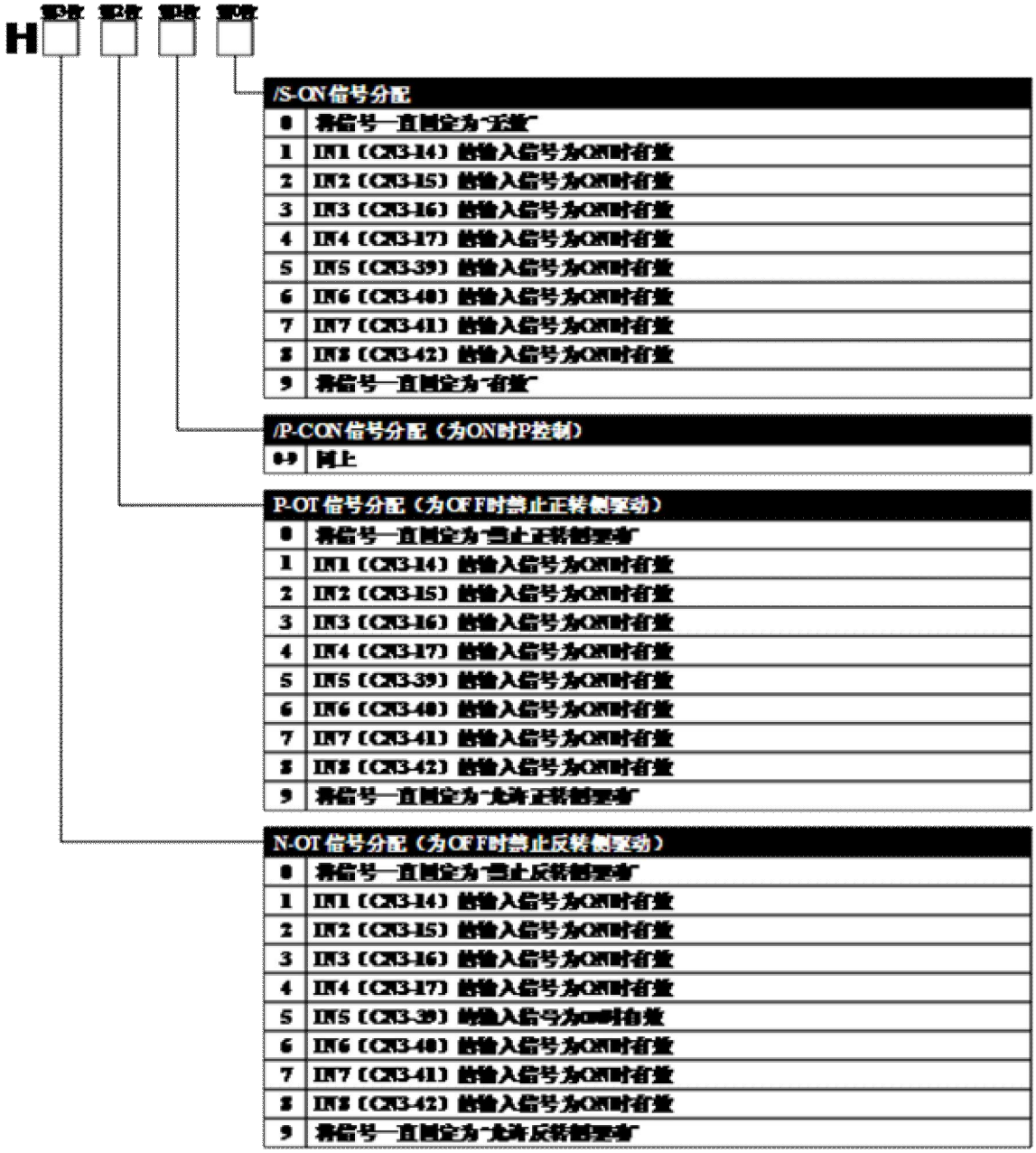
P□308	Rise time of S curve	0 ~ 10000	1 ms	0	N	
P□309	Speed command curve form	——	——	0000	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
软启动方式	Soft start method
梯形	Trapezoid
S 曲线	S curve
加减速滤波	Acceleration and deceleration filtering
加减滤波形式	Acceleration and deceleration filtering form
一次滤波	First filtering
二次滤波	Second filtering
S 曲线比率选择	Selection of S curve ratio
接近线性	Close to linearity
低	Low
中	Central
高	Height
厂家保留	Reserved by manufacturer

P□400	Torque command input gain	10 ~ 100	0.1V/rated torque	30	N	
P□401	Torque command filter time parameter	0 ~ 250	0.1ms	4	N	
P□402	Second torque command filter time parameter	0 ~ 250	0.1ms	4	N	
P□403	Positive torque limit	0 ~ 300	1 %	300	N	
P□404	Negative torque limit	0 ~ 300	1 %	300	N	
P□405	External limit of forward torque	0 ~ 300	1 %	100	N	

P□406	External limit of reserve torque	0 ~ 300	1 %	100	N	
P□407	Limit of plug braking torque	0 ~ 300	1 %	300	N	
P□408	Speed limit under torque control	0 ~ 6000	1r/min	1500	N	
P□409	Frequency of notch filter section 1	50 ~ 5000	1 Hz	5000	N	
P□410	Depth of notch filter section 1	0 ~ 100	——	10	N	
P□411	Frequency of notch filter section 2	50 ~ 5000	1 Hz	5000	N	
P□412	Depth of notch filter section 2	0 ~ 100	——	10	N	
P□413	B type vibration frequency	10 ~ 1000	0.1 Hz	1000	N	
P□414	B type vibration damping	0 ~ 200	——	25	N	
P□500	Positioning completion width	0 ~ 5000	1 command unit	10	N	
P□501	Zero clamping level	0 ~ 3000	1r/min	10	N	
P□502	Rotation detection of electric level	0 ~ 3000	1r/min	20	N	
P□503	Same-speed signal detection width	0 ~ 100	1r/min	10	N	
P□504	Offset pulse overflow level	1 ~ 32767	256 command unit	1024	N	
P□505	Latency time for servo to turn on	0 ~ 2000	ms	0	N	
P□506	Brake command - delay time for servo OFF	0 ~ 500	10ms	0	N	
P□507	Level for output speed of brake command	0 ~ 6000	1r/min	100	N	
P□508	Brake command latency time when servo is OFF	10 ~ 100	10ms	50	N	

Parameter No.	Name	Setting range	Setting unit	Factory setting	Power reboot	Remarks
P□509	Input signal selection 1	——	——	4321	Y	8765 (double axis/b)



第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
/S-ON信号分配	/S-ON signal distribution
将信号一直固定为"无效"	Set signal fixed to be "inactive"
IN1（CN3-14）的输入信号为ON时有效	Active when IN1 (CN3-14) input signal is ON
IN2（CN3-15）的输入信号为ON时有效	Active when IN2 (CN3-15) input signal is ON

IN3（CN3-16）的输入信号为ON时有效	Active when IN3 (CN3-16) input signal is ON
IN4（CN3-17）的输入信号为ON时有效	Active when IN4 (CN3-17) input signal is ON
IN5（CN3-39）的输入信号为ON时有效	Active when IN5 (CN3-39) input signal is ON
IN6（CN3-40）的输入信号为ON时有效	Active when IN6 (CN3-40) input signal is ON
IN7（CN3-41）的输入信号为ON时有效	Active when IN7 (CN3-41) input signal is ON
IN8（CN3-42）的输入信号为ON时有效	Active when IN8 (CN3-42) input signal is ON
将信号一直固定为 有效	Set signal fixed to be "active"
/P-CON信号分配（为ON时P控制）	/P-CON signal distribution (P control when input signal is ON)
同上	Ditto
P-OT信号分配（为OFF时禁止正转侧驱动）	P-OT signal distribution (positive rotation side drive prohibited when input signal is OFF)
将信号一直固定为 禁止正转侧驱动	Set signal fixed to be "positive side drive prohibited"
IN1（CN3-14）的输入信号为ON时有效	Active when IN1 (CN3-14) input signal is ON
IN2（CN3-15）的输入信号为ON时有效	Active when IN2 (CN3-15) input signal is ON
IN3（CN3-16）的输入信号为ON时有效	Active when IN3 (CN3-16) input signal is ON
IN4（CN3-17）的输入信号为ON时有效	Active when IN4 (CN3-17) input signal is ON
IN5（CN3-39）的输入信号为ON时有效	Active when IN5 (CN3-39) input signal is ON
IN6（CN3-40）的输入信号为ON时有效	Active when IN6 (CN3-40) input signal is ON
IN7（CN3-41）的输入信号为ON时有效	Active when IN7 (CN3-41) input signal is ON
IN8（CN3-42）的输入信号为ON时有效	Active when IN8 (CN3-42) input signal is ON
将信号一直固定为“允许正转侧驱动”	Set signal fixed to be "positive rotation side drive enabled"
N-OT信号分配（为OFF时禁止反转侧驱动）	N-OT signal distribution (negative side drive prohibited when input signal is OFF)
将信号一直固定为“禁止反转侧驱动”	Set signal fixed to be "negative side drive prohibited"
IN1（CN3-14）的输入信号为ON时有效	Active when IN1 (CN3-14) input signal is ON
IN2（CN3-15）的输入信号为ON时有效	Active when IN2 (CN3-15) input signal is ON
IN3（CN3-16）的输入信号为ON时有效	Active when IN3 (CN3-16) input signal is ON
IN4（CN3-17）的输入信号为ON时有效	Active when IN4 (CN3-17) input signal is ON
IN5（CN3-39）的输入信号为ON时有效	Active when IN5 (CN3-39) input signal is ON
IN6（CN3-40）的输入信号为ON时有效	Active when IN6 (CN3-40) input signal is ON
IN7（CN3-41）的输入信号为ON时有效	Active when IN7 (CN3-41) input signal is ON
IN8（CN3-42）的输入信号为ON时有效	Active when IN8 (CN3-42) input signal is ON
将信号一直固定为“允许反转侧驱动”	Set signal fixed to be "negative side drive enabled"

Parameter No.	Name	Setting range	Setting unit	Factory setting	Power reboot	Remarks
P□510	Input signal selection 2	——	——	8765 (single axis)	Y	0000 (double axis)

Bit 3 Bit 2 Bit 1 Bit 0
/ALM-RST signal distribution (remove alarm when turning from OFF to ON) 0 Set signal fixed to be "OFF" 1 Active when IN1 (CN3-14) input signal is ON 2 Active when IN2 (CN3-15) input signal is ON 3 Active when IN3 (CN3-16) input signal is ON 4 Active when IN7 (CN3-41) input signal is ON 5 Active when IN5 (CN3-39) input signal is ON 6 Active when IN6 (CN3-40) input signal is ON 7 Active when IN7 (CN3-41) input signal is ON 8 Active when IN8 (CN3-42) input signal is ON 9 Set signal fixed to be "ON" /CLR signal distribution 0-9 Same with /S-ON signal conversion /P-CL signal distribution 0-9 Ditto /N-CL signal distribution 0-9 Ditto

P□511	Input signal selection 3	——	——	0000	Y	

第 3 位第 2 位第 1 位第 0 位	Bit 3 Bit 2 Bit 1 Bit 0
/G-SEL 信号分配	/G-SEL signal distribution
与/S-ON 信号变换相同	Same with /S-ON signal conversion
/POS0 信号分配	/POS0 signal distribution
同上	Ditto
/POS1 信号分配	/POS1 signal distribution
同上	Ditto
/POS2 信号分配	/POS2 signal distribution
同上	Ditto

P□512	Input signal selection 4	——	——	0000	Y	

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
与/S-ON 信号变换相同	Same with /S-ON signal conversion
与/S-ON 信号变换相同	Same with /S-ON signal conversion
与/S-ON 信号变换相同	Same with /S-ON signal conversion
与/S-ON 信号变换相同	Same with /S-ON signal conversion

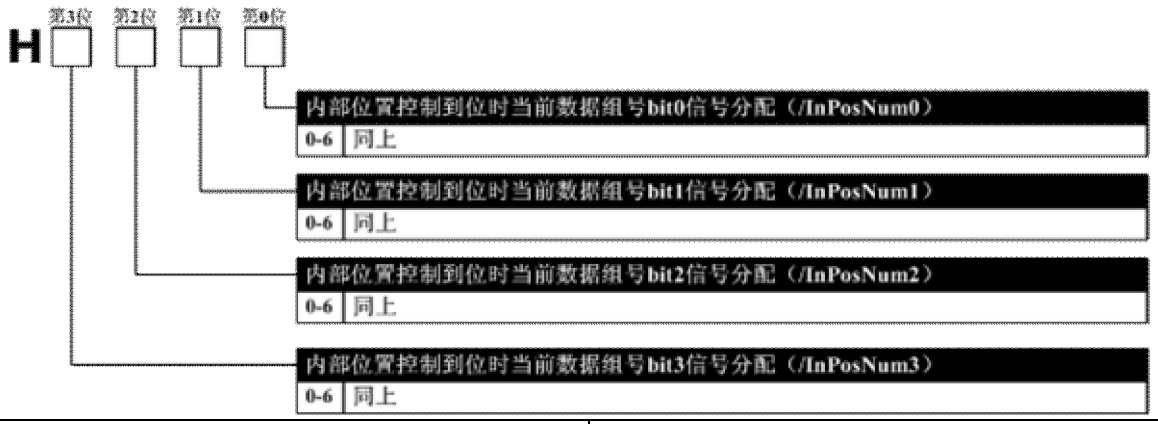
Parameter No.	Name	Setting range	Setting unit	Factory setting	Power reboot	Remarks
P□513	Output signal selection 1	——	——	4321	Y	0321 (double axis/A) 0654 (double axis/b)

第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
伺服报警信号分配（ALM）	Servo alarm signal distribution (ALM)
无效（不使用该信号）	Inactive (not using the signal)
通过OUT1（CN3-7、8）输出端子输出该上述信号	Output such signal via OUT1 (CN3-7 and CN3-8) output terminal
通过OUT2（CN3-9、10）输出端子输出该上述信号	Output such signal via OUT2 (CN3-9 and CN3-10) output terminal
通过OUT3（CN3-11、12）输出端子输出该上述信号	Output such signal via OUT3 (CN3-11 and CN3-12) output terminal
通过OUT4（CN3-32、33）输出端子输出该上述信号	Output such signal via OUT4 (CN3-32 and CN3-33) output terminal
通过OUT5（CN3-34、35）输出端子输出该上述信号	Output such signal via OUT5 (CN3-34 and CN3-35) output terminal
通过OUT6（CN3-36、37）输出端子输出该上述信号	Output such signal via OUT6 (CN3-36 and CN3-37) output terminal
定位完成信号分配（/COIN）/ 同速检测信号分配（/V-CMP）	Positioning completion signal distribution (/COIN)/same-speed detection signal distribution (/V-CMP)

	同上		Ditto			
	电机旋转检测信号分配（/TGON）		Motor rotation detection signal distribution (/TGON)			
	同上		Ditto			
	伺服准备就绪信号分配（/S-RDY）		Servo ready signal distribution (/S-RDY)			
	同上		Ditto			
P□514	Output signal selection 2	——	——	0065	Y	0000 (double axis)

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
扭矩限制输出信号分配（/CLT）	Torque limit output signal distribution (/CLT)
与 ALM 信号变换相同	Same with ALM signal conversion
制动器信号分配（/BK）	Brake signal distribution (/BK)
同上	Ditto
编码器原点信号分配（/PGC）	Encoder origin signal distribution (/PGC)
同上	Ditto
厂家保留	Reserved by manufacturer

P□515	Output signal selection 3	——	——	0000	Y	

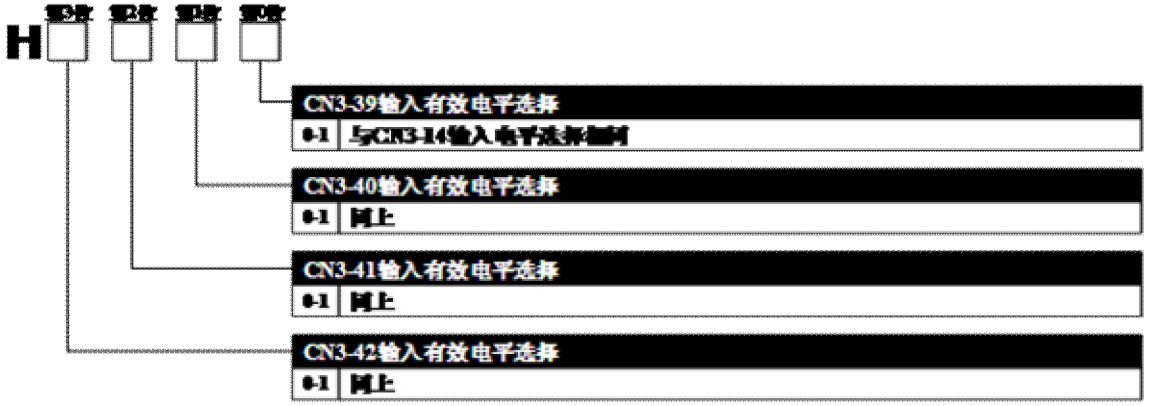


第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1

	第 0 位		Bit 0			
	内部位置控制到位时当前数据组号 bit0 信号分配（/InPosNum0）		Current data set number bit 0 signal distribution when internal position control is in place (/InPosNum0)			
	同上		Ditto			
	内部位置控制到位时当前数据组号 bit1 信号分配（/InPosNum1）		Current data set number bit 1 signal distribution when internal position control is in place (/InPosNum1)			
	同上		Ditto			
	内部位置控制到位时当前数据组号 bit2 信号分配（/InPosNum2）		Current data set number bit 2 signal distribution when internal position control is in place (/InPosNum2)			
	同上		Ditto			
	内部位置控制到位时当前数据组号 bit3 信号分配（/InPosNum3）		Current data set number bit 3 signal distribution when internal position control is in place (/InPosNum3)			
	同上		Ditto			
P□516	Reserved by manufacturer	——	——	——	N	
P□517	Input port filtering time parameter	0 ~ 1000	0.1ms	1	N	
P□518	Alarm input filtering time parameter	0 ~ 3	0.1ms	1	N	
P□519	Active input port signal level selection 1	——	——	0000	N	

第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
CN3-14输入有效电平选择	CN3-14 active input level selection
输入信号ON（L电平）时有效	Active when input signal is ON (L level)
输入信号OFF（H电平）时有效	Active when input signal is OFF (H level)
CN3-15输入有效电平选择	CN3-15 active input level selection
同上	Ditto
CN3-16输入有效电平选择	CN3-16 active input level selection
同上	Ditto
CN3-17输入有效电平选择	CN3-17 active input level selection

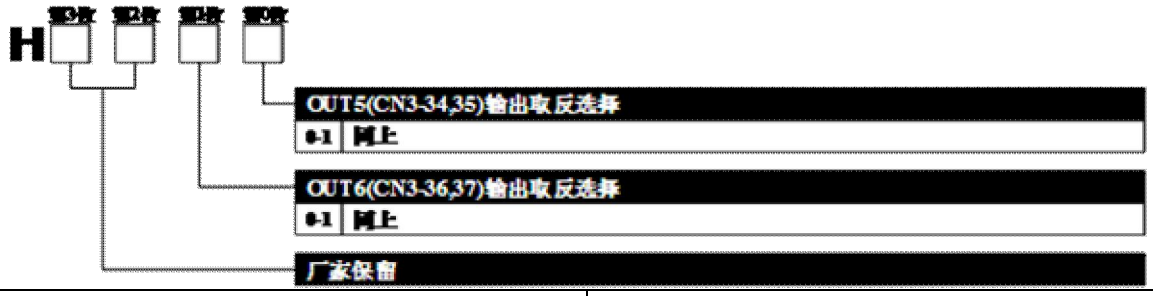
	同上		Ditto			
P□520	Input port signal logic selection 2	——	——	0000	N	

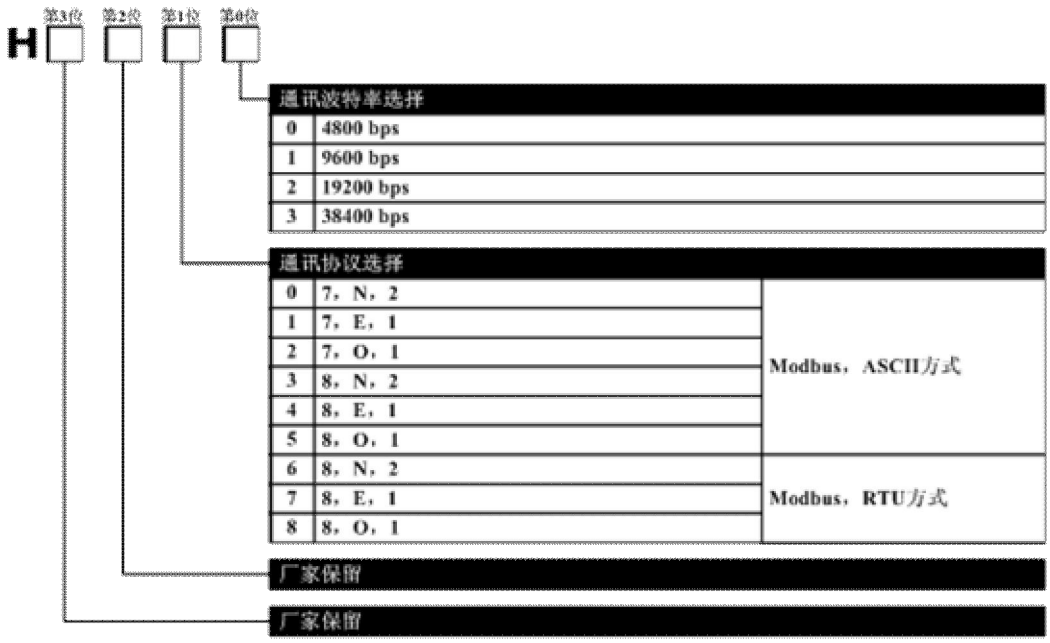


第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
CN3-39输入有效电平选择	CN3-39 active input level selection
与CN3-14输入电平选择相同	Same with CN3-14 input level selection
CN3-40输入有效电平选择	CN3-40 active input level selection
同上	Ditto
CN3-41输入有效电平选择	CN3-41 active input level selection
同上	Ditto
CN3-42输入有效电平选择	CN3-42 active input level selection
同上	Ditto

P□521	Output port signal negation selection 1	——	——	0000	N	

第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0

	OUT1(CN3-7,8)输出取反选择	OUT1 (CN3-7 and CN3-8) output negation selection				
	不取反	Not negation				
	取反	Negation				
	OUT2(CN3-9,10)输出取反选择	OUT2 (CN3-9 and CN3-10) output negation selection				
	同上	Ditto				
	OUT3(CN3-11,12)输出取反选择	OUT3 (CN3-11 and CN3-12) output negation selection				
	同上	Ditto				
	OUT4(CN3-32,33)输出取反选择	OUT4 (CN3-32 and CN3-33) output negation selection				
	同上	Ditto				
P□522	Output port signal negation selection 2	——	——	0000	N	
						
	第3位	Bit 3				
	第2位	Bit 2				
	第1位	Bit 1				
	第0位	Bit 0				
	OUT5(CN3-34,35)输出取反选择	OUT5 (CN3-34 and CN3-35) output negation selection				
	同上	Ditto				
	OUT6(CN3-36,37)输出取反选择	OUT6 (CN3-36 and CN3-37) output negation selection				
	同上厂家保留	Ditto Reserved by manufacturer				
P□600	RS-485 communication parameter selection switch	——	——	0151	Y	

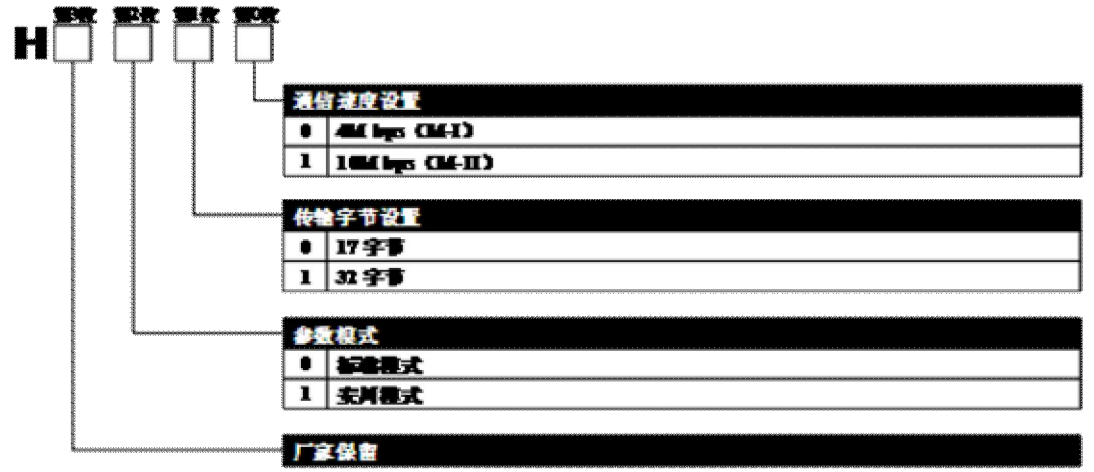


第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
通讯波特率选择	Communication baud rate selection
通讯协议选择	Communication protocol selection
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer
Modbus，ASCII 方式	Modbus, ASCII
Modbus，RTU 方式	Modbus, RTU

P□601	RS-485 communication axis address	1 ~ 127	——	1 (A axis)	Y	2 (b axis)
P□602	RS-485 communication timeout parameter	0 ~ 1000	100 ms	0	N	
P□603	CANopen communication parameter selection switch	——	——	0004	Y	

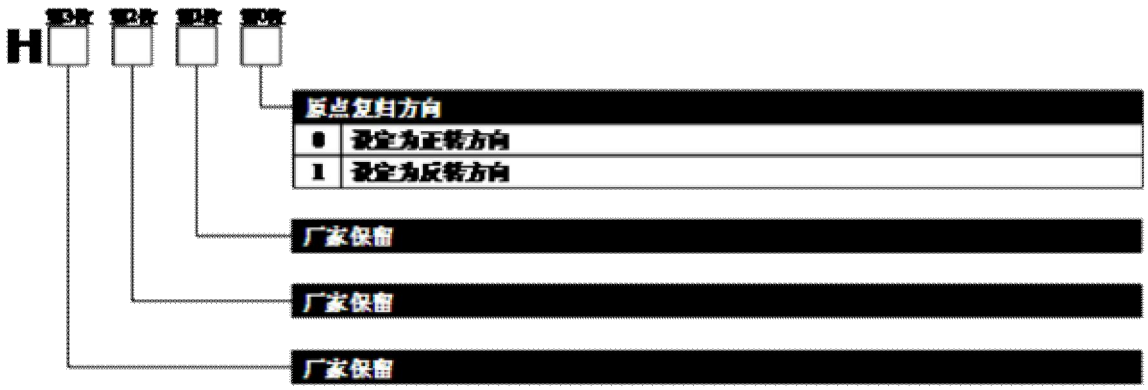
第3位	Bit 3
第2位	Bit 2
第1位	Bit 1
第0位	Bit 0
CAN通讯波特率	CAN communication baud rate
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer
CANopen通讯使能开关	CANopen communication enable switch
关闭CANopen通讯	Disable CANopen communication
使能CANopen通讯	Enable CANopen communication

P□604	CANopen communication axis address	1 ~ 127	——	1 (A axis)	Y	2 (b axis)
P□605	Metratrolink communication parameter	——	——	0011	Y	



第3位	Bit 3
第2位	Bit 2
第1位	Bit 1

	第0位		Bit 0			
	通信速度设置		Communication speed setting			
	传输字节设置		Transmission byte setting			
	17 字节		17 bytes			
	32 字节		32 bytes			
	参数模式		Parameter mode			
	标准模式		Standard mode			
	安川模式		YASKAWA mode			
	厂家保留		Reserved by manufacturer			
P□606	Metratrolink station address	0000 - 001F	——	0001	Y	0001 (b axis)
P□620	Linear acceleration	1 ~ 65535	10000 p/s/s	100	N	
P□621	Linear deceleration	1 ~ 65535	10000 p/s/s	100	N	
P□622	Emergency deceleration	1 ~ 65535	10000 p/s/s	10000	N	
P□623	External positioning displacement distance	－1073741823 ~ +1073741823	1 command unit	100	N	
P□625	Zero return mode setting	——	——	1	Y	



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位 H	Bit 0 H
原点复归方向	Zero return direction
设定为正转方向	Set as positive rotation direction
设定为反转方向	Set as negative rotation direction
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer
厂家保留	Reserved by manufacturer

P□626	Reference point seeking switch speed	0 ~ 65535	100 p/s	150	Y	
P□627	Zero return closing speed	0 ~ 65535	100 p/s	50	Y	
P□628	Zero return displacement distance				Y	

Remarks:

1. Parameter mode

Standard mode (P□605.2 = 0):

Parameter access address is parameter No. in the table (decimal)

2. YASKAWA mode (P□605.2 = 1):

Parameter access address reflects partly YASKAWA common parameters and the remaining addresses use parameter No. in the table (hexadecimal)

Reflection Parameter Table:

Reflection Parameter No. (P□605.2=1)	Name	Original parameter No. (P□605.2=0)	Reflection Parameter No. (P□605.2=1)	Name	Original parameter No. (P□605.2=0)
P□100	Speed loop gain	P□100	P□506	Brake command latency time when servo is OFF	P□508
P□101	Speed loop integral	P□101	P□50A	Input signal selection 1	P□509
P□102	Position loop gain	P□102	P□50B	Input signal selection 2	P□510
P□212	Encoder frequency divider	P□201	P□50E	Output signal selection 1	P□513
P□20E	Electronic gear numerator	P□202	P□50F	Output signal selection 2	P□514
P□210	Electronic gear denominator	P□203	P□510	Output signal selection 3	P□515

Examples:

In standard mode (P□605.2 = 0), speed loop gain parameter access address is 100 (hexadecimal 0x0064) and torque command filtering time parameter access address is 401 (hexadecimal 0x0191);

In YASKAWA mode (**P□605.2 = 1), speed loop gain parameter access address is 256 (hexadecimal 0x0100) and torque command filtering time parameter access address is 1025 (hexadecimal 0x0401).**

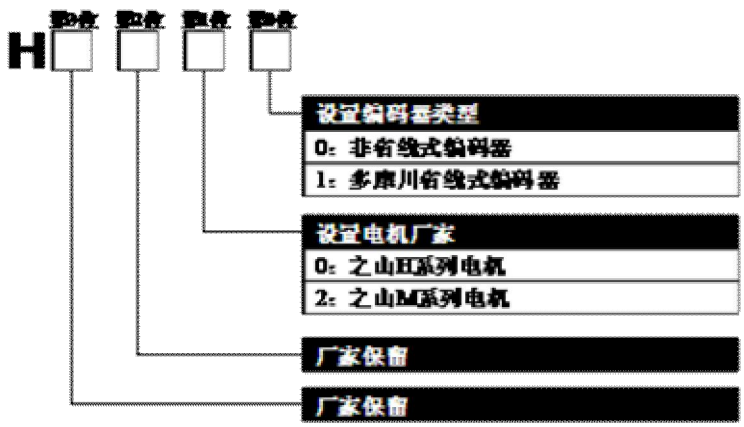
Appendix C List of Alarm Display

Alarm display	ALM output	Alarms	Alarm contents	Clear or not
□01	H	Encoder PA, PB, PC disconnection	Encoder disconnection or cable welding problem.	Clear
□02	H	Encoder PU, PV, PW disconnection	Encoder disconnection or cable welding problem.	Clear
□03	H	Overload	Continuous running at a certain torque exceeding the rated value	Clear
□04	H	A/D switch channel abnormal	A/D switch channel abnormal	Clear
□05	H	PU, PV, PW false code	PU, PV, PW signals are all high or low	Clear
□06	H	PU, PV, PW phases incorrect	PU, PV, PW signals are all high or low	Clear
□10	H	Overcurrent	Servo drive IPM module current is overlarge.	Clear
□11	H	Overvoltage	Servo drive main circuit voltage is too high.	No
□12	H	Undervoltage	Servo drive main circuit voltage is too low.	No
□13	H	Parameter damage	EEROM data in servo drive is abnormal.	Clear
□14	H	Over-speed	Servo motor speed is extremely high	Clear
□15	H	Deviation counter overflow	Internal position deviation counter overflow	Clear
□16	H	Position deviation is overlarge	Position deviation pulse exceeds the set value of parameter P□504.	Clear
□17	H	Electronic gear fault	Electronic gear is unreasonably set or pulse frequency is too high	Clear
□18	H	1st channel of current detection is abnormal	Current detection abnormal	Clear
□19	H	2nd channel of current detection is abnormal	Current detection abnormal	Clear
□22	H	Motor model is incorrect	Servo drive parameters do not match with those of motor	Clear
□23	H	Servo drive does not match with motor	Servo drive does not match with motor	Clear
□25	H	Bus encoder multi-coil information error	Multi-coil information error	Clear
□26	H	Bus encoder multi-coil information overflow	Multi-coil information overflow	Clear
□27	H	Bus encoder battery alarm 1	Battery voltage is lower than 2.5 V, multi-coil information is lost	Clear
□28	H	Bus encoder battery alarm 2	Battery voltage is lower than 3.1 V, battery voltage is relatively low	Clear
□30	H	Bleeder resistor disconnection alarm	Braking resistor damage.	Clear
□31	H	Regeneration overload	Regeneration processing circuit is abnormal.	No
□33	H	Momentary outage alarm.	There is outage of over one power cycle under AC current.	Clear
□34	H	Rotary transformer is abnormal	Rotary transformer communication is abnormal.	Clear

□40	H	Bus encoder communication is abnormal	Servo drive and encoder cannot realize communication.	Clear
□41	H	Bus encoder overspeed	When power is ON, encoder rotates at high speed	Clear
□42	H	Bus encoder absolute status error	Encoder damage or encoder decoding circuit damage	Clear
□43	H	Bus encoder counting error	Encoder damage or encoder decoding circuit damage	Clear
□44	H	Check error in bus encoder control field	Encoder signal is interrupted or encoder decoding circuit damage	Clear
□45	H	Check error in bus encoder communication data	Encoder signal is interrupted or encoder decoding circuit damage	Clear
□46	H	Stop bit error in bus encoder status field	Encoder signal is interrupted or encoder decoding circuit damage	Clear
□47	H	Stop bit error in bus encoder SFOME	Encoder signal is interrupted or encoder decoding circuit damage	Clear
□48	H	Bus encoder data are not initialized	Bus encoder SFOME data are null	Clear
□49	H	Sum check error in bus encoder data	Sum check in bus encoder EEPROM data is abnormal	Clear
□60	H	MODBUS communication timeout	Drive fails to accept data normally at the set time in P□602	Clear
□61	H	CANopen master station heartbeat timeout	Drive fails to accept master station heartbeat massage normally at the set time	Clear
□70	H	Drive overheat alarm	Drive internal IPM module temperature is too high	Clear
□90	H	Software does not match with hardware	Parameter is wrongly set or software does not match with hardware	No
□--	L	No error display	Display normal action status	Clear

Note: 1. "□" in alarm display may be "A" or "b", referring to A axis alarm or b axis alarm respectively

Appendix D Guidelines for Motor Model by Users

<table>
<tr><th>Operation steps</th><th>Operation instruction</th><th>Operation key</th><th>Display after operation</th></tr>
<tr><td>1</td><td>After energizing, gently press M function key to switch to A axis auxiliary function mode.</td><td>M</td><td>FA000</td></tr>
<tr><td>2</td><td>Gently press “∧” key for four times and set FA004.</td><td>∧</td><td>FA004</td></tr>
<tr><td>3</td><td>Gently press SET key to start password operation.</td><td>SET</td><td>-P.in-</td></tr>
<tr><td>4</td><td>Long press (continuously for over 1 s) SET key to set password.</td><td>SET</td><td>00000.</td></tr>
<tr><td>5</td><td>Enter password 26753 and set password at each bit with Shift key.</td><td></td><td>26758.</td></tr>
<tr><td>6</td><td>Long press (continuously for over 1 s) SET key to confirm password.</td><td>SET</td><td>-P.in-</td></tr>
<tr><td>7</td><td>Gently press SET key to exit password operation.</td><td>SET</td><td>FA004</td></tr>
<tr><td>8</td><td>Gently press M function key for several times to switch to A axis parameter setting mode.</td><td>M</td><td>PA000</td></tr>
<tr><td>9</td><td>Gently press “∧” key for six times and set FA006.</td><td>∧</td><td>PA006</td></tr>
<tr><td>10</td><td>Press SET key to display current PA000 data. The decimal point in bit 0 currently displayed flashes. Set motor manufacturer and encoder type with Shift key and "∧" key.
 

<table>
<tr><td>第3位</td><td>Bit 3</td></tr>
<tr><td>第2位</td><td>Bit 2</td></tr>
</table></td><td>SET</td><td>H0000.</td></tr>
</table>

	第1位	Bit 1	
	第0位	Bit 0	
	设置编码器类型	Set encoder type	
	0：非省线式编码器	0: non wire-saving encoder	
	1：多摩川省线式编码器	1: TAMAGAWA wire-saving encoder	
	设置电机厂家	Set motor manufacturer	
	0：之山H系列电机	0: Zhishan H Series Motor	
	2：之山M系列电机	2: Zhishan M Series Motor	
	厂家保留	Reserved by manufacturer	
	厂家保留	Reserved by manufacturer	
11	Press SET to return to the display of FA006.		
12	Gently press “∨” key once to set FA005.		
13	Gently press SET key to start motor model code setting.		
14	Modify the value according to appendix (motor adaption table) and set value at each bit with Shift key.		
15	Gently press SET key to exit motor model code setting.		

Note: 1. In case of double-axis servo drive, M function key should be press for a long time (continuously for over 1 s) during setting of b axis motor model to switch to b axis parameter and then follow step 9-12.

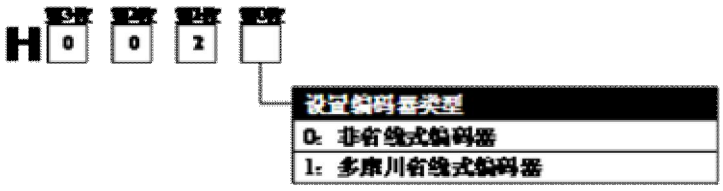
2. After setting motor model code, it is required to turn off and reboot servo drive to make modified parameters effective.

Motor Adaption Table

Note: Before selecting motor model, please set motor manufacturer and encoder type first which can both be set via PA006.

1: Zhishan M Series Motor

If the motor is Zhishan M Series Motor, refer to PA006 setting below:



第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
设置编码器类型	Set encoder type
0：非省线式编码器	0: non wire-saving encoder
1：多摩川省线式编码器	1: TAMAGAWA wire-saving encoder

Motor model	Torque N•m	Rotation speed rpm	Power kW	Motor type Pn005
60ST-M00630	0.637	3000	0.2	0
60ST-M01330	1.27	3000	0.4	1
60ST-M01930	1.91	3000	0.6	2
80ST-M01330	1.27	3000	0.4	3
80ST-M02430	2.39	3000	0.75	4
80ST-M03520	3.5	2000	0.73	5
80ST-M04025	4.0	2500	1.0	6
90ST-M02430	2.4	3000	0.75	7
90ST-M03520	3.5	2000	0.73	8
90ST-M04025	4.0	2500	1.0	9
110ST-M02030	2.0	3000	0.6	10
110ST-M04020	4.0	2000	0.8	11
110ST-M04030	4.0	3000	1.2	12
110ST-M05030	5.0	3000	1.5	13
110ST-M06020	6.0	2000	1.2	14
110ST-M06030	6.0	3000	1.8	15
130ST-M04025	4.0	2500	1.0	16
130ST-M05025	5.0	2500	1.3	17
130ST-M06025	6.0	2500	1.5	18
130ST-M07725	7.7	2500	2.0	19
130ST-M10010	10.0	1000	1.0	20
130ST-M10015	10.0	1500	1.5	21
130ST-M10025	10.0	2500	2.6	22
130ST-M15015	15.0	1500	2.3	23
130ST-M15025	15.0	2500	3.8	24

180ST-M17215	17.2	1500	2.7	25
180ST-M19015	19.0	1500	3.0	26
180ST-M21520	21.5	2000	4.5	27
180ST-M27010	27.0	1000	2.9	28
180ST-M27015	27.0	1500	4.3	29
180ST-M35010	35	1000	3.7	30
180ST-M35015	35.0	1500	5.5	31

2. Zhishan H Series Motor

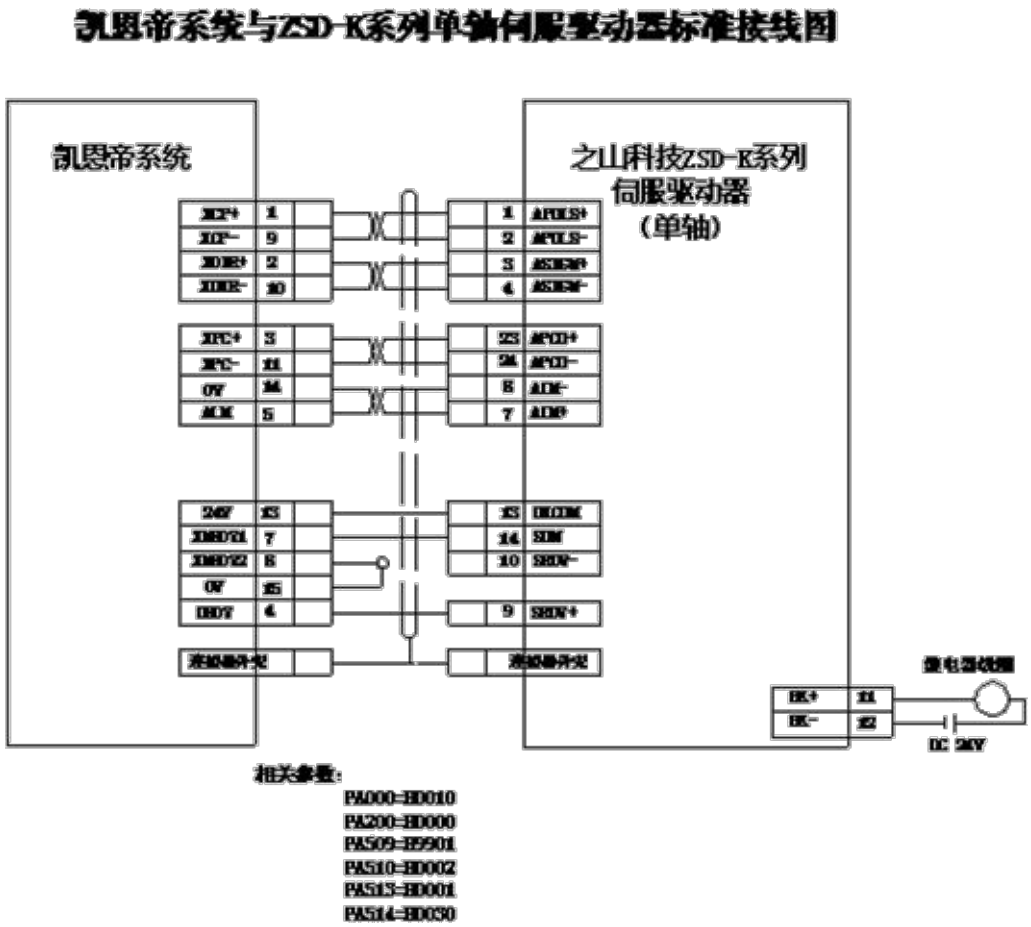
If the motor is Zhishan H Series Motor, refer to PA006 setting below:

第 3 位	Bit 3
第 2 位	Bit 2
第 1 位	Bit 1
第 0 位	Bit 0
设置编码器类型	Set encoder type
0：非省线式编码器	0: non wire-saving encoder
1：多摩川省线式编码器	1: TAMAGAWA wire-saving encoder

Motor model	Torque N•m	Rotation speed rpm	Power kW	Motor type Pn005
80ST-M01330LF1B	1.3	3000	0.4	0
80ST-M02430LF1B	2.4	3000	0.75	1
80ST-M03330LF1B	3.3	3000	1.0	2
110ST-M02030LFB	2.0	3000	0.6	3
110ST-M04030LFB	4.0	3000	1.2	4
110ST-M05030LFB	5.0	3000	1.5	5
110ST-M06020LFB	6.0	2000	1.2	6
110ST-M06030LFB	6.0	3000	1.8	7
130ST-M04025LFB	4.0	2500	1.0	8
130ST-M05025LFB	5.0	2500	1.3	10
130ST-M06025LFB	6.0	2500	1.5	11

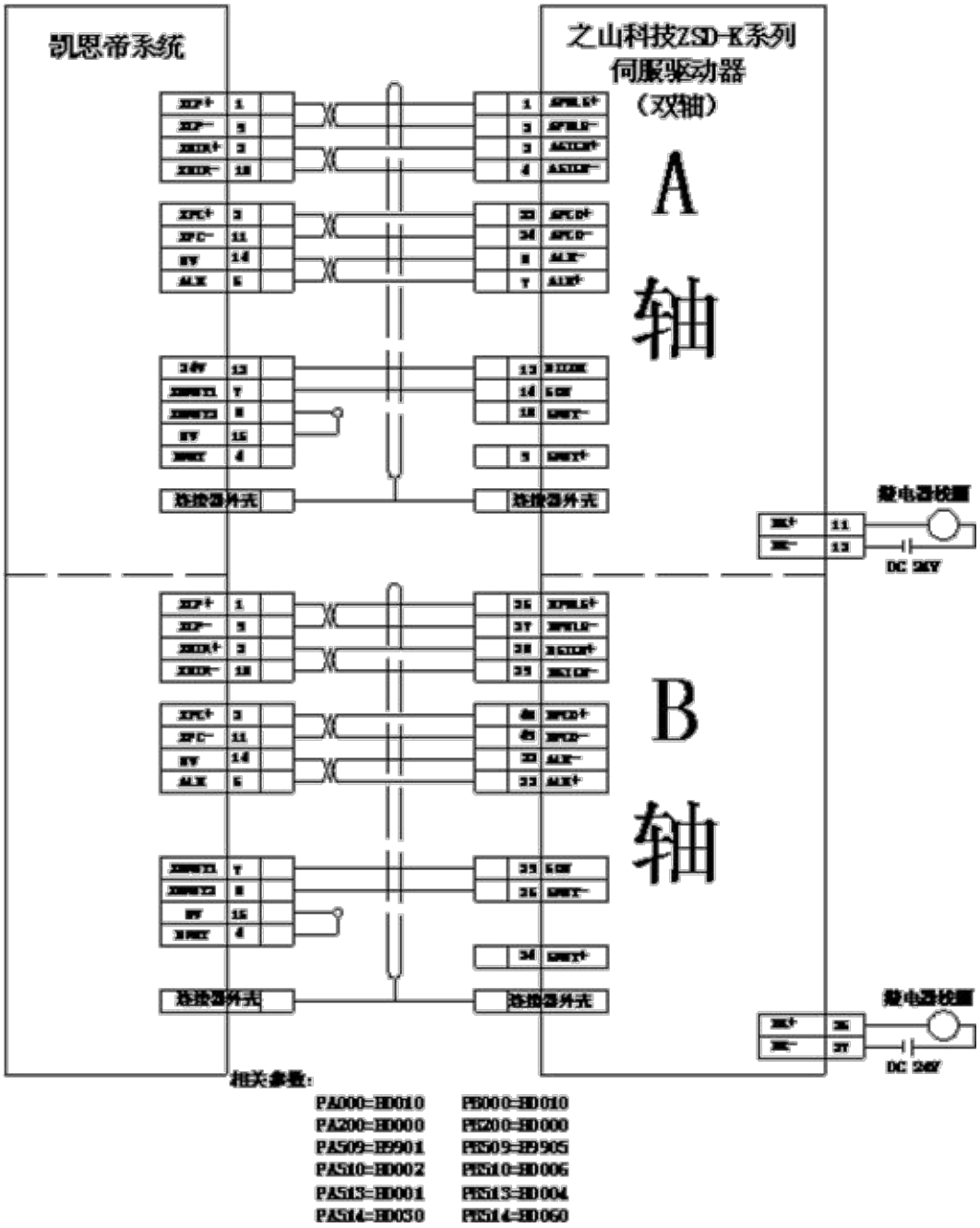
130ST-M07720LFB	7.7	2000	1.6	12
130ST-M07725LFB	7.7	2500	2.0	13
130ST-M07730LFB	7.7	3000	2.4	14
130ST-M10015LFB	10	1500	1.5	15
130ST-M10025LFB	10.0	2500	2.5	16
130ST-M15015LFB	15.0	1500	2.3	17
130ST-M15025LFB	15.0	2500	3.8	18
150ST-M15025LFB	15.0	2500	3.8	19
150ST-M18020LFB	18.0	2000	3.6	20
150ST-M23020LFB	23.0	2000	4.7	21
150ST-M27020LFB	27.0	2000	5.4	22

Appendix E System Wiring Diagram



凯恩帝系统与 MGD-K 系列单轴伺服驱动器标准接线图	Standard wiring diagram of single-axis servo drive of KND system and MGD-K Series
凯恩帝系统	KND system
之山科技 MGD-K 系列	Zhishan Technology MGD-K Series
伺服驱动器	Servo drive
（单轴）	(Single-axis)
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
相关参数：	Relevant parameters:

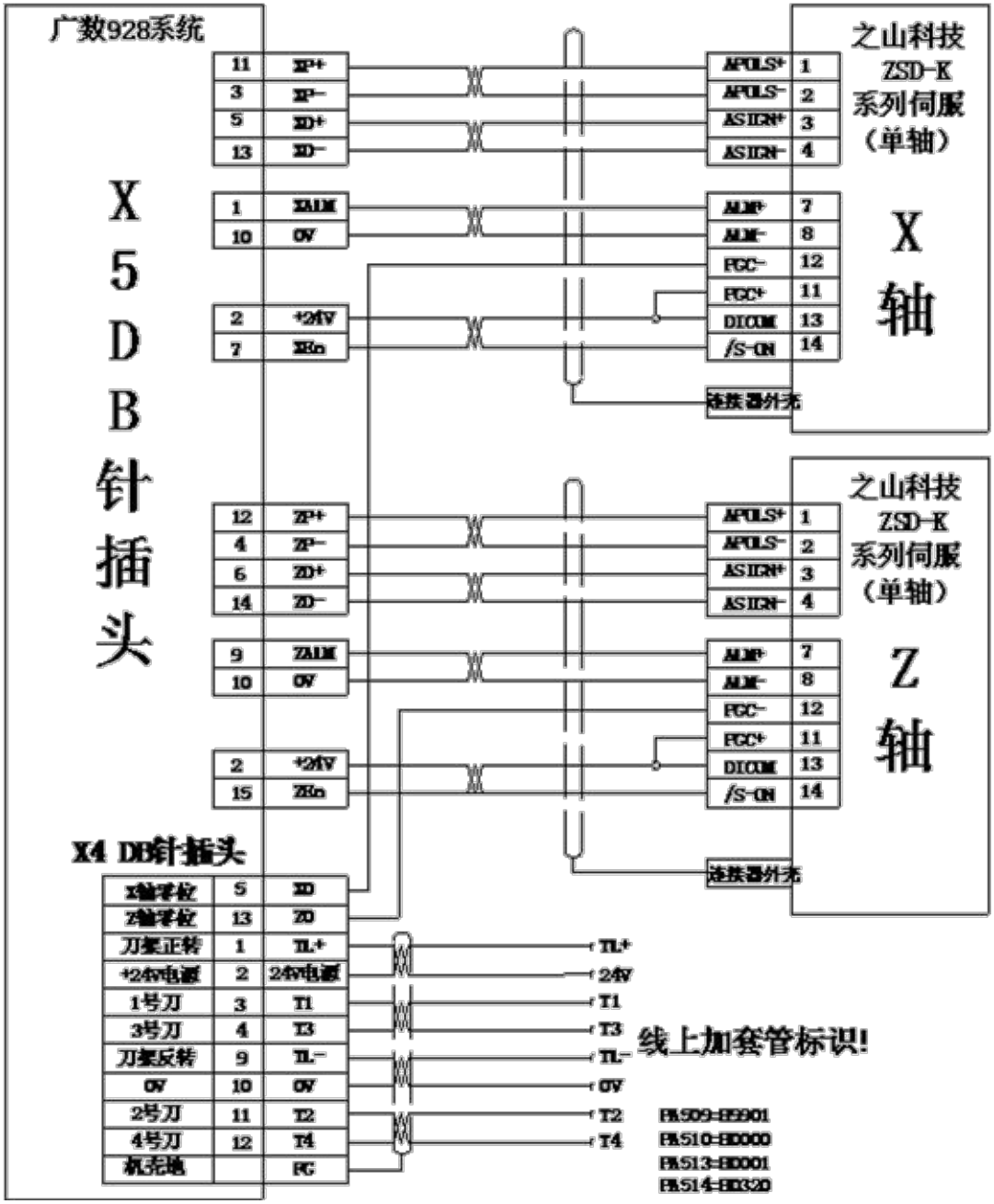
凯恩帝系统与ZSD-K系列双轴伺服驱动器标准接线图



凯恩帝系统与 MGD-K 系列双轴伺服驱动器标准接线图	Standard wiring diagram of double-axis servo drive of KND system and MGD-K Series
凯恩帝系统	KND system
之山科技 MGD-K 系列 伺服驱动器 （双轴）	Zhishan Technology MGD-K Series Servo drive (Double-axis)
A 轴	A axis
连接器外壳	Connector housing
连接器外壳	Connector housing

继电器线圈	Relay coil
B 轴	B axis
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
相关参数：	Relevant parameters:

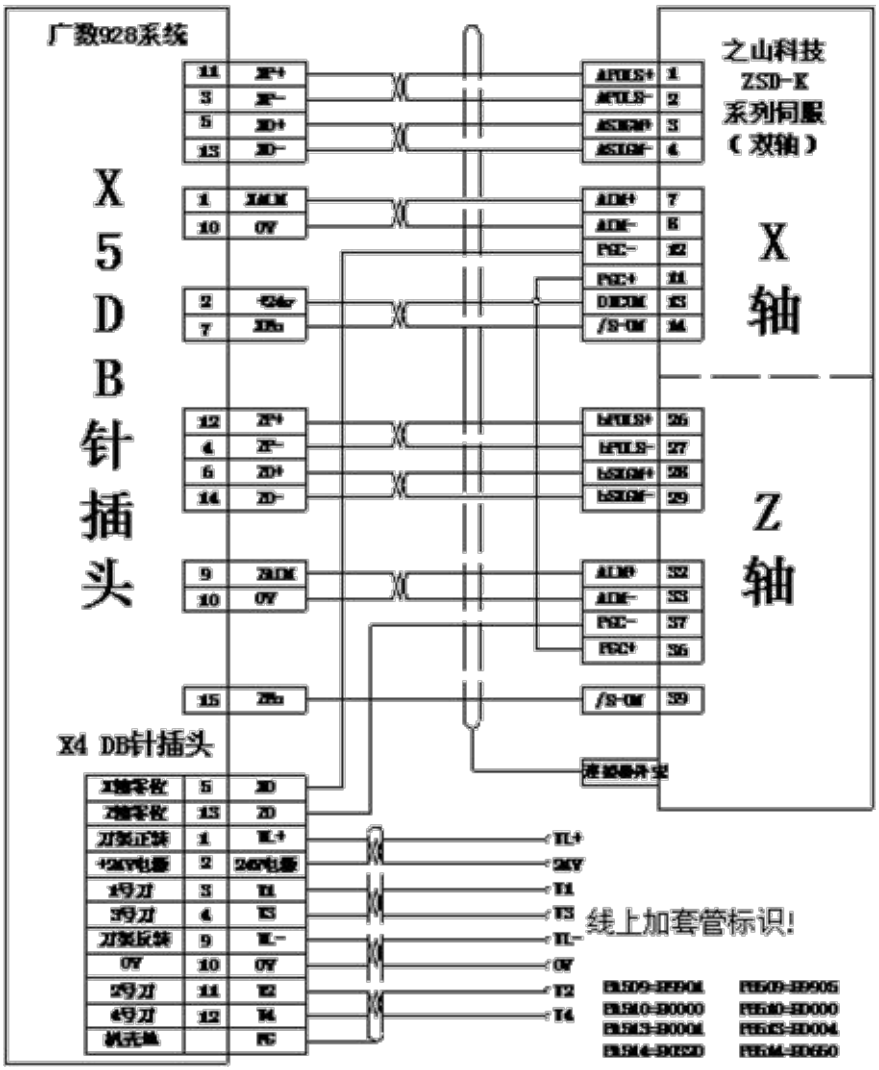
广数928系统与ZSD-K系列单轴伺服驱动器标准接线图



广数 928 系统与 MGD-K 系列单轴伺服驱动器标准接线图	Standard wiring diagram of single-axis servo drive of GSK 928 system and MGD-K Series
广数 928 系统	GSK 928 System
X5 DB 针插头	X5 DB pin plug
X4 DB 针插头	X4 DB pin plug
X 轴零位	X axis zero point
Z 轴零位	Z axis zero point
刀架正转	Positive rotation of tool rest

+24V 电源	+24 V power supply
24V 电源	24 V power supply
1 号刀	No. 1 tool
3 号刀	No. 3 tool
刀架反转	Negative rotation of tool rest
2 号刀	No. 2 tool
4 号刀	No. 4 tool
机壳地	Enclosure earthing
之山科技 MGD-K 系列伺服（单轴）	Zhishan Technology MGD-K Series Servo (single-axis)
X 轴	X-axis
连接器外壳	Connector housing
之山科技 MGD-K 系列伺服（单轴）	Zhishan Technology MGD-K Series Servo (single-axis)
Z 轴	Z-axis
连接器外壳	Connector housing
线上加套管标识!	Sleeve sign should be provided on wires!

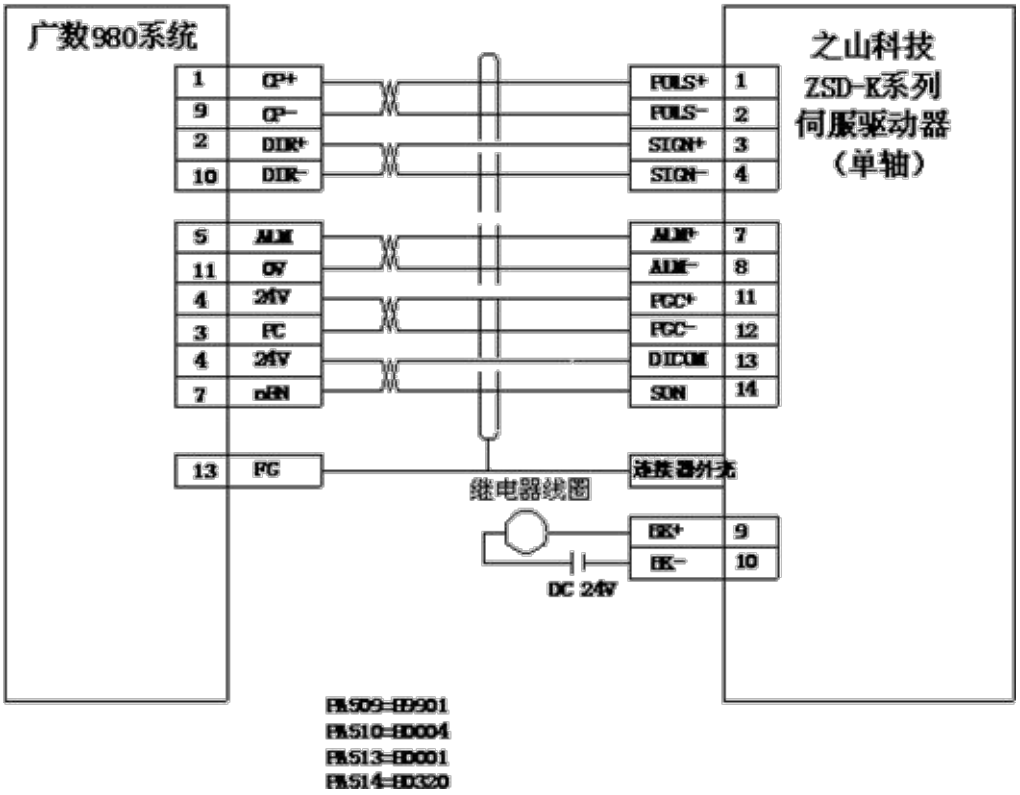
广数928系统与ZSD-K系列双轴伺服驱动器标准接线图



广数 928 系统与 MGD-K 系列双轴伺服驱动器标准接线图	Standard wiring diagram of double-axis servo drive of GSK 928 system and MGD-K Series
广数 928 系统	GSK 928 System
X5 DB 针插头	X5 DB pin plug
X4 DB 针插头	X4 DB pin plug
X 轴零位	X axis zero point
Z 轴零位	Z axis zero point
刀架正转	Positive rotation of tool rest
+24V 电源	+24 V power supply
24V 电源	24 V power supply
1 号刀	No. 1 tool
3 号刀	No. 3 tool
刀架反转	Negative rotation of tool rest
2 号刀	No. 2 tool

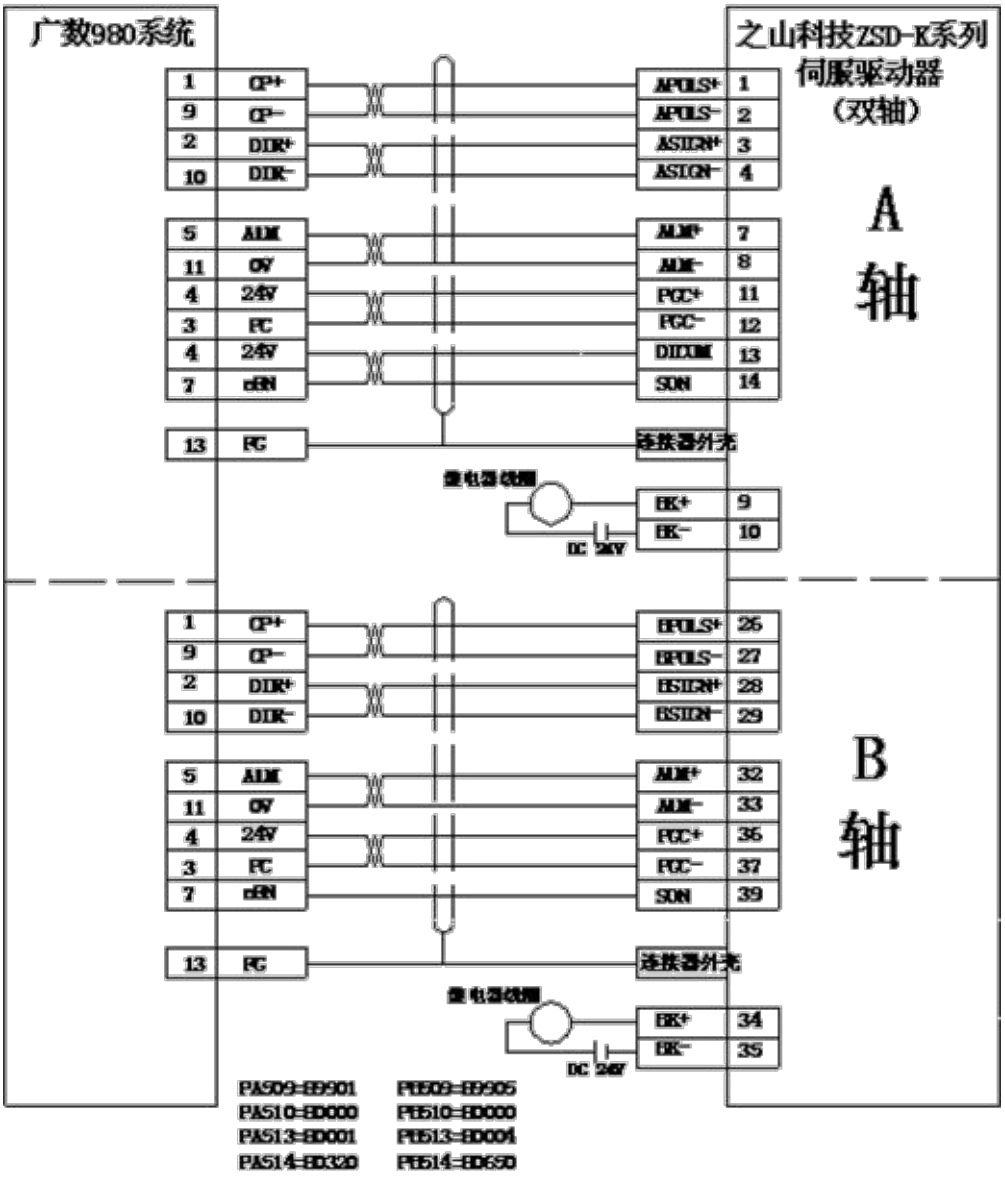
4 号刀	No. 4 tool
机壳地	Enclosure earthing
之山科技 MGD-K 系列伺服（双轴）	Zhishan Technology MGD-K Series Servo (double-axis)
X 轴	X-axis
Z 轴	Z-axis
连接器外壳	Connector housing
线上加套管标识!	Sleeve sign should be provided on wires!

广数980系统与ZSD-K系列单轴伺服驱动器标准接线图

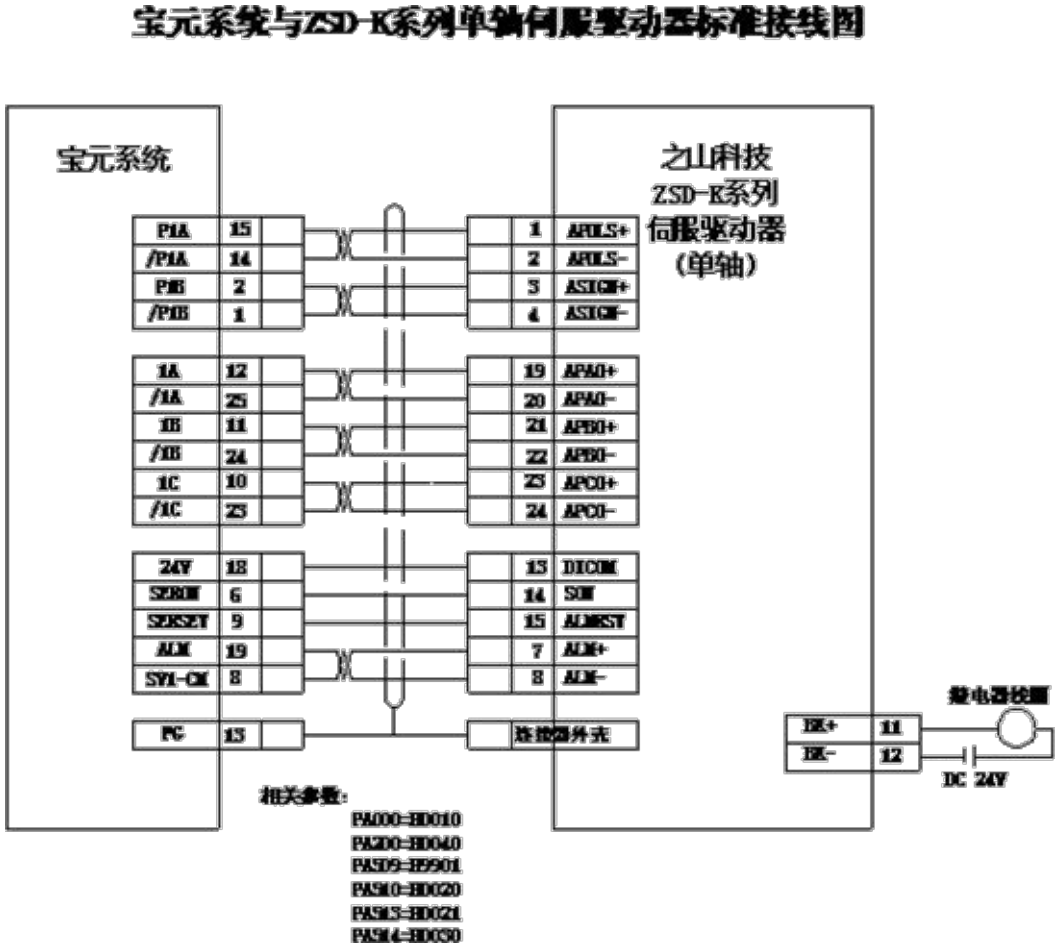


广数 980 系统与 MGD-K 系列单轴伺服驱动器标准接线图	Standard wiring diagram of single-axis servo drive of GSK 980 system and MGD-K Series
广数 980 系统	GSK 980 System
之山科技 MGD-K 系列 伺服驱动器 （单轴）	Zhishan Technology MGD-K Series Servo drive (Single-axis)
连接器外壳	Connector housing
继电器线圈	Relay coil

广数980系统与ZSD-K系列双轴伺服驱动器标准接线图

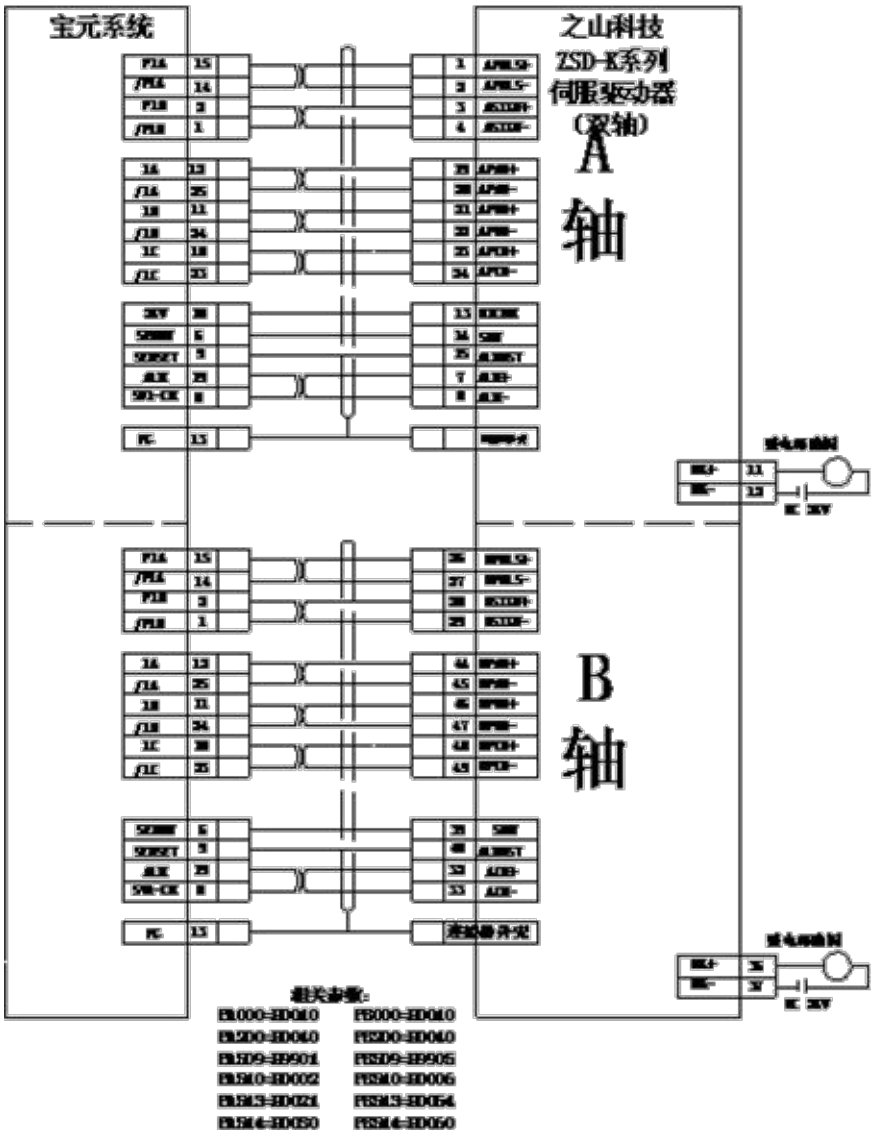


广数 980 系统与 MGD-K 系列双轴伺服驱动器标准接线图	Standard wiring diagram of double-axis servo drive of GSK 980 system and MGD-K Series
广数 980 系统	GSK 980 System
之山科技 MGD-K 系列 伺服驱动器 （双轴）	Zhishan Technology MGD-K Series Servo drive (Double-axis)
A 轴	A axis
连接器外壳	Connector housing
继电器线圈	Relay coil
B 轴	B axis
连接器外壳	Connector housing
继电器线圈	Relay coil



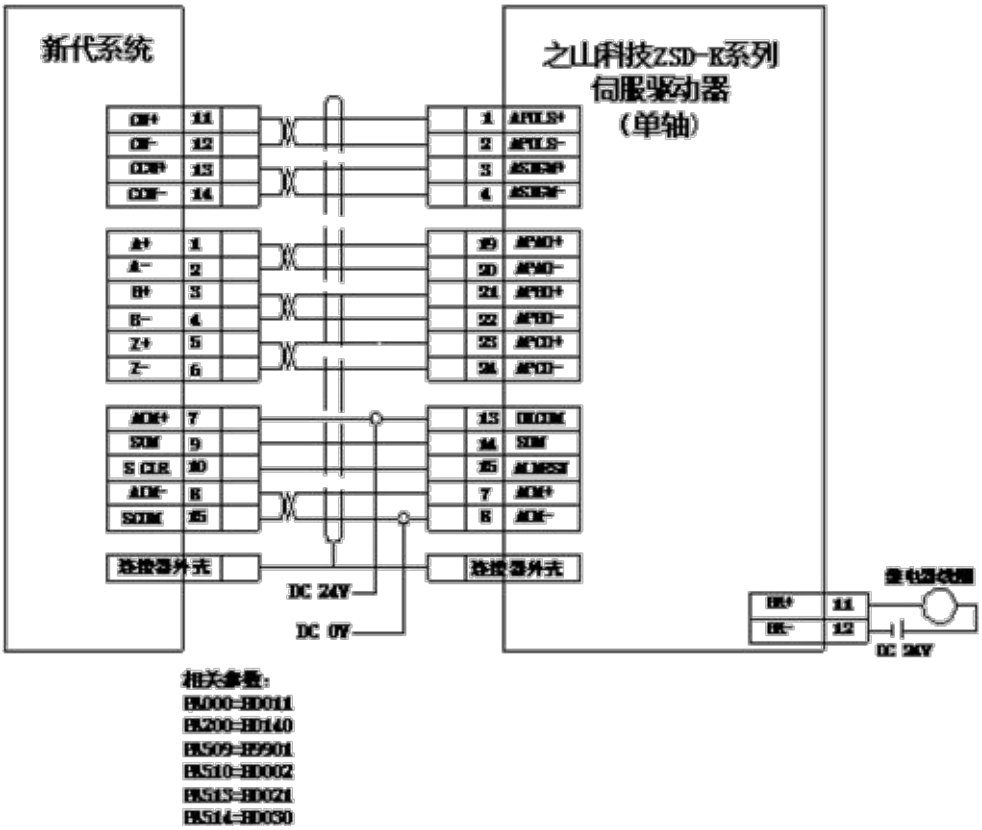
宝元系统与 MGD-K 系列单轴伺服驱动器标准接线图	Standard wiring diagram of single-axis servo drive of BYSK system and MGD-K Series
宝元系统	BYSK system
之山科技 MGD-K 系列 伺服驱动器 （单轴）	Zhishan Technology MGD-K Series Servo drive (Single-axis)
连接器外壳	Connector housing
继电器线圈	Relay coil
相关参数：	Relevant parameters:

宝元系统与ZSD-K系列双轴伺服驱动器标准接线图



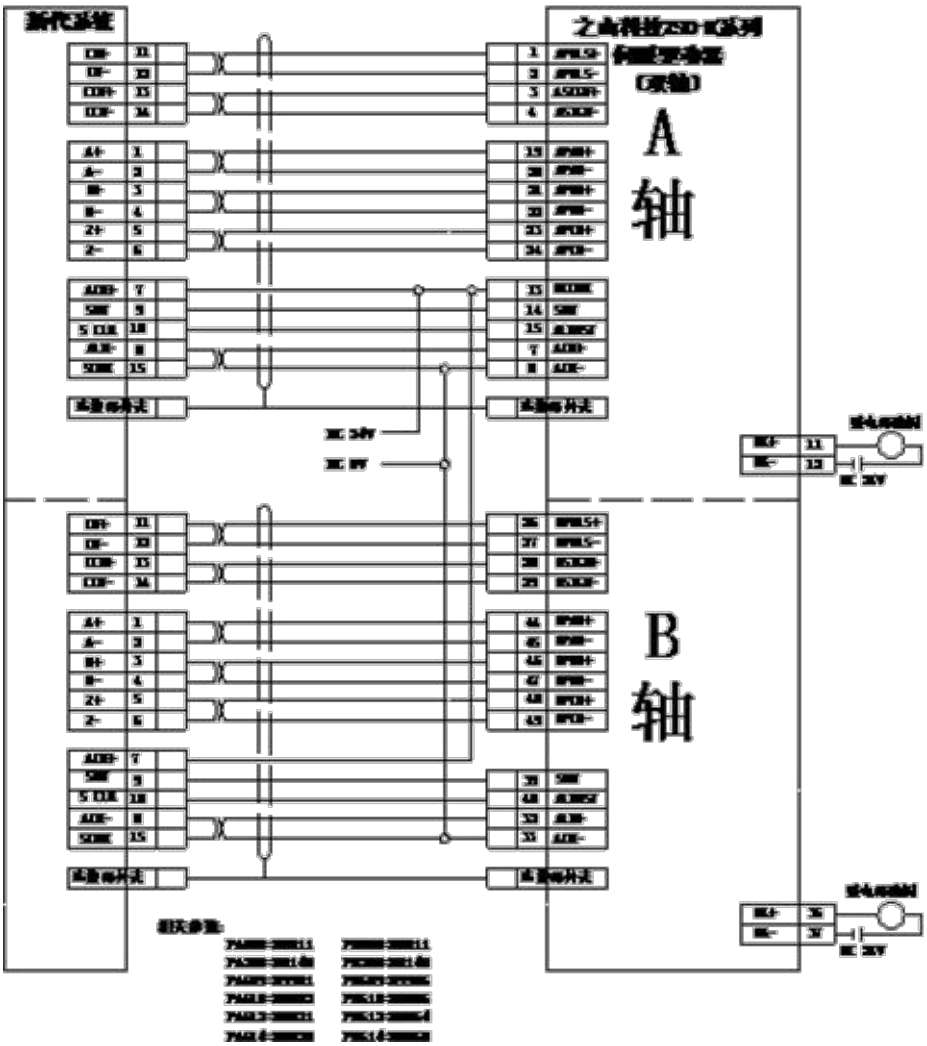
宝元系统与 MGD-K 系列双轴伺服驱动器标准接线图	Standard wiring diagram of double-axis servo drive of BYSK system and MGD-K Series
宝元系统	BYSK system
之山科技 MGD-K 系列 伺服驱动器 （双轴）	Zhishan Technology MGD-K Series Servo drive (Double-axis)
A 轴	A axis
连接器外壳	Connector housing
继电器线圈	Relay coil
B 轴	B axis
连接器外壳	Connector housing
继电器线圈	Relay coil
相关参数：	Relevant parameters:

新代系统与ZSD-K系列单轴伺服驱动器标准接线图



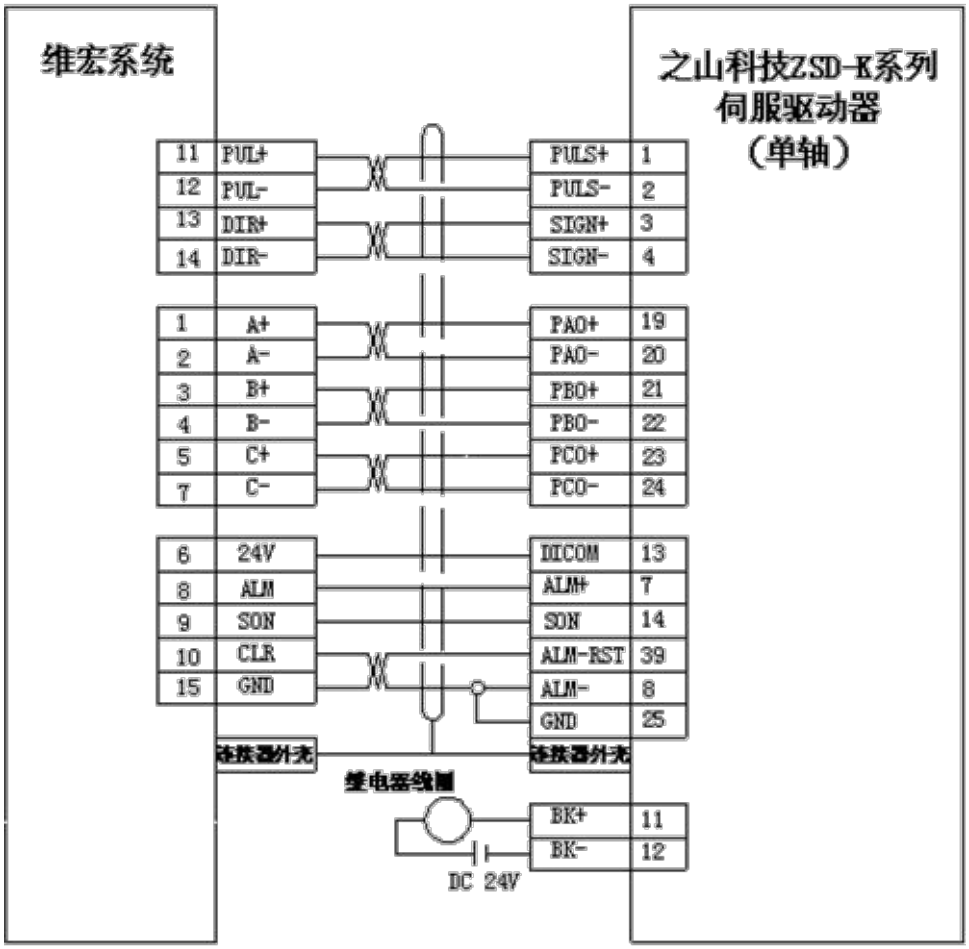
新代系统与 MGD-K 系列单轴伺服驱动器标准接线图	Standard wiring diagram of single-axis servo drive of Syntec system and MGD-K Series
新代系统	Syntec system
之山科技 MGD-K 系列 伺服驱动器 （单轴）	Zhishan Technology MGD-K Series Servo drive (Single-axis)
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
相关参数：	Relevant parameters:

新代系统与ZSD-K系列双轴伺服驱动器标准接线图



新代系统与 MGD-K 系列双轴伺服驱动器标准接线图	Standard wiring diagram of double-axis servo drive of Syntec system and MGD-K Series
新代系统	Syntec system
之山科技 MGD-K 系列 伺服驱动器 （双轴）	Zhishan Technology MGD-K Series Servo drive (Double-axis)
A 轴	A axis
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
B 轴	B axis
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
相关参数：	Relevant parameters:

维宏系统与ZSD-K系列单轴伺服驱动器标准接线图



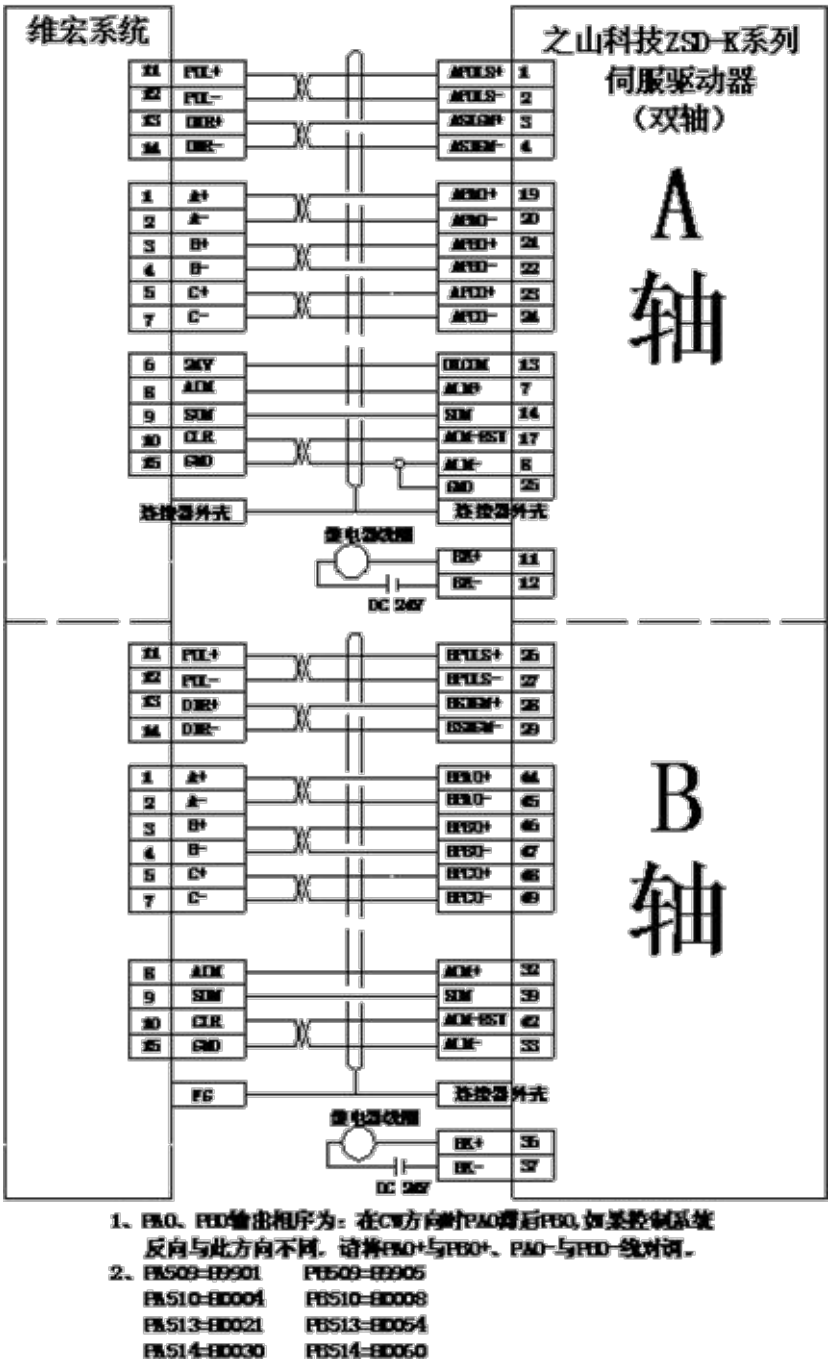
1、PAO、PBO输出相序为：在CW方向时PAO滞后PBO，如果控制系统反向与此方向不同，请将PAO+与PBO+、PAO-与PBO-线对调。

2、PA509=H9901
PA510=H0004
PA513=H0021
PA514=H0030

维宏系统与 MGD-K 系列单轴伺服驱动器标准接线图	Standard wiring diagram of single-axis servo drive of Weihong system and MGD-K Series
维宏系统	Weihong system
之山科技 MGD-K 系列 伺服驱动器 （单轴）	Zhishan Technology MGD-K Series Servo drive (Single-axis)
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
1、PAO、PBO 输出相序为：在 CW 方向时 PAO 滞后 PBO,如果控制系统反向与此方向不同，请将 PAO+与 PBO+、PAO-与 PBO-线	1. PAO and PBO output phase sequence: PAO is behind PBO in CW direction. If control system is in the opposite direction, please exchange PAO+ and PBO+ as well as PAO-

对调。	and PBO- wires.

维宏系统与ZSD-K系列双轴伺服驱动器标准接线图

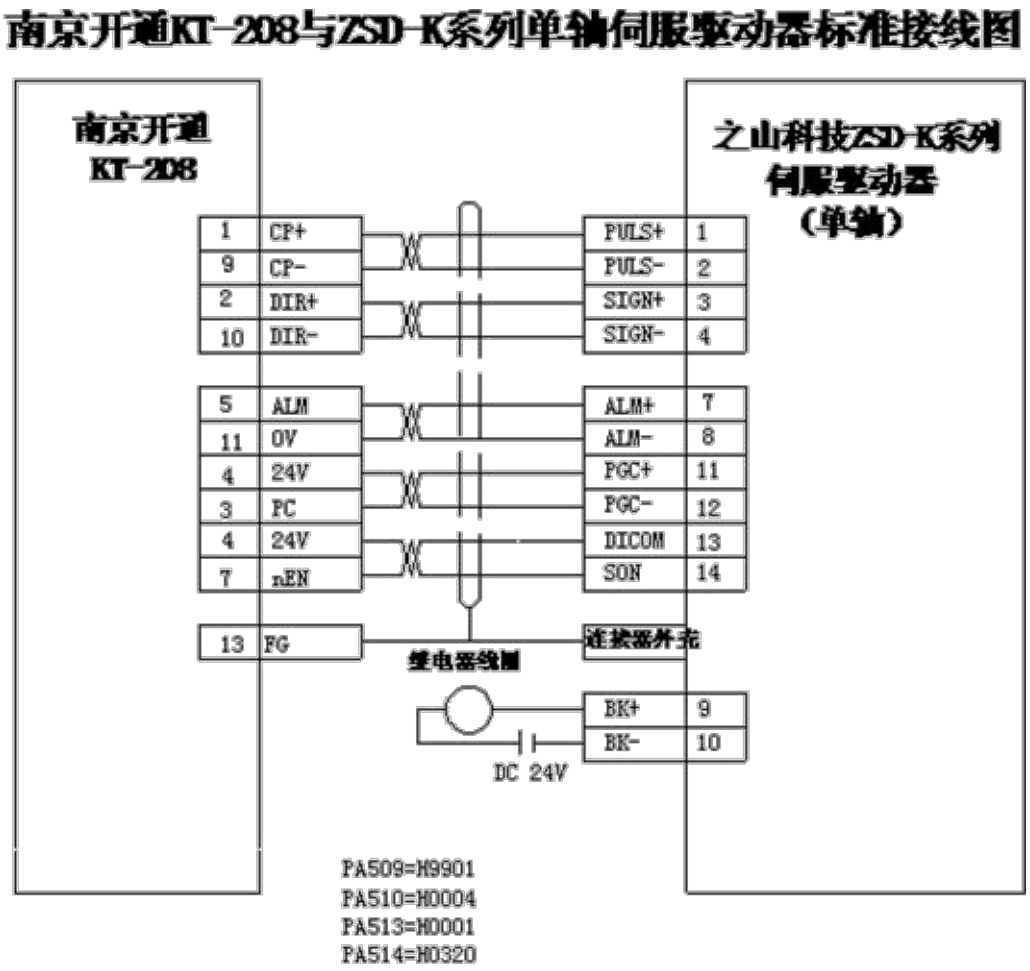


1、PA0、PB0输出相序为：在CW方向时PA0滞后PB0，如果控制系统
反向与此方向不同，请将PA0+与PB0+、PA0-与PB0-线对调。

2、PA509=89901　　PB509=89905
PA510=80004　　PB510=80008
PA513=80021　　PB513=80054
PA514=80030　　PB514=80060

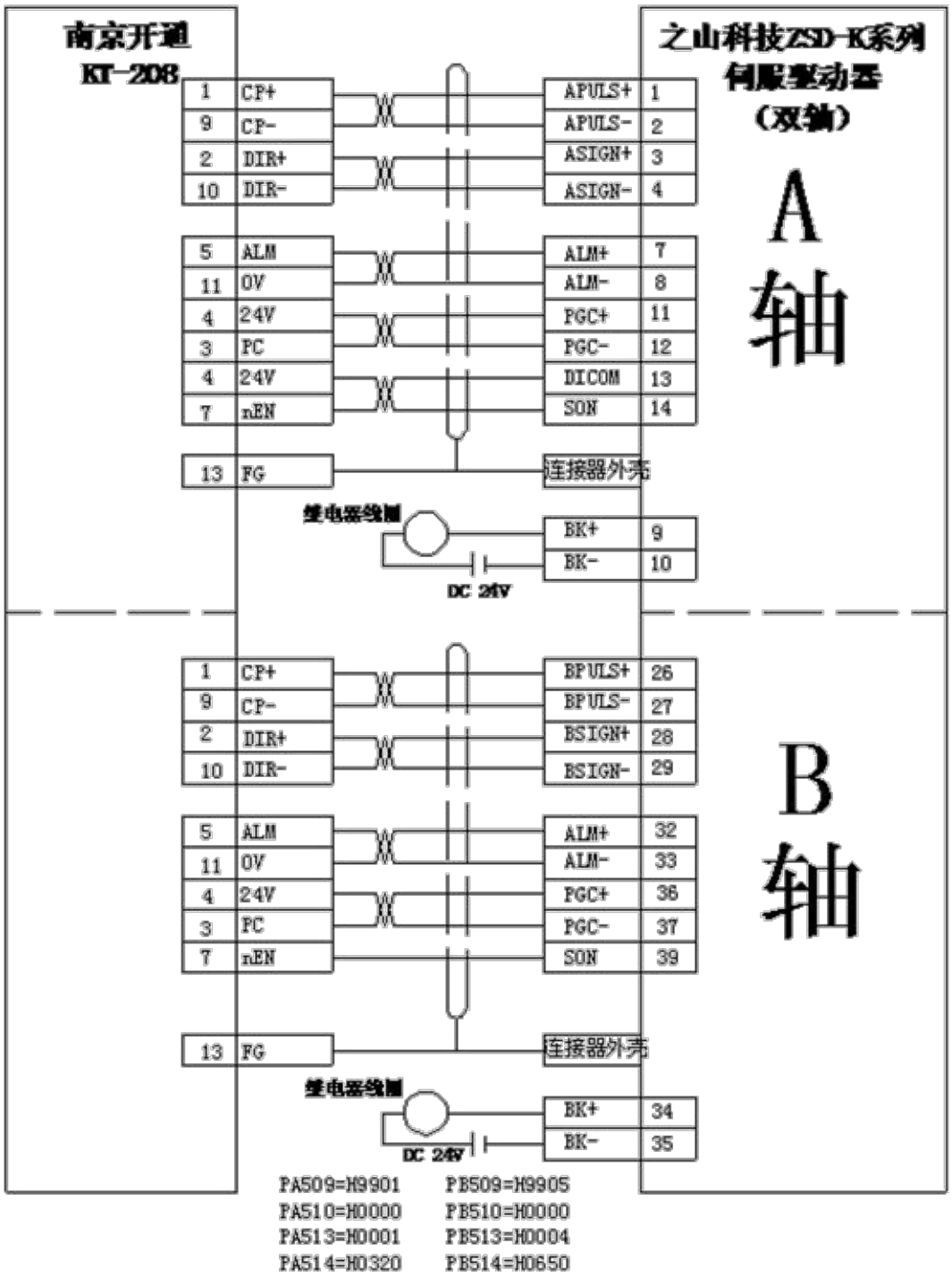
维宏系统与 MGD-K 系列双轴伺服驱动器标准接线图	Standard wiring diagram of double-axis servo drive of Weihong system and MGD-K Series
维宏系统	Weihong system
之山科技 MGD-K 系列 伺服驱动器 （双轴）	Zhishan Technology MGD-K Series Servo drive (Double-axis)
A 轴	A axis
连接器外壳	Connector housing
连接器外壳	Connector housing

继电器线圈	Relay coil
B 轴	B axis
连接器外壳	Connector housing
继电器线圈	Relay coil
1、PAO、PBO 输出相序为：在 CW 方向时 PAO 滞后 PBO,如果控制系统反向与此方向不同，请将 PAO+与 PBO+、PAO-与 PBO-线对调。	1. PAO and PBO output phase sequence: PAO is behind PBO in CW direction. If control system is in the opposite direction, please exchange PAO+ and PBO+ as well as PAO- and PBO- wires.



南京开通 KT-208 与 MGD-K 系列单轴伺服驱动器标准接线图	Standard wiring diagram of single-axis servo drive of KT-208 and MGD-K Series
南京开通 KT-208	KT-208
之山科技 MGD-K 系列 伺服驱动器 （单轴）	Zhishan Technology MGD-K Series Servo drive (Single-axis)
连接器外壳	Connector housing
继电器线圈	Relay coil

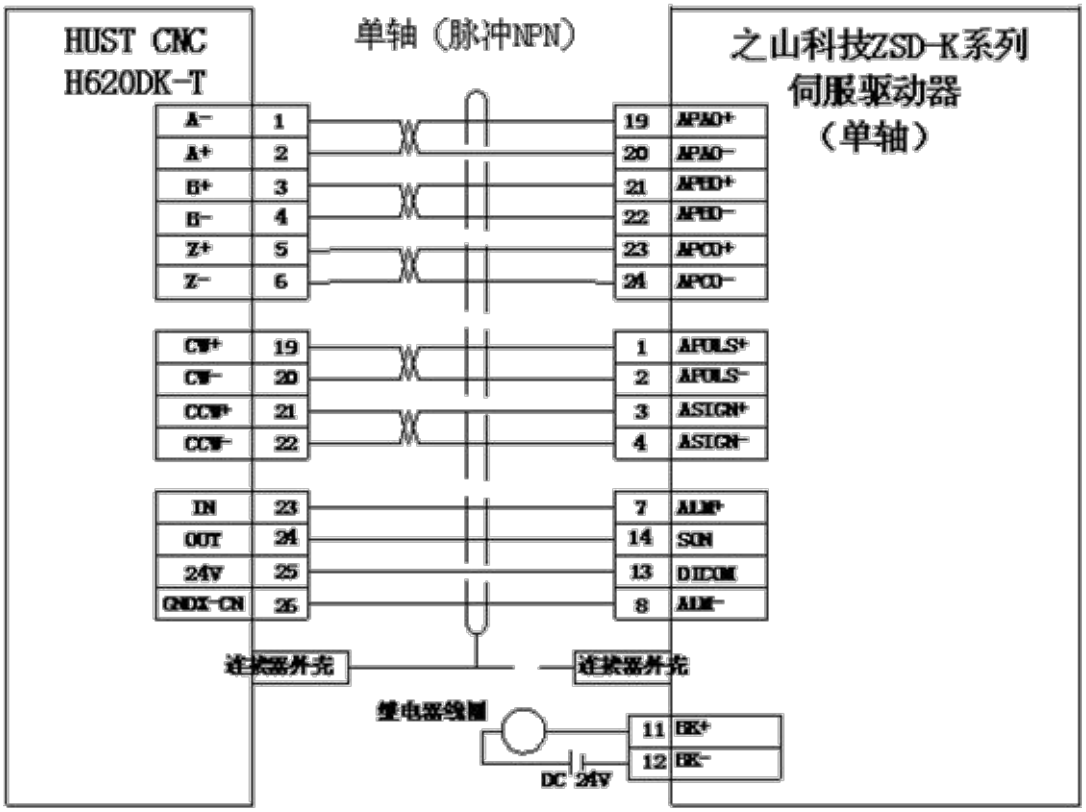
南京开通KT-208与ZSD-K系列双轴伺服驱动器标准接线图

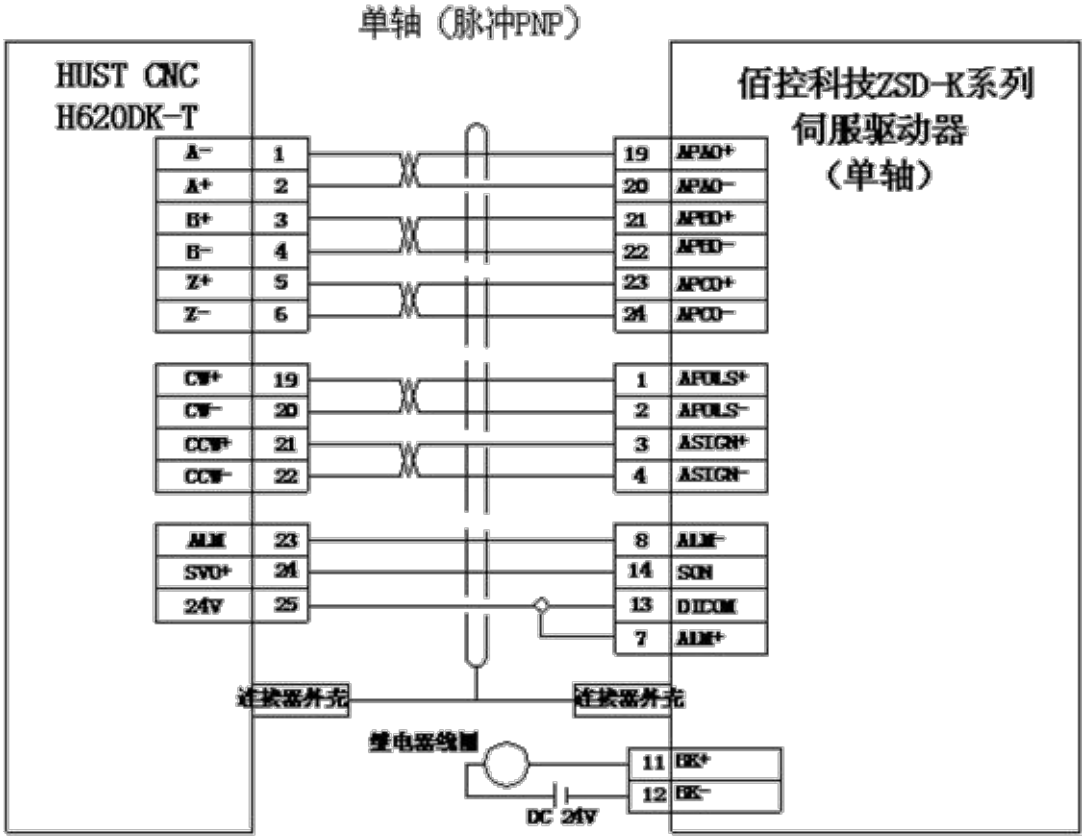


南京开通 KT-208 与 MGD-K 系列双轴伺服驱动器标准接线图	Standard wiring diagram of double-axis servo drive of KT-208 and MGD-K Series
南京开通 KT-208	KT-208
之山科技 MGD-K 系列 伺服驱动器	Zhishan Technology MGD-K Series Servo drive (Double-axis)

（双轴）	
A 轴	A axis
连接器外壳	Connector housing
继电器线圈	Relay coil
B 轴	B axis
连接器外壳	Connector housing
继电器线圈	Relay coil

广州亿图系统与ZSD-K系列单轴伺服驱动器标准接线图



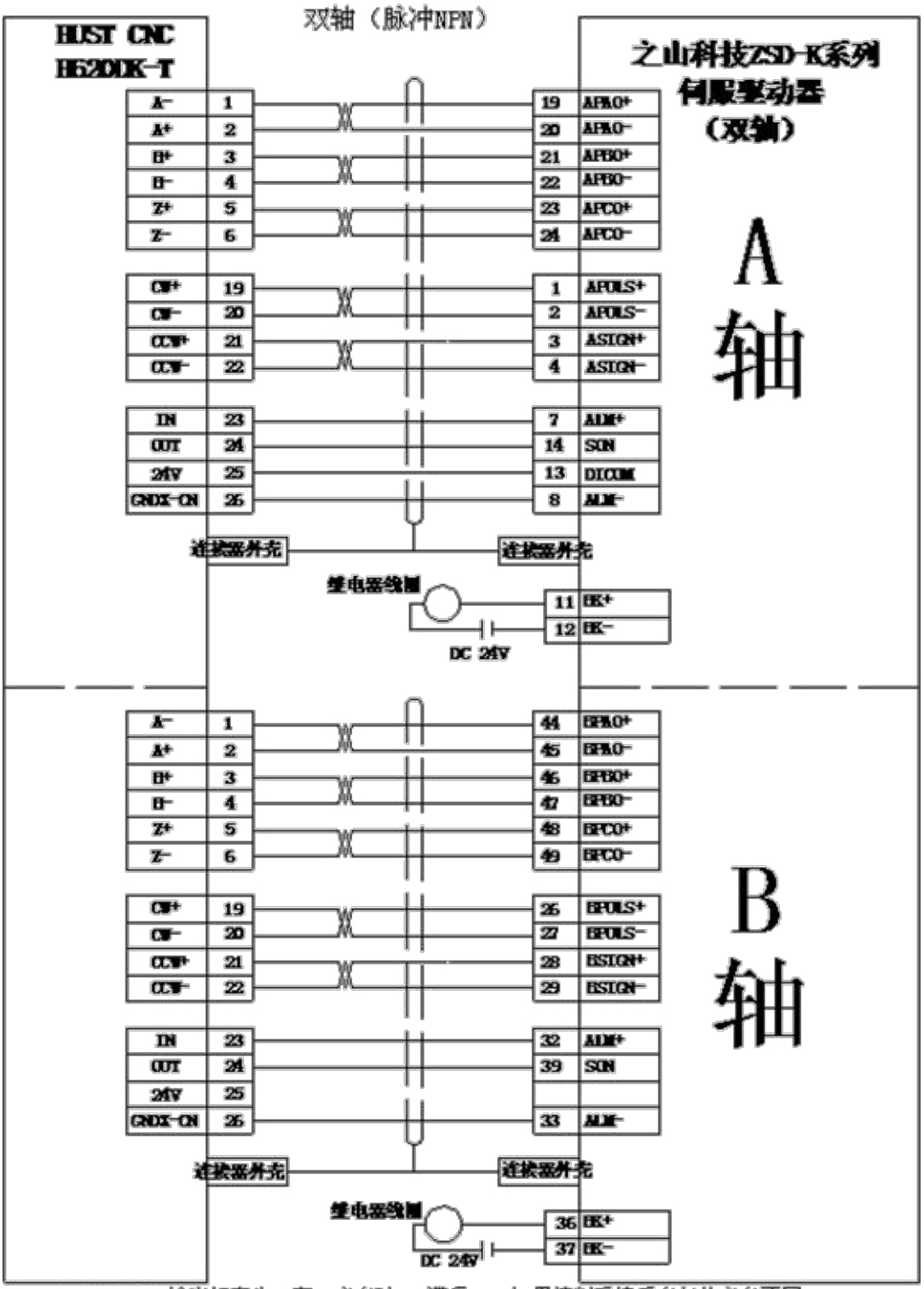


1、PA0、PB0输出相序为：在CW方向时PA0滞后PB0,如果控制系统反向与此方向不同，请将PA0+与PB0+、PA0-与PB0-线对调。

2、PA000=H0010
PA200=H0040
PA509=H9901
PA513=H0021
PA514=H0030

广州亿图系统与 MGD-K 系列单轴伺服驱动器标准接线图	Standard wiring diagram of single-axis servo drive of Hust system and MGD-K Series
单轴（脉冲 NPN）	Single-axis (pulse NPN)
之山科技 MGD-K 系列 伺服驱动器 （单轴）	Zhishan Technology MGD-K Series Servo drive (Single-axis)
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
单轴（脉冲 PNP）	Single-axis (pulse PNP)
佰控科技 MGD-K 系列伺服驱动器（单轴）	Bicon Technology MGD-K Series Servo Drive (single-axis)
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
1、PAO、PBO 输出相序为：在 CW 方向时 PAO 滞后 PBO,如果控制系统反向与此方向不同，请将 PAO+与 PBO+、PAO-与 PBO-线对调。	1. PAO and PBO output phase sequence: PAO is behind PBO in CW direction. If control system is in the opposite direction, please exchange PAO+ and PBO+ as well as PAO- and PBO- wires.

广州亿图系统与ZSD-K系列双轴伺服驱动器标准接线图

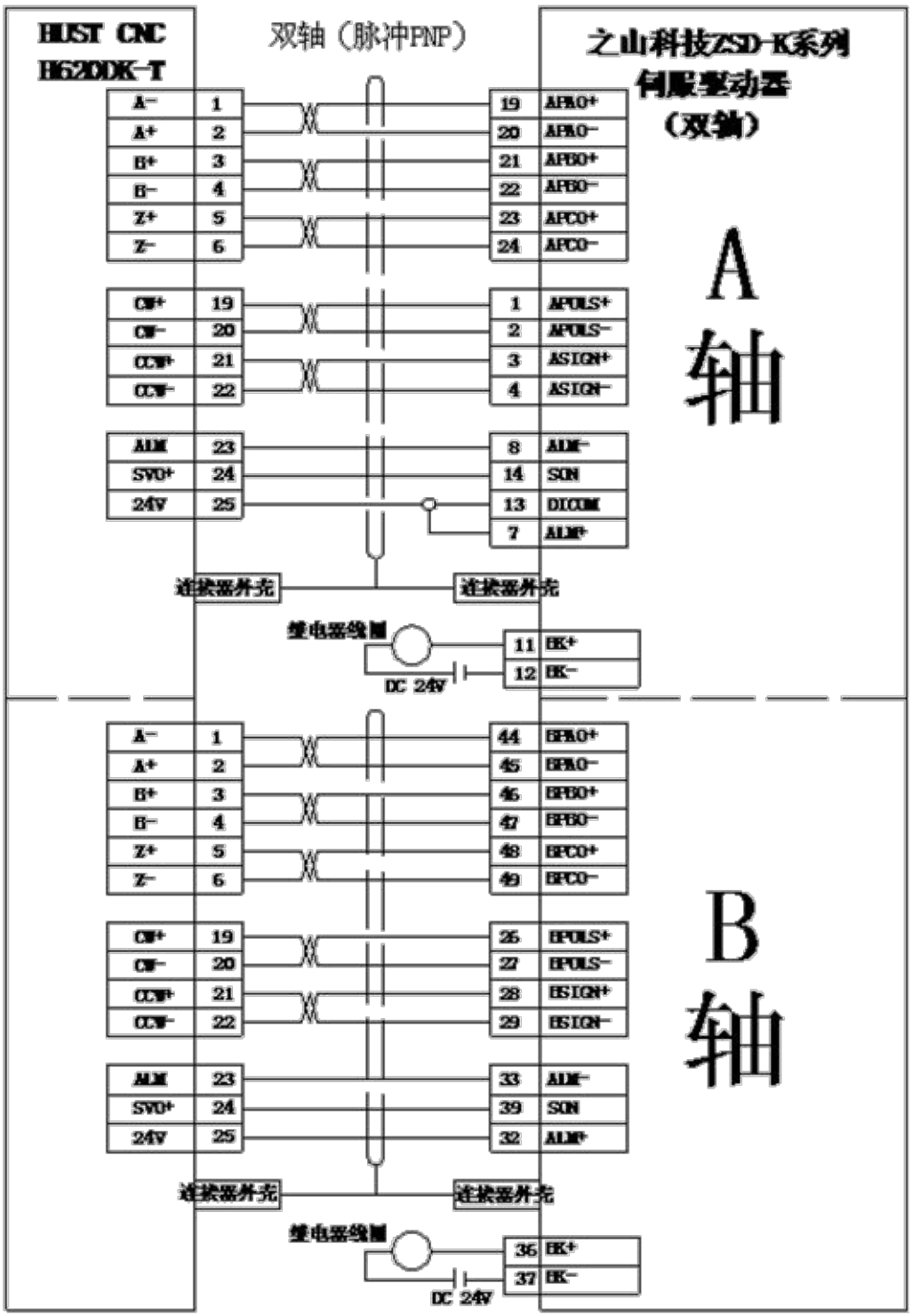


1、PA0、PB0输出相序为：在CW方向时PA0滞后PB0,如果控制系统反向与此方向不同，
请将PA0+与PB0+PA0-与PB0-线对调。

2、PA000=H0010　　PB000=H0010
PA200=H0040　　PB200=H0040
PA509=H9901　　PB509=H9905
PA513=H0021　　PB513=H0054
PA514=H0030　　PB514=H0060

广州亿图系统与 MGD-K 系列双轴伺服驱动器标准接线图	Standard wiring diagram of double-axis servo drive of Hust system and MGD-K Series
之山科技 MGD-K 系列 伺服驱动器 （双轴）	Zhishan Technology MGD-K Series Servo drive (Double-axis)
双轴（脉冲 NPN）	Double-axis (pulse NPN)
A 轴	A axis
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
B 轴	B axis
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
1、PAO、PBO 输出相序为：在 CW 方向时 PAO 滞后 PBO,如果控制系统反向与此方向不同，请将 PAO+与 PBO+PAO-与 PBO-线对调。	1. PAO and PBO output phase sequence: PAO is behind PBO in CW direction. If control system is in the opposite direction, please exchange PAO+ and PBO+ as well as PAO- and PBO- wires.

广州亿图系统与ZSD-K系列双轴伺服驱动器标准接线图



1、PAO、PBO输出相序为：在CW方向时PAO滞后PBO,如果控制系统反向与此方向不同，
请将PAO+与PBO+、PAO-与PBO-线对调。

2、PA000=H0010　　PB000=H0010
PA200=H0040　　PB200=H0040
PA509=H9901　　PB509=H9905
PA513=H0021　　PB513=H0054
PA514=H0030　　PB514=H0060

广州亿图系统与 MGD-K 系列双轴伺服驱动器标准接线图	Standard wiring diagram of double-axis servo drive of Hust system and MGD-K Series
双轴（脉冲 PNP）	Double-axis (pulse PNP)
之山科技 MGD-K 系列 伺服驱动器 （双轴）	Zhishan Technology MGD-K Series Servo drive (Double-axis)
A 轴	A axis
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
B 轴	B axis
连接器外壳	Connector housing
连接器外壳	Connector housing
继电器线圈	Relay coil
1、PAO、PBO 输出相序为：在 CW 方向时 PAO 滞后 PBO,如果控制系统反向与此方向不同，请将 PAO+与 PBO+、PAO-与 PBO-线对调。	1. PAO and PBO output phase sequence: PAO is behind PBO in CW direction. If control system is in the opposite direction, please exchange PAO+ and PBO+ as well as PAO- and PBO- wires.

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research & development
www.purelogic.ru

8 800 555-63-74 бесплатные звонки по РФ

Контакты
+7(495) 505-63-74 (Москва)
+7(473) 204-51-56 (Воронеж)
+7(812) 425-17-35 (Санкт-Петербург)

394033, Россия, г.Воронеж,
Ленинский проспект, 160
офис 135

Пн-Чт: 8.00–17:00
Пт: 8.00–16.00
Перерыв: 12.30–13.30

info@purelogic.ru