# A5-E series AC Servo Driver

## EtherCAT Communication User Manual


Shenzhen Xinlichuan Electric Co., Ltd.

# catalog

# Chapter 1 Safety Precautions

Before using the servo drive system, please carefully read the relevant precautions of the equipment, and be sure to follow the installation and debugging safety precautions and operating procedures. The company is exempt from liability for equipment damage or personal injury caused by failure to operate as required.

- This product is a general industrial product and is not intended for use with machines or systems that may affect human life
- Please have professional qualified personnel perform wiring, operation, maintenance, inspection, and other operations。
- When applied to devices that may cause major accidents or losses, please equip safety devices.
- Although this product has made every effort in quality management, unexpected factors such as noise, static electricity, input power, wiring, and parts may cause unexpected actions. Please fully consider mechanical safety measures to ensure safety with in the possible range of actions

# Chapter 2 Electrical Specifications

## 2.1 Specification

| | | |
|---|---|---|
| Input power supply | Single phase 220VAC（A5-10/A5-20） | |
| work environment | temperature | 0～45℃ |
| | humidity | No condensation below 90% RH |
| | altitude | altitude≤1000m |
| | Installation environment | No corrosive gases, flammable gases, oil mist or dust, etc |
| | Installation instruction | Vertical installation |
| Encoder | | Supports 17 bit incremental/absolute encoder and 23 bit incremental/absolute encoder |
| Output Voltage | 24VVoltage output | 100mA，Can supply power to the DI port。 |
| Control signal | digital input | 5 ordinary digital inputs, with configurable functions. |
| | Digital Output | 3-way digital output with configurable functions。 |
| communication | | EtherCAT Communication。 |
| Display panel and button operation | | 5 buttons (Mode, Set, Left, Up, Down) and 6 digital tubes |
| Regenerative discharge braking resistor | | Built in 50W, 40 Ω braking resistor. Frequent braking situations require external braking resistors。 |

## 2.2 Driver Model

LCA5 - 10 E - 100
① ② ③ ④

① : Driver series

② : Driver power
- 10:50W~750W
- 20:1KW
- 30:1KW~2.6KW
- 50:3KW~3.8KW

③ : Control Type
- P:Pulse type
- E:EtherCAT Bus type

④ : Motor power
- 50:50w
- 100:100W
- 200:200W
- 400:400W
- 750:750W
- 1000:1KW
- ……
- 3800:3.8KW

## 2.3 Motor Model

LCMT - 02 _ LB C17 N B - 60 M006 30B
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① :Motor series

② :Motor power
- 02:0.2KW
- 04:0.4KW
- ……
- 38:3.8KW

③ : Poles
- □：4Poles
- S：5Poles

4.Motor inertia
- LB:220Vlow inertia
- MB:220VMedium inertia

⑤：Encoder Type
- C17: 17 bit magnetic encoder incremental
- R17: 17 bit magnetic encoder absolute value
- C23: 23 bit magnetic encoder incremental
- R23: 23 bit magnetic encoder absolute value

⑥ : Motor brake
- N:No brake
- Z:With brake

⑦ :Motor oil seal and keyway
- A: No oil seal, no keyway
- B: With oil seal, with keyway
- C: Oil seal without keyway

⑧: Motor flange
- 60:60flange
- 80:80flange
- 130:130flange

⑨：Motor holding torque

⑩：Motor rated power
- 10:1000RPM
- 15:1500RPM
- ……
- 30:3000RPM

# Chapter 3 Installation

**warn**

- The storage and installation of the product must meet the environmental conditions requirements。
- Damaged or incomplete products shall not be installed or used。
- The installation of the product requires fireproof materials and should not be installed on or near flammable materials to prevent fires.。
- The servo drive unit must be installed inside the electrical cabinet to prevent dust, corrosive gases, conductive objects, liquids, and flammable substances from entering.
- The servo drive unit and servo motor should avoid vibration and be prohibited from bearing impacts。
- It is strictly prohibited to drag the servo motor wires and encoder wires

## 3.1 Installation of servo drive unit

**Warn**

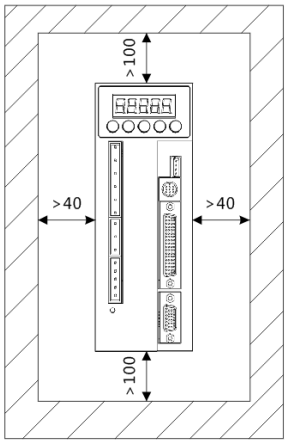
- The servo drive unit must be installed in a well protected electrical cabinet。
- The servo drive unit must be installed in the specified direction and interval, and ensure good heat dissipation conditions。
- Do not install on or near flammable objects to prevent fires.

### 3.1.1Installation Environment

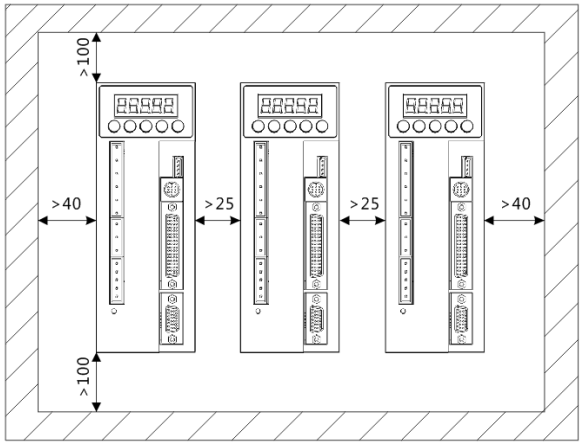
- Temperature/humidity: 0-55 ℃ (without frost), below 90% RH (without condensation).
- Storage temperature/humidity: -20~65 ℃ (without frost), below 90% RH (without condensation).
- Atmospheric environment: inside the control cabinet, without corrosive, flammable gases, oil mist, dust, etc.
- Elevation: Below 1000m above sea level.
- Vibration: less than 0.5G (4.9m/s2), 10-60 Hz (non continuous operation)
- Protection: The servo drive itself has no protective structure, so it must be installed in a well protected electrical cabinet to prevent corrosive, flammable gases, and conductivity,Intrusion of objects, metal dust, oil mist, and liquids.

### 3.1.2Installation Intruction

- Our company's servo drive is a vertical structure, please install it vertically. The installation direction is perpendicular to the installation face upwards。
- The installation layout of a single or multiple servo drives is shown in the following figure.

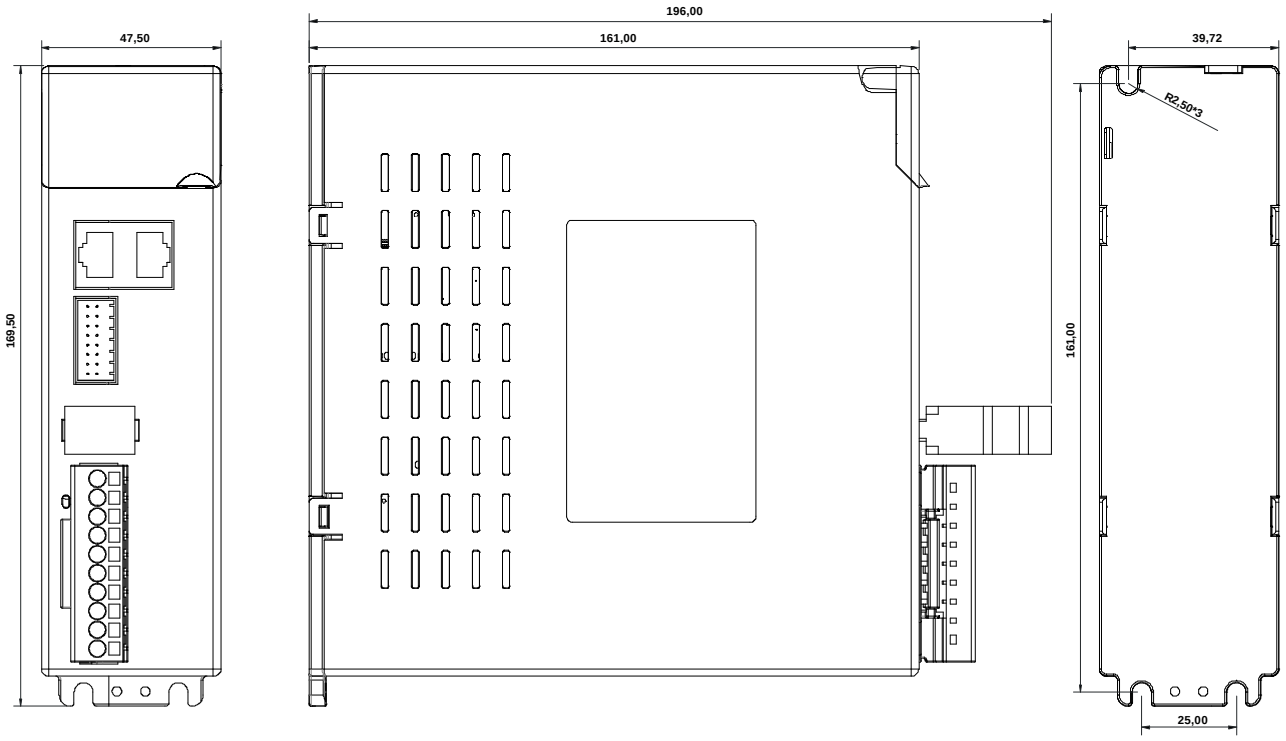



Installation interval of single servo drive unit




Installation interval for multiple servo units

## 3.1.3Installation dimensions

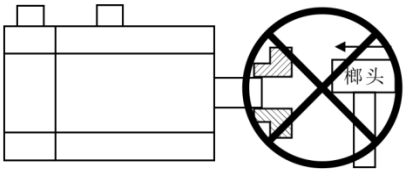



A5-10E/A5-20E Driver Dimensions

## 3.2 Installation of servo motor

**Warn**

● It is strictly prohibited to strike the shaft end of the motor, otherwise it may damage the motor encoder。




## 3.2.1Installation Environment

◆Using temperature/humidity: 5~40℃ (no frost), below 90%RH (no condensation).

◆Storage temperature/humidity: -20~55℃ (no frost), below 80%RH (no condensation).

◆Atmospheric environment: Indoor (no exposure), no corrosive, flammable gas, oil mist, dust, etc.

◆Elevation: below 1000m above sea level.

◆Vibration: less than 0.5G (4.9m/s2), 10~60 Hz (non-continuous operation).

◆Protection level: IP54

## 3.2.2Installation Intruction

◆ Installation direction: To prevent liquids such as water and oil from flowing into the motor from the motor outlet, please place the cable outlet below. If the motor shaft is installed facing upwards and

When a gearbox is attached, it is necessary to prevent oil stains inside the gearbox from seeping into the motor shaft。

◆ Concentric: When connecting with machinery, please use a coupling device and keep the axis of the servo motor in a straight line with the axis of the machinery 。

◆ Cable: Do not bend or apply tension to the cable, so when wiring (using), please do not tension the cable too tightly。

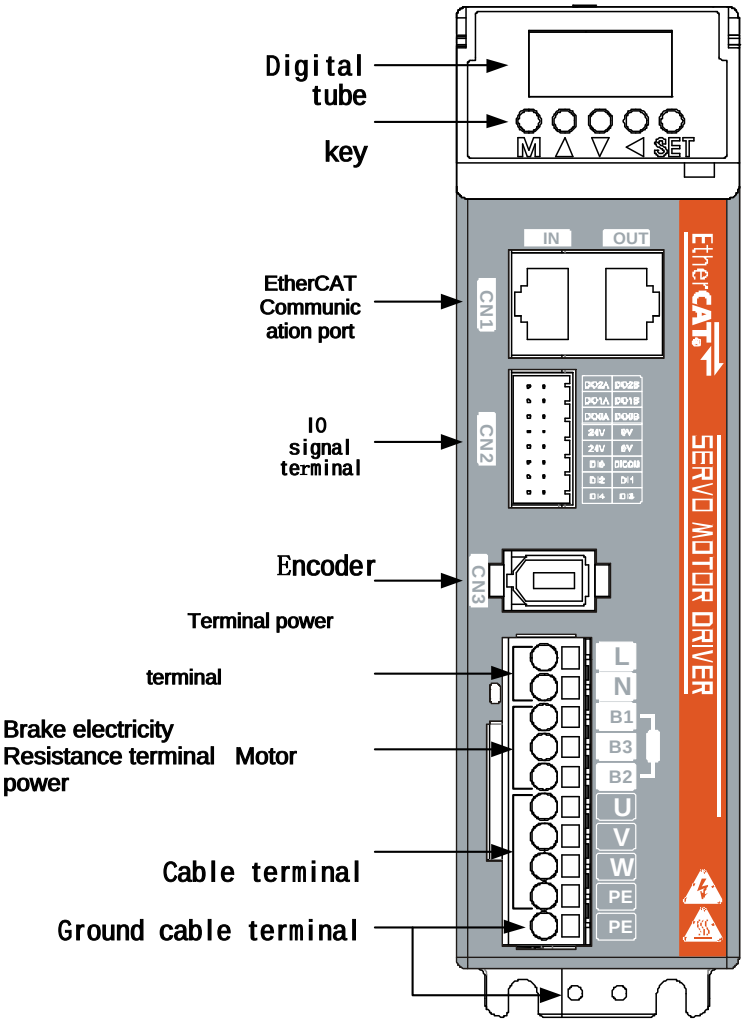
◆ Fixed: The motor installation must be firm and equipped with anti loosening measures.

# Chapter 4 Wiring

**Warn**

- The power supply for this series of drives is single-phase 220V, and it is necessary to check the power supply used by the drive when wiring.
- Users must consider safety precautions during the design and assembly of this product to prevent accidents caused by incorrect operations
- The drive terminals U, V, and W must correspond to the motor U, V, and W, otherwise it may cause speeding。
- The driver and motor must be well grounded.
- Before disassembling this drive, it must be powered off for at least 5 minutes.
- Frequent power on/off is prohibited. After a power outage, it is necessary to wait for the digital tube to turn off before reconnecting。
- When using internal braking resistors, the short circuit must be connected between terminals B2 and B3, and it is prohibited to directly connect wires between B1 and B2.

## 4.1 Terminal Description




A5-10E/A5-20EDriver

# 4. 2 Main circuit wiring

## 4. 2. 1 Definition of Main Circuit Terminals

◆ **A5-10E/A5-20E driver input power terminal**

| Serial Number | signal definition | Function |
|---|---|---|
| 1 | L | Power terminal, capable of connecting AC single-phase 220V |
| 2 | N | |

◆ **Brake resistor terminal**

| Pin | signal definition | Function | Instruction |
|---|---|---|---|
| 1 | B1 | DC bus positive terminal output DC+ | The positive terminal of the built-in resistor is connected to B1. When using the built-in resistor, please short circuit B2 and B3. When using an external resistor, please connect the resistor between B1 and B2 (B2 and B3 must be disconnected). |
| 2 | B3 | Built in brake resistor negative terminal output. | |
| 3 | B2 | Brake transistor collector output | |

◆ **Motor terminals**

| Socket num | signal definition | Function |
|---|---|---|
| 1 | U | Connected to motor U-phase |
| 2 | V | Connected to motor V phase |
| 3 | W | Connected to motor W-phase |
| 4 | PE | Connected to motor housing |

4.2.2 Main circuit power terminal (spring type) usage method

1. Peel off the outer skin of the wire to expose 8-9mm bare copper wire.

2. The pressing method is as follows:

- Pry open the slot using the control lever matched with the servo drive (as shown in Figure A);
- Insert a "straight" screwdriver into the terminal opening (end width 3.0-3.5mm), then firmly press to open the slot (as shown in Figure B).

3、The pressing method is as follows:

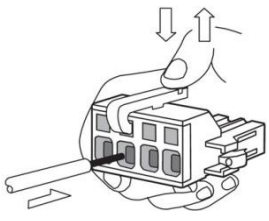


图 A

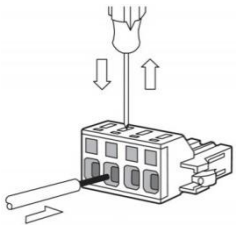
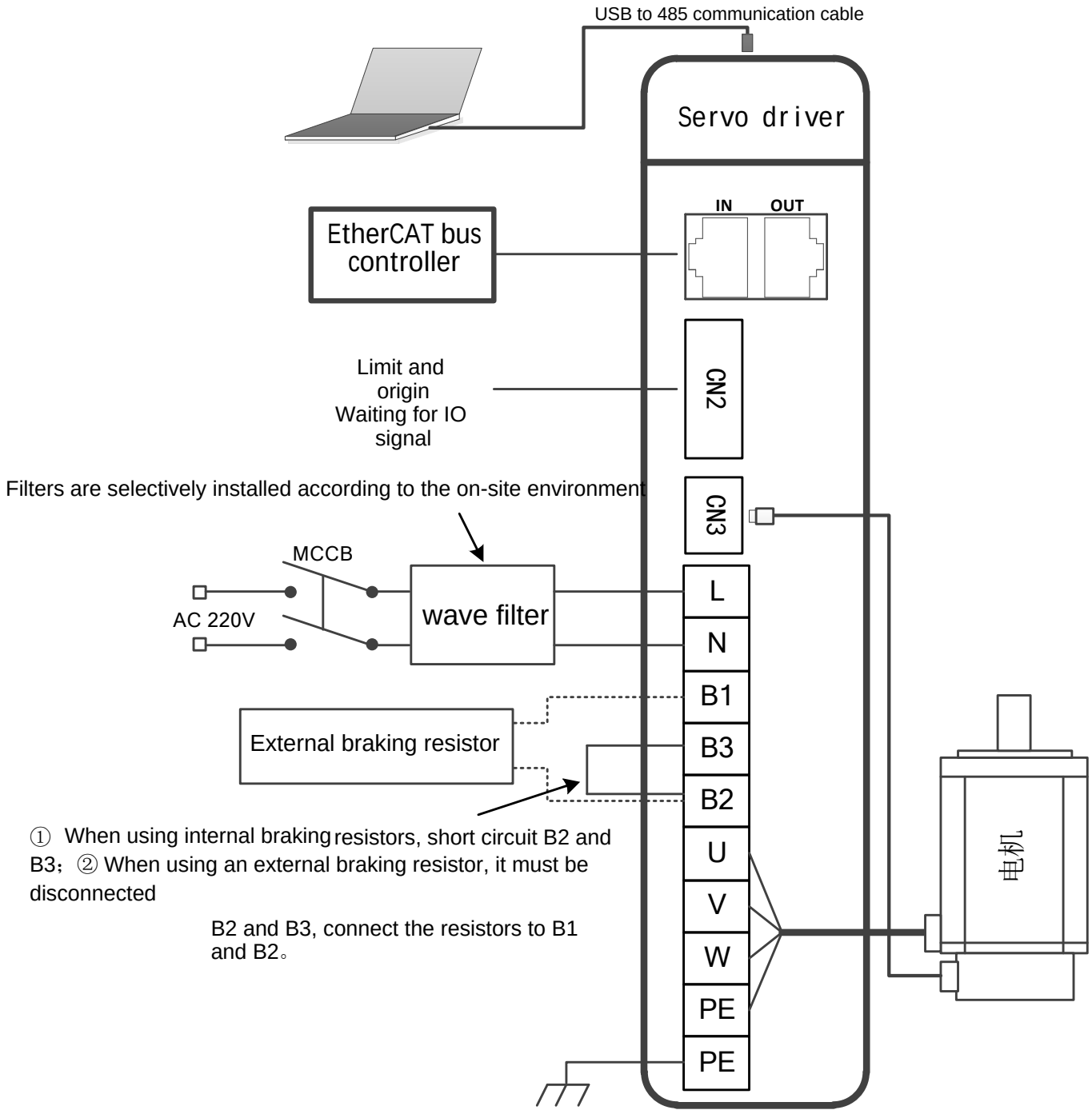


图 B

## 4.2.3 Driver wiring diagram

➢ **A5-10E/A5-20E Driver Wiring Diagram**



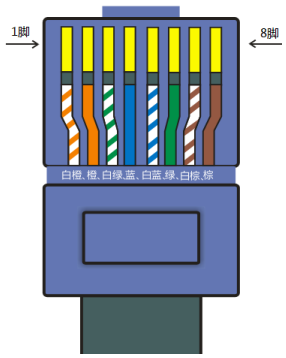

Note: When using internal braking resistors, short circuit B2 and B3 (already connected at the factory). When using external braking resistors, disconnect B2 and B3，

Connect the external braking resistor between B1 and B2.。

# 4.3 Definition of wiring terminals

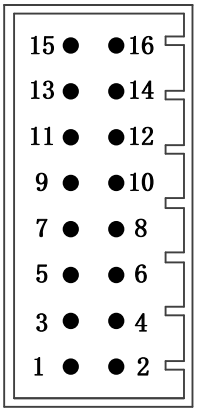
## 4.3.1EtherCAT communication port definition (CN1)

| Pin | signal definition | Signal intruction |
|---|---|---|
| 1 | TX+ | EtherCATData sending positive end |
| 2 | TX- | EtherCAT data transmission negative end |
| 3 | RX+ | EtherCAT data receiving positive end |
| 4 | / | / |
| 5 | / | / |
| 6 | RX- | EtherCAT data receiving negative terminal |
| 7 | / | / |
| 8 | / | / |


Crystal head pin sequence

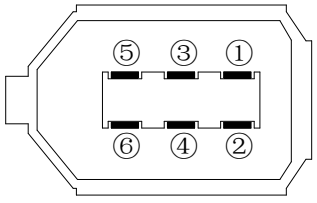
## 4.3.2 Definition of Control Terminals (CN2)

| Pin | Signal name | Function name | Notes or supplementary explanations | Terminal Definition Diagram |
|---|---|---|---|---|
| 11 | DO0A | Digital output 0A terminal | Detailed description of parameter configuration, as described in Chapter 4.5.2.<br>Attention: The maximum allowable current for the output port is 200mA, and it cannot directly drive high current loads such as motor brake. An external relay needs to be added. |  |
| 12 | DO0B | Digital output 0B end | | |
| 13 | DO1A | Digital output 1 A terminal | | |
| 14 | DO1B | Digital output 1B terminal | | |
| 15 | DO2A | Digital output 2A terminal | | |
| 16 | DO2B | Digital output 2 B terminal | | |
| 7 | 24V | 24V power output positive terminal | The maximum current output of 24V is 100mA, which can only be used as a DI port and pulse signal power supply. **It is prohibited to use it to drive external loads.** | |
| 9 | 24V | | | |
| 8 | 0V | 24V power output negative terminal | | |
| 10 | 0V | | | |
| 6 | DICOM | DI port common terminal | DICOM can be connected to+24V or 0V | |
| 5 | DI0 | Digital input 0 | Detailed description of parameter configuration, as described in Chapter 4.5.1. | |
| 4 | DI1 | Digital input 1 | | |
| 3 | DI2 | Digital input 2 | | |
| 2 | DI3 | Digital input 3 | | |
| 1 | DI4 | Digital input 4 | | |



4.3.3Encoder Terminal Definition (CN3)

◆ Driver encoder terminal schematic diagram

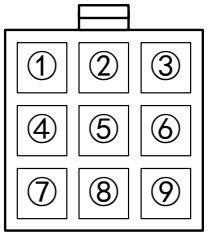



Encoder terminal pin diagram

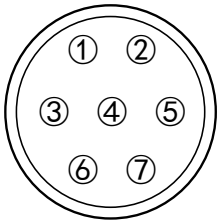
◆ Driver encoder pin definition

| Servo side | | Name | cable color |
|---|---|---|---|
| 1 | VCC | Encoder power supply+5V | Red |
| 2 | GND | Encoder power supply ground | Yellow |
| 3 | / | / | / |
| 4 | / | / | / |
| 5 | SD+ | Encoder signal+ | Blue |
| 6 | SD- | Encoder Signal- | Black |

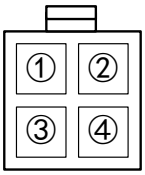
◆ Motor terminal diagram



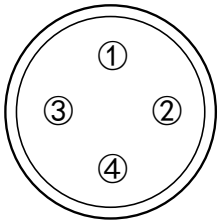

9-pin Ampere plug male




7-pin aviation plug




4-pin Ampere plug




4-pin aviation plug

◆ Definition of motor encoder terminal pins (the definition of Amp head is the same as that of aviation head)

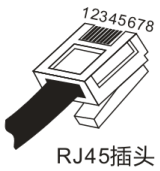
| Motor side | | Name | Cable color |
|---|---|---|---|
| 1 | PE | Shielding wire | |
| 2 | E- | Battery powered negative pole | white |
| 3 | E+ | Battery powered positive pole | Green |
| 4 | SD- | Encoder signal- | Black |
| 5 | GND | Encoder power supply ground | Yellow |
| 6 | SD+ | Encoder signal+ | Blue |
| 7 | VCC | Encoder power supply+5V | Red |

◆ Definition of motor power line pins

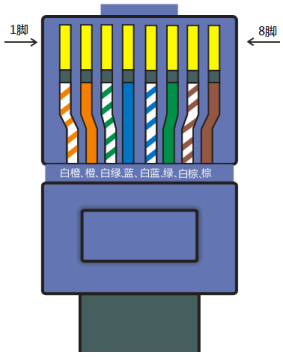
| Motor side (Amp plug) | | Name | Line color |
|---|---|---|---|
| 1 | U | Motor U-phase | Brown |
| 2 | V | Motor V-phase | Blue |
| 3 | W | Motor W-phase | Yellow |
| 4 | PE | motor housing | Grren |

## 4. 3. 4 Definition of Communication Terminals (CN4/CN5)

| Pin | Cable color | Singnal definition |
|---|---|---|
| 1 | White orange | GND |
| 2 | Orange | / |
| 3 | White green | / |
| 4 | Blue | 485+ |
| 5 | White blue | 485- |
| 6 | Green | / |
| 7 | White brown | / |
| 8 | Brown | / |




RJ45插头

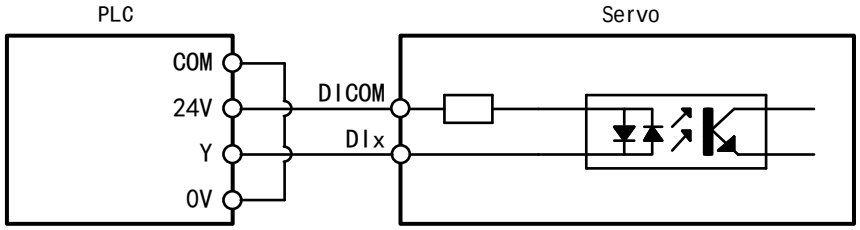



Crystal head pin sequence

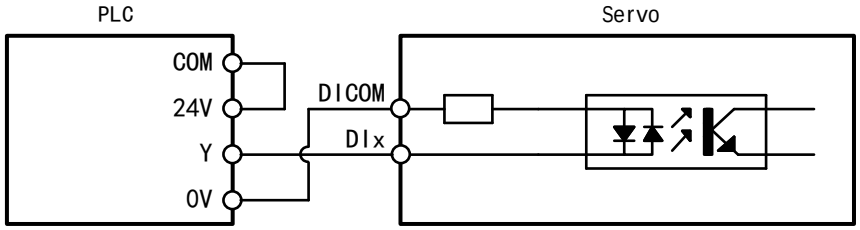
## 4. 4 Control signal terminal wiring

### 4.4.1 DI input circuit

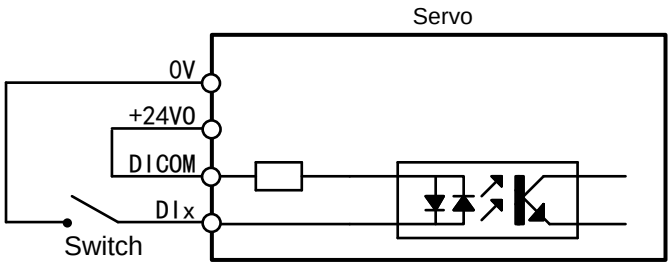
- NPNType input wire




- PNPType input wire



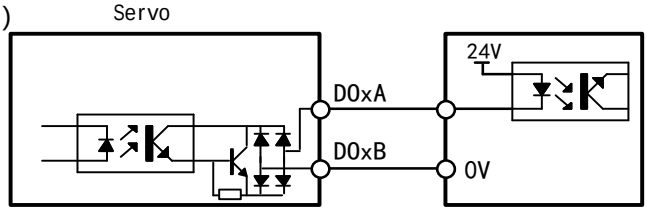

- Switch input wiring



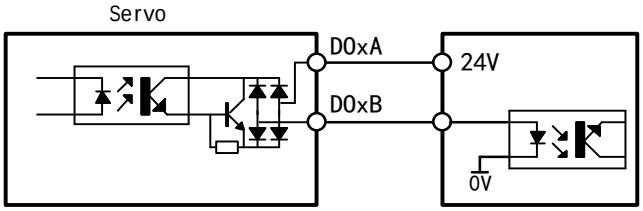

### 4.4.2DO output circuit

- DO output wiring (connecting optocoupler

)

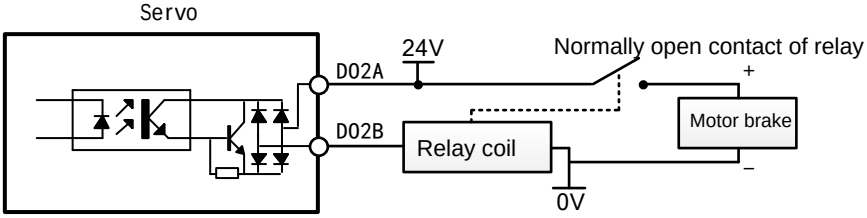



Low level output wiring




High level output wiring

- DO output wiring (connecting relay)




The output signal of the brake is controlled by a relay to control the motor to hold th e brake

### 4.5 Detailed Description of DI/DO Port Function

**Configuration** 4.5.1 DI Function Description

## 1. DI port configuration parameters:

| DI Port | Function selection | | | Logic level | |
|---|---|---|---|---|---|
| | parameter number | Initial value | Function Description | parameter number | Initial value |
| DI0 | P03.02 | 14 | Forward overtravel switch | P03.03 | 0 |
| DI1 | P03.04 | 15 | Reverse overtravel switch | P03.05 | 0 |
| DI2 | P03.06 | 31 | origin switch | P03.07 | 0 |
| DI3 | P03.08 | 0 | - | P03.09 | 0 |
| DI4 | P03.10 | 0 | - | P03.11 | 0 |

## 2. DI Port Function Command Table

| Code | Name | Function name | Description | Remark |
|---|---|---|---|---|
| FunIN.14 | P-OT | Forward overtravel switch | Effective - prohibit forward drive; Invalid - allows forward drive. | When the mechanical movement exceeds the movable range, enter the overtravel prevention function. The logical selection of the corresponding terminal is recommended to be set to: effective level. |
| FunIN.15 | N-OT | Reverse overtravel switch | Effective - prohibit reverse drive; Invalid - reverse drive allowed. | |
| FunIN.31 | HomeSwitch | origin switch | Invalid - not triggered; Effective - triggered. | The logical selection of the corresponding terminal must be set to: effective level. If set to 2 (effective rising edge), the internal drive will be forcibly changed to 1 (effective high level); If set to 3 (effective falling edge), the internal drive will be forcibly changed to 0 (effective low-level); If set to 4 (both rising and falling edges are effective), the driver will be forced to change to 0 internally (low level is effective) |
| FunIN.34 | EmergencyStop | EMERGENCY STOP | Effective - position lock after zero speed shutdown; Invalid - has no impact on the current running state. | The logical selection of the corresponding terminal is recommended to be set to: effective level. |
| FunIN.38 | TouchProbe1 | Probe 1 | Invalid - probe not triggered; Effective - Probe can trigger | The probe logic is only related to the probe function (60 B8h) and is not related to the terminal logic selection. |
| FunIN.39 | TouchProbe2 | Probe 2 | Invalid - probe not triggered; Effective - the probe can be triggered. | The probe logic is only related to the probe function (60 B8h) and is not related to the terminal logic selection. |

### 4.5.2 DO Function Description

## 1. DO port configuration parameters:

| DI Port | Function selection | | | Logic level | |
|---|---|---|---|---|---|
| | parameter number | Initial value | Function Description | parameter number | Initial value |
| DO0 | P04.00 | 1 | Servo ready | P04-01 | 0 |
| DO1 | P04.02 | 5 | Positioning Complete | P04-03 | 0 |
| DO2 | P04.04 | 3 | zero-speed | P04-05 | 0 |

## 2. DO Port Function Command Table

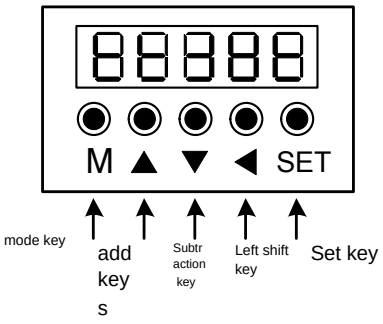
| Code | Name | Function name | Description |
|---|---|---|---|
| FunOUT.1 | S-RDY | Servo ready | The servo status is ready and can receive S-ON valid signals: valid - the servo is ready; Invalid - servo not ready. |
| FunOUT.2 | TGON | Motor rotation output | When the speed is higher than 2006-11h: valid - the motor rotation signal is valid; Invalid - Motor rotation signal invalid。 |
| FunOUT.5 | COIN | Positioning Complete | When controlling the position, the position deviation pulse reaches the positioning completion threshold of 6067 hours, and the time reaches 6068 hours, which is effective |
| FunOUT.7 | C-LT | Torque limitation | Confirmation signal for torque limitation: effective - motor torque limitation; Invalid - motor torque is not limited. |
| FunOUT.8 | V-LT | Speed limit | Confirmation signal for speed limitation during torque control: effective - motor speed limitation; Invalid - motor speed not limited。 |
| FunOUT.9 | BK | Band brake output | Holding brake signal output: effective - closed, releasing the holding brake; Invalid - activate the brake. |
| FunOUT.10 | WARN | Warning output | The warning output signal is valid. (Conduction) |

| | | | |
|---|---|---|---|
| FunOUT.11 | ALM | fault output | The status is valid when a fault is detected. |
| FunOUT.12 | ALMO1 | Output a 3-digit alarm code | Output a 3-digit alarm code. |
| FunOUT.13 | ALMO2 | Output a 3-digit alarm code | Output a 3-digit alarm code. |
| FunOUT.14 | ALMO3 | Output a 3-digit alarm code | Output a 3-digit alarm code. |
| FunOUT.18 | ToqReach | Torque reaches output | Effective - the absolute torque value reaches the set value;<br>Invalid - The absolute torque value is less than the set value reached. |
| FunOUT.19 | V-Arr | Speed output reached | Effective - Speed feedback reaches the set value;<br>Invalid - Speed feedback did not reach the set value. |

# Chapter 5 Panel Display and Operation

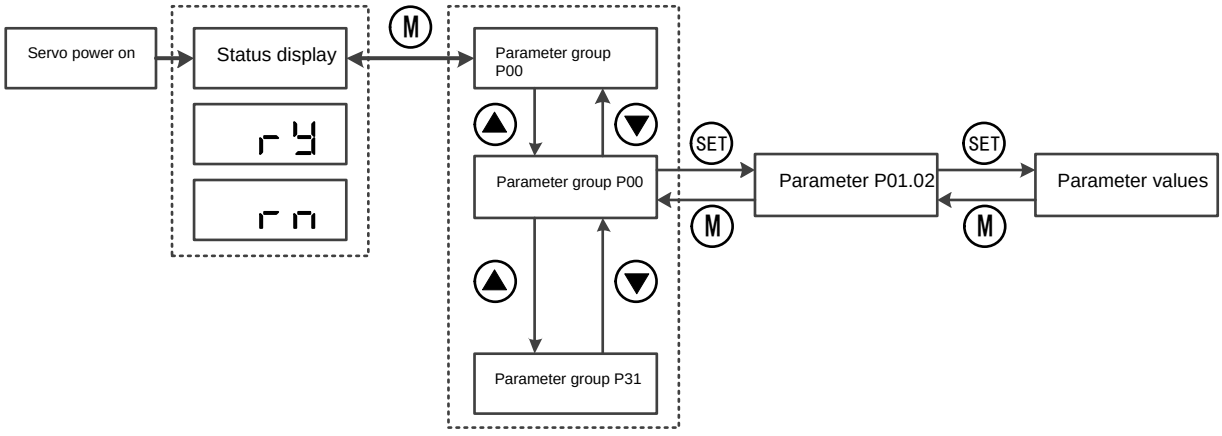
## 5.1 Panel Introduction and Explanation

### 5.1.1 Panel Button Description



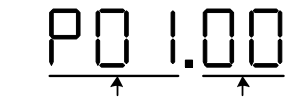

| Name | General functions |
|---|---|
| M | Switch between modes to return to the previous menu level |
| ▲ | Increase the flicker bit value of LED digital tubes |
| ▼ | Reduce the flicker bit value of LED digital tubes |
| ◀ | Change the flashing position of the LED digital tube and view the high bit values of data with a length greater than 5 bits |
| SET | Enter the next level menu and execute commands such as storing parameter settings |

### 5.1.2 Panel button operation method



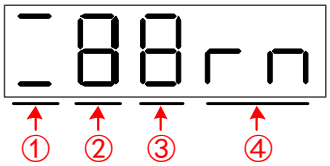

### 5.1.3 Parameter number display

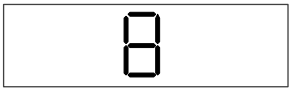
The servo parameter number of this series consists of two parts: parameter group and internal parameter group number, as shown in the following figure:




Object dictionary index=0x2000+parameter group number;
Object dictionary sub-index = hexadecimal number of the parameter group +1;
For example:
The object dictionary index of P02.03 is 2002-03h, and the object dictionary index of P0B.17 is 200b-12h.

## 5.1.4 Status Display

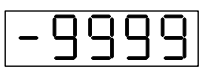



| Display part | Display | Name | Display occasion | Meaning |
|---|---|---|---|---|
| ① |  | Port 1 connection indication | The drive is ready and the servo enable signal is valid. | **Long dark:** No communication connection detected by the physical layer<br>**Steady on:** A communication connection has been established at the physical layer |
| |  | Port 0 connection indication | | |
| ② |  | communication status | The drive is ready and the servo enable signal is valid. | The EtherCAT state machine status of the slave.<br>1: Initialization state<br>2: Pre-running state<br>4: Safe operating status<br>8: Running status |
| ③ |  | control mode | The drive is ready and the servo enable signal is valid. | The current operating mode of the servo, does not flash.<br>0: No mode<br>1: Contour position control<br>3: Contour speed mode<br>4: Contour torque mode<br>6: Return to zero mode<br>8: Periodic synchronization position mode<br>9: Periodic synchronization speed mode<br>A: Periodic synchronous torque mode |
| ④ |  | Nr<br>Servo not ready | Servo initialization is complete, but the drive is not ready. | Because the main circuit is not powered on, the servo is in a non-operational state. |
| |  | Ry<br>Servo is ready | The drive is ready | The servo drive is in an operational state and is waiting for the servo enable signal from the host computer. |
| |  | Rn<br>Servo is running | The servo enable signal is valid | The servo drive is running. |

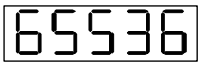
## 5.1.5 Parameter Value Display

- **Signed number of 4 digits and below or unsigned number of 5 digits and below**

It adopts single page (5-digit digital tube) display. For signed numbers, the highest bit of data "-" represents a negative sign. Example: -9999 is displayed as follows:

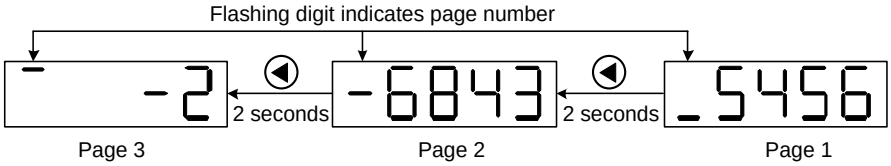



Example: 65535 is displayed as follows:

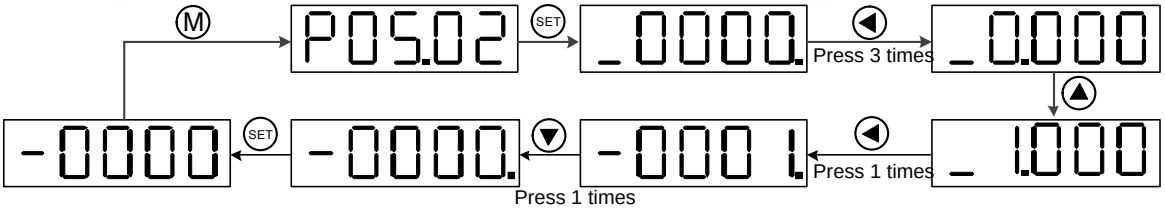



- **Signed number with more than 4 digits or unsigned number with more than 5 digits**

  The display is divided into pages from low to high digits, and every 5 digits are one page.
  The display method is: current page + current page value, as shown in the figure below, by long pressing"◀" key for more than 2 seconds to switch the current page. Example: -268435456 is displayed as follows:




- **Modify the number of pulses per revolution in P05-02 and set the default value to 10000 to 1000 (the modification of other numerical parameters with more than 4 digits is the same as this step)**




## 5.1.6 Monitoring Parameter Display (P0B group parameters)

| function code | index | sub | name | Setting range | Unit | attribute | type |
|---|---|---|---|---|---|---|---|
| P0B.00 | 200B | 01 | Actual motor speed | The actual operating speed of the servo motor, accurate to 1rpm | rpm | RO | Int16 |
| P0B.01 | 200B | 02 | speed command | Drive current speed command | rpm | RO | Int16 |
| P0B.02 | 200B | 03 | Internal torque command (relative to rated torque) | Servo motor actual output torque as a percentage of motor rated torque | % | RO | Int16 |
| P0B.03 | 200B | 04 | Input signal monitoring (DI signal) | The corresponding level status of the 5 DI terminals: the upper half of the digital tube lights up as high level; the lower half lights up as low level | - | RO | Int16 |
| P0B.05 | 200B | 06 | Output signal monitoring (DO signal) | The corresponding level status of the 3 DO terminals: the upper half of the digital tube lights up to indicate high level, and the lower half of the digital tube lights up to indicate low level. | - | RO | Int16 |
| P0B.07 | 200B | 08 | absolute position counter (32-digit decimal display) | Motor current absolute position (command unit) | command unit | RO | Int32 |
| P0B.13 | 200B | 0E | Input command pulse counter(32-digit decimal display) | Display the number of input position instructions | command unit | RO | Int32 |
| P0B.15 | 200B | 10 | Encoder position deviation counter (32-digit decimal display) | Encoder position deviation = total number of input position instructions - total number of encoder feedback pulses | Encoder unit | RO | Int32 |
| P0B.17 | 200B | 12 | Feedback pulse counter (32-digit decimal display) | Count and display the number of pulses fed back by the servo motor encoder | Encoder unit | RO | Int32 |
| P0B.19 | 200B | 14 | Total power-on time (32-digit decimal display) | - | s | RO | Int32 |
| P0B.24 | 200B | 19 | Phase current effective value | Servo motor phase current effective value | A | RO | Uint16 |
| P0B.26 | 200B | 1B | Bus voltage value | Main circuit DC bus voltage value | V | RO | Uint16 |
| P0B.27 | 200B | 1C | Module temperature value | - | ℃ | RO | Uint16 |
| P0B.33 | 200B | 22 | Fault record | 0. Current fault<br>1. Last failure<br>...<br>9. Last 9 failures | - | RO | Uint16 |
| P0B.34 | 200B | 23 | Selected times fault code | P0B.33 Selected fault code<br>When no fault occurs, the value displayed in P0B.34 is "Er.000" | - | RO | Uint16 |
| P0B.35 | 200B | 24 | Selected failure timestamp | P0B.34 displays the total servo running time when the fault occurs.<br>When no fault occurs, the value displayed in P0B.35 is "0" | s | RO | Int32 |
| P0B.37 | 200B | 26 | Motor speed at selected fault | When the fault displayed by P0B.34 occurs, the servo motor speed | rpm | RO | Int16 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | When no fault occurs, the value displayed in P0B.37 is "0" | | | |
| P0B.38 | 200B | 27 | Motor U-phase current at selected fault | When the fault displayed by P0B.34 occurs, the effective value of the U-phase winding current of the servo motor does not occur. When the fault occurs, the value displayed by P0B.38 is "0". | A | RO | Int16 |
| P0B.39 | 200B | 28 | Motor U-phase current at selected fault | When the fault displayed by P0B.34 occurs, the effective value of the V-phase winding current of the servo motor does not occur. When the fault occurs, the value displayed by P0B.39 is "0". | A | RO | Int16 |
| P0B.40 | 200B | 29 | Bus voltage at selected fault | When the fault displayed by P0B.34 occurs, the DC bus voltage value of the main circuit has no value. When the fault occurs, the value displayed by P0B.40 is "0". | V | RO | Uint16 |
| P0B.41 | 200B | 2A | Input terminal status at selected fault | When the fault displayed by P0B.34 occurs, the method of checking the high and low level status corresponding to the five DI terminals is the same as P0B.03; when no fault occurs, P0B.41 displays that all DI terminals are low level, and the corresponding decimal value is "0" | - | RO | Uint16 |
| P0B.42 | 200B | 2B | Output terminal status at selected fault | When the fault displayed by P0B.34 occurs, the method of viewing the high and low level status corresponding to the three DO terminals is the same as P0B.05; when no fault occurs, P0B.42 displays that all DO terminals are low level, and the corresponding decimal value is "0" | - | RO | Uint16 |
| P0B.53 | 200B | 36 | Position deviation counter | Position deviation = total number of input position instructions (command unit) - total number of encoder feedback pulses (command unit) | command unit | RO | Int32 |
| P0B.55 | 200B | 38 | Actual motor speed | 0.1rpm | rpm | RO | Int32 |
| P0B.57 | 200B | 3A | Control electrical bus voltage | Control circuit DC bus voltage value | - | RO | Uint16 |
| P0B.58 | 200B | 3B | Mechanical absolute position (lower 32 bits) | The lower 32-bit value of the mechanical corresponding position feedback | Encoder unit | RO | Int32 |
| P0B.60 | 200B | 3D | Mechanical absolute position (high 32 bits) | Mechanical corresponding position feedback high 32-bit value | Encoder unit | RO | Int32 |
| P0B.64 | 200B | 41 | Real-time input position instruction counter | Displays the position command counter before electronic gear ratio multiplication. | command unit | RO | Int32 |
| P0B.70 | 200B | 47 | Absolute encoder revolutions | Displays the number of revolutions of the absolute encoder | r | RO | Uint16 |
| P0B.71 | 200B | 48 | Position within 1 revolution of absolute encoder | Display the single-turn position feedback value of the absolute encoder | Encoder unit | RO | Int32 |
| P0B.77 | 200B | 4E | Absolute encoder absolute position (lower 32 bits) | Display the position feedback value of the absolute encoder, the lower 32-bit data | Encoder unit | RO | Int32 |
| P0B.79 | 200B | 50 | Absolute encoder absolute position (high 32 bits) | Display the position feedback value of the absolute encoder, the upper 32-bit data | Encoder unit | RO | Int32 |
| P0B.81 | 200B | 52 | Rotating load single-turn position (lower 32 bits) | Position feedback value of rotating load, lower 32-bit data | Encoder unit | RO | Uint32 |
| P0B.83 | 200B | 54 | Rotating load single-turn position (high 32 bits) | Position feedback value of rotating load, high 32-bit data | Encoder unit | RO | Uint32 |
| P0B.85 | 200B | 56 | Rotating load single turn position | Position feedback value of rotating load, high 32-bit data | command unit | RO | Uint32 |

# 5.2 Common operations

**⚠ warn**

- Before powering on, please check whether the driver wiring is correct.
- Make sure the motor is in an unloaded state to prevent collision or other dangerous situations.

## 5.2.1 Initialization parameters

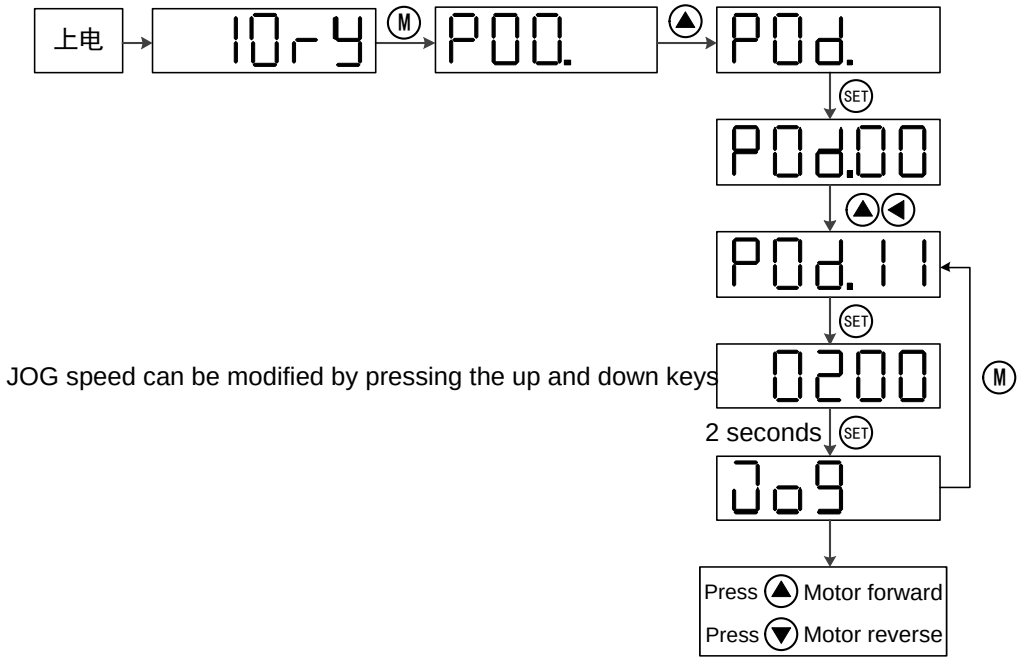
Set P02-31 to 1 to initialize the drive parameters. After the settings are completed, the drive needs to be restarted.

## 5.2.2 Manual reset alarm

Set P0D.01 to 1 to clear the resettable alarm;
The multi-turn absolute encoder power-off alarm (Er.731) requires setting P0D.20 to 2 first, and then setting P0D.01 to 1 before the alarm can be cleared.

## 5.2.3 JOG mode operation

When using the jog operation function, you need to cancel the servo enable first, otherwise you cannot enter the JOG state!




JOG speed can be modified by pressing the up and down keys

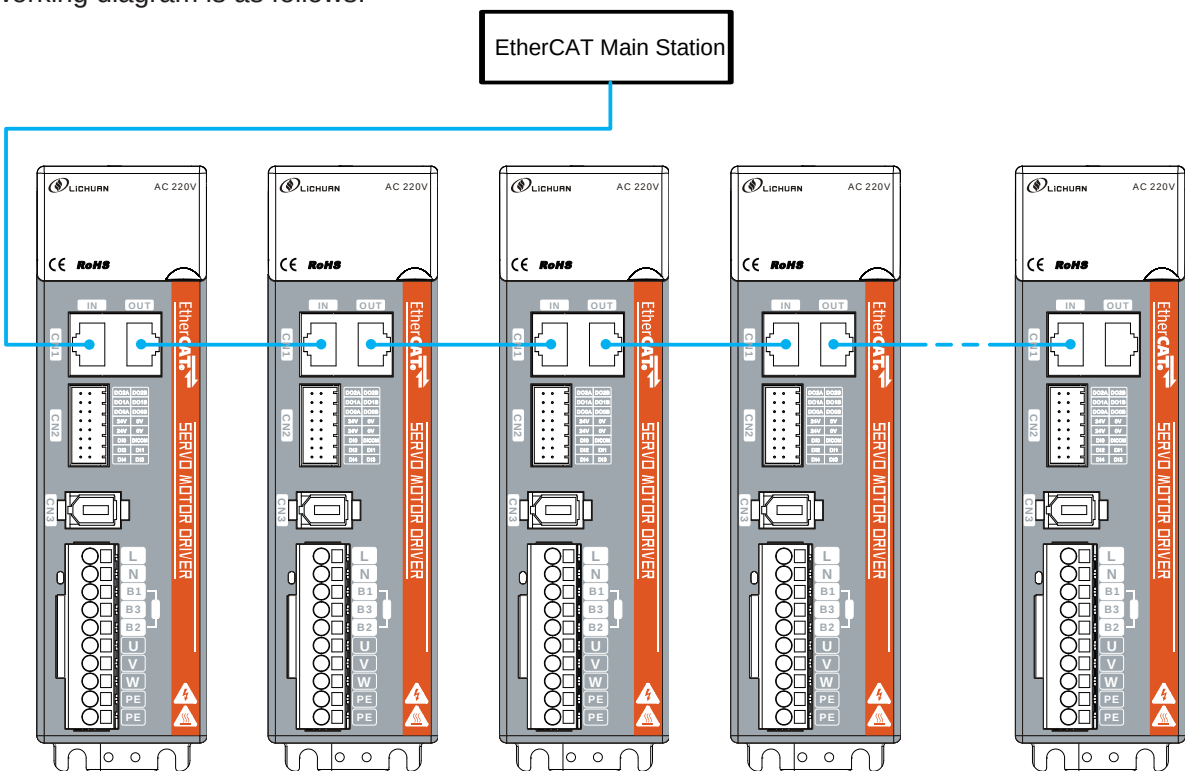
## 5.3 Gain parameter setting and description

| Parameter number | Parameter name | Predetermined area | Function |
|---|---|---|---|
| P08.00 | Speed loop gain | 0.1～2000.0 | This parameter determines the response of the speed loop. The larger the parameter is, the faster the speed loop will respond. However, setting it too high may cause vibration;<br>In position mode, if you want to increase the position loop gain, you need to increase the speed loop gain at the same time. |
| P08.01 | Speed loop integration time constant | 0.15～512.00 | The smaller the set value, the stronger the integral effect and the faster the response, which may cause jitter when using a large inertia load; the larger the setting value, the slower the response. When using a large inertia load, increase this parameter appropriately. |
| P08.02 | Position loop gain | 0.0～2000.0 | This parameter determines the responsiveness of the position loop. Setting a larger position loop gain can shorten the positioning time. But setting it too high may cause vibration. |
| P08.15 | Load inertia ratio | 0.00～120.00 | Sets the mechanical load inertia ratio relative to the motor's own moment of inertia.<br>When the motor drives a belt/rack and pinion/swing arm and other large inertia loads, if there is back and forth shaking, this parameter can be increased. |
| P08.18 | Speed feedforward filter time constant | 0.00～64.00 | Sets the filter time constant for velocity feedforward. |
| P08.19 | Speed feed forward gain | 0.0～100.0 | Increasing this parameter can improve the position command response and reduce the position deviation at fixed speed.<br>When adjusting, first set P08.18 to a fixed value; then gradually increase the setting value of P08.19 from 0 until the speed feedforward takes effect at a certain setting value. |
| P08.20 | Torque feedforward filter time constant | 0.00～64.00 | Sets the filter time constant for torque feedforward. |
| P08.21 | Torque feedforward gain | 0.0～200.0 | Increasing this parameter can improve the responsiveness to changing speed commands.<br>Increasing this parameter can improve the position command response and reduce the position deviation at fixed speed. |
| P08.23 | Speed feedback low-pass filter cutoff frequency | 100～4000 | The smaller the setting, the smaller the speed feedback fluctuation, but the greater the feedback delay. |
| P08.24 | Pseudo-differential feedforward control coefficient | 0.0～100.0 | When this coefficient is set to 100.0, the speed loop adopts PI control (the default control method of the speed loop), and the dynamic response is fast;<br>When set to 0.0, the speed loop integral effect is obvious and can filter out low-frequency interference, but the dynamic response is slow.<br>By adjusting P08.24, the speed loop can be made to have faster responsiveness without increasing speed feedback overshoot, and it can also improve the anti-interference ability in the low frequency band. |

# Chapter 6 Communication Network Configuration

## 6.1 EtherCATnetworking diagram

EtherCAT is an industrial Ethernet technology with high performance, low cost, easy application and flexible to pology. It can be used for industrial field-level ultra-high-speed I/O networks. It uses the standard Ethernet phy sical layer and the transmission media twisted pair or optical fiber ( 100Base-TX or 100Base-FX). The EtherC AT networking diagram is as follows:




### 6.1.1EtherCATCommunication technical specifications

| Items | | Specification |
|---|---|---|
| EtherCAT Basic performanc e of slave station | Protocol | EtherCAT Protocol |
| | Support services | CoE （PDO、SDO） |
| | Synchronously | DC-Distributed clock |
| | Physical layer | 100BASE-TX |
| | Baud rate | 100 Mbit/s (100Base-TX) |
| | Duplex mode | Full duplex |
| | Topological structure | Linear |
| | Transmission medium | Shielded Category 5e or Category 6 or above electrical performance specifications network cable |
| | Transmission distance | Less than 100m between two nodes (good environment, good cables) |
| | Number of slaves | The protocol supports up to 65535, but the actual use does not exceed 100 units. |
| | EtherCAT Frame length | 44 bytes to 1498 bytes |
| | Process data | Maximum size of a single Ethernet frame is 1486 bytes |
| | Synchronization jitter of two slaves | < 1us |

# 6.2 Driver related parameter configuration

## 6.2.1System parameter setting

In order to enable this series of servo drives to accurately connect to the EtherCAT fieldbus network, the relevant parameters of the servo drives need to be set. As shown in the following table:

| Function code | Index | Sub Index | Name | Setting range | Unit | Factory settings | Effective method | Setting method | Related Patterns |
|---|---|---|---|---|---|---|---|---|---|
| P02.00 | 2002h | 01 | Control mode selection | 9：EtherCAT Mode | - | 9 | Effective immediately | shutdown settings | - |
| P0C.13 | 200Ch | 0E | Whether the communication write function code value is updated to EEPROM | 0: Do not save<br>1: 2000h series object dictionary is written and stored in EEPROM after communication<br>2: 6000h series object dictionary is written and stored in EEPROM after communication<br>3: 2000h series and 6000h series object dictionary is written and stored in EEPROM after communication | - | 3 | Effective immediately | Run settings | PST |

Note: The parameters that need to be saved in EEPROM must be set to the corresponding value in 200C-0Dh before setting. Otherwise, the parameters will return to their default values after powering on again.

## 6.2.2 Rotation direction selection

By setting "Rotation direction selection (2002-03h) or P02-02", the rotation direction of the motor can be changed without changing the input command polarity. The relevant parameters are as follows:

| Function code | Index | Sub Index | Name | Setting range | Unit | Factory settings | Effective method | Setting method | Related Patterns |
|---|---|---|---|---|---|---|---|---|---|
| P02.02 | 2002h | 03 | Rotation direction selection | 0: Take the CCW direction as the forward direction (A leads B)<br>1: Take the CW direction as the forward direction (A lags B) | - | 0 | Power on again | shutdown settings | PST |

When the rotation direction selection (2002-03h) is changed, the shape of the servo drive output pulse and the positive and negative of the monitoring parameters will not change.

## 6.2.3 Brake settings

The holding brake is a mechanism that prevents the servo motor shaft from moving when the servo driver is in a non-running state and keeps the motor locked in position so that the moving parts of the machine will not move due to its own weight or external force. Under the relevant parameters:

| Function code | Index | Sub Index | Name | Setting range | Unit | Factory settings | Effective method | Setting method | Related Patterns |
|---|---|---|---|---|---|---|---|---|---|
| P02.09 | 2002h | 0A | Delay from brake output ON to command reception | 0～500 | ms | 250 | Effective immediately | Run settings | PS |
| P02.10 | 2002h | 0B | In static state, delay from brake output OFF to motor de-energization | 1～1000 | ms | 150 | Effective immediately | Run settings | PS |
| P02.11 | 2002h | 0C | Rotating state, speed threshold when brake output is OFF | 0～3000 | rpm | 30 | Effective immediately | Run settings | PS |
| P02.12 | 2002h | 0D | Rotating state, delay from servo enable OFF to brake output OFF | 1～1000 | ms | 500 | Effective immediately | Run settings | PS |

The brake output signal controls the motor brake wiring diagram through the relay, please refer to Chapter 4.4.2.

# 6.3 Communication cycle of each mode

| Period Time | Contour position mode (pp) | Return to zero mode (hm) | Periodic synchronized position mode(csp) | Cycle sync speed mode (csv) | Contour speed mode(pv) | Contour speed mode(pt) | Periodic synchronized torque mode(cst) |
|---|---|---|---|---|---|---|---|
| 125us | × | × | × | × | × | √ | √ |
| 250us | × | × | × | × | × | √ | √ |
| 500us | × | × | × | √ | √ | √ | √ |
| 1ms | √ | √ | √ | √ | √ | √ | √ |

The synchronization cycles supported by each mode of 1ms and below are as shown in the table above. Use outside the specifications may cause operation errors;
Above 1ms, the synchronization period whose value is an integral multiple of the position loop control period (the position loop control period is 250us) is also supported.

# 6.4 Process data PDO

## 6.4.1 Variable PDO mapping

This series of drives provides 1 variable RPDO and 1 variable TPDO for users to use. As shown in the following table:

| Variable PDO | index | Maximum number of mappings | longest byte | Default mapping object |
|---|---|---|---|---|
| RPDO1 | 1600h | 10 个 | 40 | 6040h (control word)<br>607Ah (target location)<br>60B8h (probe function) |
| TPDO1 | 1A00h | 10 个 | 40 | 603Fh (error code)<br>6041h (status word)<br>6064h (position feedback)<br>60BCh (probe 2 rising edge position feedback)<br>60B9h (probe status)<br>60BAh (Probe 1 rising edge position feedback)<br>60FDh (DI status) |

## 6.4.2 Fixed PDO mapping

This series of drives provides 5 fixed RPDOs and 4 fixed TPDOs for use. As shown in the following table:

| PDO group | Supported servo modes | PP/CSP | PDO Group | Supported servo modes | PP/PV/PT/CSP/CSV/CST |
|---|---|---|---|---|---|
| Group 1 | 1701h (RPDO258) | Mapping object (3, 8 bytes)<br>6040h (control word)<br>607Ah (target location)<br>60B8h (probe function) | Group 2 | 1702h(RPDO259) | Mapping objects (7, 19 bytes)<br>6040h (control word)<br>607Ah (target location)<br>60FFh (target speed)<br>6071h (target torque)<br>6060h (mode selection)<br>60B8h (probe function)<br>607Fh (maximum speed) |
| | 1B01h (TPDO258) | Mapping object (8, 24 bytes)<br>603Fh (error code)<br>6041h (status word)<br>6064h (position feedback)<br>6077h (torque feedback)<br>60F4 (position deviation)<br>60B9 (probe status)<br>60BA (Probe 1 rising edge position feedback)<br>60FD (DI status) | | 1B02h(TPDO259) | Mapping objects (9, 25 bytes)<br>603Fh (error code)<br>6041h (status word)<br>6064h (position feedback)<br>6077h (torque feedback)<br>6061h (mode display)<br>60B9 (probe status)<br>60BA (Probe 1 rising edge position feedback)<br>60BC (Probe 2 rising edge position feedback)<br>60FD (DI status) |

| PDO group | Supported servo modes | PP/CSP |
|---|---|---|
| Group 1 | 1703h(RPDO260) | Mapping objects (7, 17 bytes)<br>6040h (control word)<br>607Ah (target location)<br>60FFh (target speed)<br>6060h (mode selection)<br>60B8h (probe function)<br>60E0h (forward torque limit)<br>60E1h (negative torque limit) |
| | 1B03h(TPDO260) | Mapping object (10, 29 bytes)<br>603Fh (error code)<br>6041h (status word)<br>6064h (position feedback)<br>6077h (torque feedback)<br>60F4h (position deviation)<br>6061h (mode display)<br>60B9h (probe status)<br>60BAh (Probe 1 rising edge position feedback)<br>60BCh (Probe 2 rising edge position feedback)<br>60FD (DI status) |

| PDO Group | Supported servo modes | PP/PV/PT/CSP/CSV/CST |
|---|---|---|
| Group 2 | 1704h(RPDO261) | Mapping objects (7, 17 bytes)<br>6040h (control word)<br>607Ah (target location)<br>60FFh (target speed)<br>6071h (target torque)<br>6060h (mode selection)<br>607Fh (maximum speed)<br>60B8h (probe function)<br>60E0h (forward torque limit)<br>60E1h (negative torque limit) |
| | 1B02h(TPDO259) | Mapping object (9, 25 bytes)<br>603Fh (error code)<br>6041h (status word)<br>6064h (position feedback)<br>6077h (torque feedback)<br>6061h (mode display)<br>60B9 (probe status)<br>60BA (Probe 1 rising edge position feedback)<br>60BC (Probe 2 rising edge position feedback)<br>60FD (DI status) |

| PDO group | Supported servo modes | PP/CSP | | |
|---|---|---|---|---|
| Group 5 | 1705h(RPDO262) | Mapping object (8, 19 bytes)<br>6040h (control word)<br>607Ah (target location)<br>60FFh (target speed)<br>6060h (mode selection)<br>60B8h (probe function)<br>60E0h (forward torque limit)<br>60E1h (negative torque limit)<br>60B2h (torque bias) | 1B04h(TPDO261) | Mapping object (10, 29 bytes)<br>603Fh (error code)<br>6041h (status word)<br>6064h (position feedback)<br>6077h (torque feedback)<br>6061h (mode display)<br>60F4h (position deviation)<br>60B9h (probe status)<br>60BAh (Probe 1 rising edge position feedback)<br>60BCh (Probe 2 rising edge position feedback)<br>606Ch (speed feedback) |

# Chapter 7 Control Mode Description

## 7.1 Control introduction

When using this series of drives, the servo drive must be guided according to the process specified in the standard 402 protocol, so that the servo drive can run in the specified state. Each status is described in the following table:

| | |
|---|---|
| initialization | Drive initialization and internal self-test have been completed.<br>The parameters of the drive cannot be set, and the drive function cannot be executed. |
| Servo has no fault | The servo drive has no fault or the error has been eliminated.<br>Drive parameters can be set. |
| Servo ready | The servo drive is ready.<br>Drive parameters can be set. |
| Waiting for servo enable to be turned on | The servo drive is waiting to turn on the servo enable.<br>Drive parameters can be set. |
| Servo operation | The driver runs normally, a certain servo operation mode is enabled, the motor is powered on, and when the command is not 0, the motor rotates.<br>The drive parameters whose attribute is "Run Change" can be set, but others cannot. |
| Quick shutdown | The quick stop function is activated and the drive is executing the quick stop function.<br>The drive parameters whose attribute is "Run Change" can be set, but others cannot. |
| Fault shutdown | The drive has failed and is in the process of shutting down.<br>The drive parameters whose attribute is "Run Change" can be set, but others cannot. |
| Fault | The fault shutdown is completed, all drive functions are disabled, and the drive parameters can be changed for troubleshooting. |

The switching of control commands and status words is as follows:

| CiA402 status switching | | Corresponding value of control word 6040h | Bit0~bit9 of status word 6041h |
|---|---|---|---|
| 0 | Power on → initialize | Natural transition, no control instructions required | 0x0000 |
| 1 | Initialization→servo no fault | Natural transition, no control instructions required. If an error occurs during initialization, go directly to 13 | 0x0250 |
| 2 | The servo is faultless → the servo is ready | 6 | 0x0231 |
| 3 | Servo is ready→waiting to turn on servo enable | 7 | 0x0233 |
| 4 | Waiting to turn on servo enable→ servo running | F | 0x0237 |
| 5 | Servo running→waiting to turn on servo enable | 7 | 0x0233 |
| 6 | Waiting to turn on servo enable→Servo is ready | 6 | 0x0231 |
| 7 | Servo is ready→Servo is fault-free | 0 | 0x0250 |
| 8 | Servo running → Servo ready | 6 | 0x0231 |
| 9 | Servo is running → servo is fault-free | 0 | 0x0250 |
| 10 | Waiting to turn on the servo enable → the servo has no fault | 0 | 0x0250 |
| 11 | Servo operation → quick stop | 2 | 0x0217 |
| 12 | Quick stop → servo has no fault | Quick stop mode 605A is selected from 0 to 3. After the stop is completed, there will be a natural transition without control instructions. | 0x0250 |
| 13 | Fault shutdown | In any other state except "fault", once the servo drive fails, it will automatically switch to the fault shutdown state without control instructions. | 0x021F |
| 14 | Fault shutdown→fault | After the fault shutdown is completed, t here will be a natural transition without control instructions. | 0x0218 |

| | | | |
|---|---|---|---|
| 15 | Fault→Servo has no fault | 0x80<br>Bit7 is valid on the rising edge;<br>Bit7 remains 1, and other control instru ctions are invalid. | 0x0250 |
| 16 | Quick stop → servo operation | Quick stop mode 605A is selected from 5 to 7. After the stop is completed, 0x0F is sent. | 0x0237 |

## 6. 5. 1 控制字 6040h

| Bit 位 | Name | | Describe |
|---|---|---|---|
| 0 | Servo operation can be turned on | switch on | 1: valid, 0: invalid |
| 1 | Turn on the main circuit power | enable voltage | 1: valid, 0: invalid |
| 2 | Quick shutdown | quick stop | 1: valid, 0: invalid |
| 3 | Servo operation | enable operation | 1: valid, 0: invalid |
| 4～6 | Operating mode related | operation mode specific | Relevant to each servo operation mode |
| 7 | Fault reset | fault reset | For resettable faults and warnings, the fault reset function is executed; the rising edge of bit7 is valid;<br>Bit7 remains 1, and other control instructions are invalid. |
| 8 | pause | halt | Please check the object dictionary 605Dh for the pause methods in each mode. |
| 9 | Operating mode related | operation mode specific | Relevant to each servo operation mode |
| 10 | N/A | N/A | N/A |
| 11～15 | N/A | N/A | N/A |

## 6.5.2 Status word 6041h

| Bit | Name | | Describe |
|---|---|---|---|
| 0 | Servo ready | ready to switch on | 1: valid, 0: invalid |
| 1 | Servo operation can be turned on | switch on | 1: valid, 0: invalid |
| 2 | Servo operation | operation enabled | 1: valid, 0: invalid |
| 3 | Fault | fault | 1: valid, 0: invalid |
| 4 | The main circuit is electrically connected | voltage enabled | 1: valid, 0: invalid |
| 5 | Quick shutdown | quick stop | 1: valid, 0: invalid |
| 6 | Servo is not operational | switch on disabled | 1: valid, 0: invalid |
| 7 | warn | warning | 1: valid, 0: invalid |
| 8 | N/A | N/A | N/A |
| 9 | remote control | remote | 1: valid, 0: invalid |
| 10 | target reached | target reach | 1: valid, 0: invalid |
| 11 | Internal restrictions are in effect | internal limit active | 1: valid, 0: invalid |
| 12～13 | Operating mode related | operation mode specific | Relevant to each servo operation mode |
| 14 | N/A | N/A | N/A |
| 15 | Origin found | Home Find | 1: valid, 0: invalid |

# 7.2 Working mode

## 7.2.1 Introduction to servo mode

The control modes supported by this series of servo drives are:

| index | subindex | Name | set value | explanation |
|---|---|---|---|---|
| 6060h | 00 | Operating mode | 1 | Contour position mode (pp) |
| | | | 3 | Profile velocity mode (pv) |
| | | | 4 | Profile torque mode (pt) |
| | | | 6 | Return to zero mode (hm) |
| | | | 8 | Cyclic synchronized position mode (csp) |
| | | | 9 | Cycle synchronized velocity pattern (csv) |
| | | | 10 | Periodic synchronized torque mode (cst) |

## 7.2.2 Servo mode switching

1. When the servo drive is in any state, after switching from the contour position mode or the periodic synchronous position mode to other modes, the unexecuted position instructions will be discarded.

2. When the servo drive is in any state, after switching from contour speed mode, contour torque mode, period synchronous speed mode, period synchronous torque mode to other modes, it will first perform a ramp stop. After the shutdown is completed, it can switch to other modes.

3. When the servo is in the zero return mode and is running, it cannot switch to other modes; when the zero return is completed or interrupted (fault or enable invalid), it can switch to other modes.

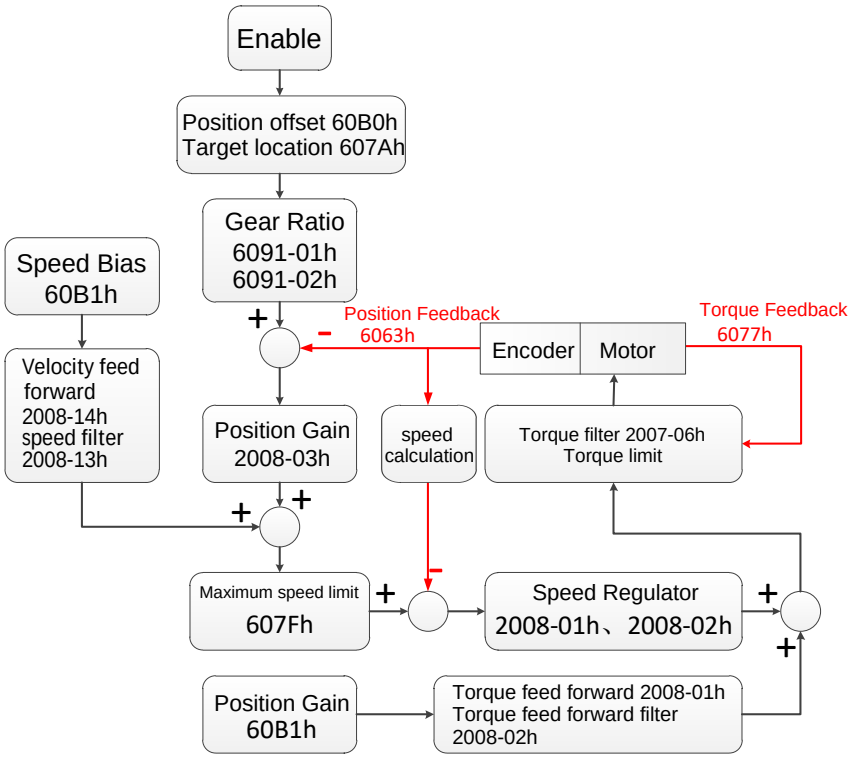
4. In the servo running state, when switching from other modes to running in periodic synchronization mode, please wait at least 1ms before sending instructions, otherwise instruction loss or errors will occur.

# 7.3 Periodic synchronized position mode (CSP mode)

Set the 6060h to 8 and the drive is in CSP mode. In the periodic synchronization position mode, the upper controller completes the position command planning, and then sends the planned target position 607Ah to the servo driver in a periodic synchronization manner. The position, speed, and torque control are completed internally by the servo driver. This mode is suitable for multi-axis synchronous position control. The commonly used object dictionary using CSP mode is as follows:

| Index | Subindex | Name | Access Type | Type of Data | Unit | Configuration recommendations |
|---|---|---|---|---|---|---|
| 603Fh | 00 | Error code | RO | UINT16 | - | Recommended configuration |
| 6041h | 00 | Status word | RO | UINT16 | - | Must be configured |
| 6061h | 00 | Mode display | RO | INT8 | - | Configure when needed |
| 6062h | 00 | Position command | RO | INT32 | command unit | Configure when needed |
| 6064h | 00 | Position feedback | RO | INT32 | command unit | Configure when needed |
| 606Ch | 00 | Actual speed | RO | INT32 | command unit/S | Configure when needed |
| 60F4h | 00 | Position deviatio | RO | INT32 | command unit | Configure when needed |
| 60FCh | 00 | Position command | RO | INT32 | encoder unit | Configure when needed |
| 60FDh | 00 | Input IO status | RO | UINT32 | - | Configure when needed |
| 6040h | 00 | Control word | RW | UINT16 | - | Must be configured |
| 6060h | 00 | Control mode | RW | INT8 | - | Recommended configuration |
| 607Ah | 00 | Target position | RW | INT32 | command unit | Must be configured |
| 607Fh | 00 | Maximum rotation speed | RW | UDINT | command unit | Configure when needed |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6065h | 00 | Position deviation excessive threshold | RW | UINT32 | command unit | Configure when needed |
| 6067h | 00 | Position reaches threshold | RW | UINT32 | encoder unit | Configure when needed |
| 6068h | 00 | Location arrival window | RW | UINT16 | ms | Configure when needed |
| 6091h | 01 | Motor resolution | RW | UINT32 | - | Configure when needed |
| | 02 | Axis resolution | RW | UINT32 | - | Configure when needed |
| 60B0h | 00 | Position offset | RW | INT32 | command unit | Configure when needed |
| 60B1h | 00 | Speed bias | RW | INT32 | command unit/S | Configure when needed |
| 60B2h | 00 | Torque bias | RW | INT32 | 0.1% | Configure when needed |
| 6072h | 00 | Maximum torque | RW | UINT16 | 0.1% | Configure when needed |
| 60E0h | 00 | Forward torque limit | RW | UINT16 | 0.1% | Configure when needed |
| 60E1h | 00 | Forward torque limit | RW | UINT16 | 0.1% | Configure when needed |



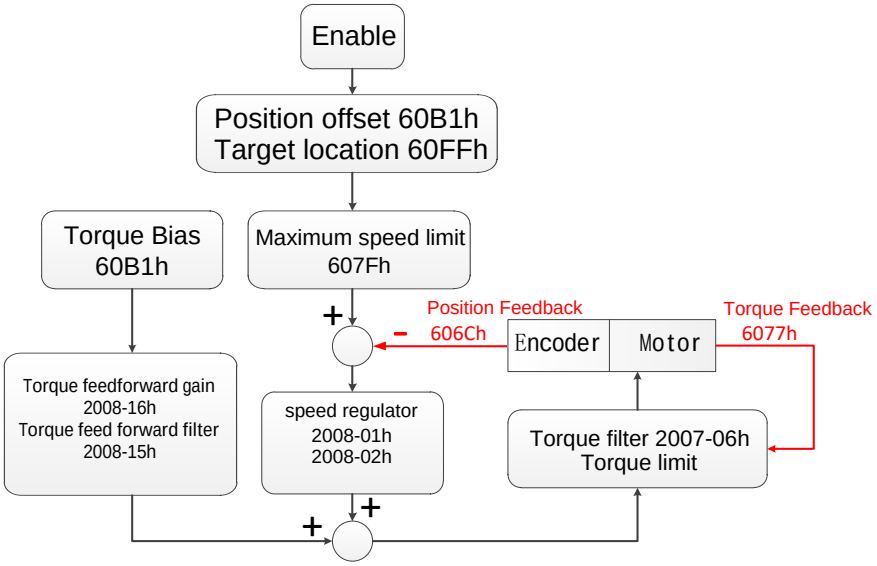

CSP mode control block diagram

## 7.4 Periodic synchronization speed mode (CSV mode)

Set 6060h to 9 and the drive is in CSV mode. In the periodic synchronous speed mode, the upper controller periodically and synchronously sends the calculated target speed 60FF to the servo driver, and the speed and torque adjustment are performed internally by the servo. This mode is suitable for multi-axis synchronous speed control. The commonly used object dictionary using CSV mode is as follows:

| index | subindex | Name | access type | type of data | Unit | Configuration recommendations |
|---|---|---|---|---|---|---|
| 603Fh | 00 | Error code | RO | UINT16 | - | Rconfiguration |
| 6041h | 00 | Status word | RO | UINT16 | - | Must be configured |
| 6061h | 00 | Mode display | RO | INT8 | - | Configure when needed |
| 6064h | 00 | Position feedback | RO | INT32 | command unit | Configure when needed |
| 606Ch | 00 | Actual speed | RO | INT32 | command unit/S | Configure when needed |
| 6077h | 00 | Actual torque | RO | INT16 | 0.1% | Configure when needed |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6040h | 00 | control word | RW | UINT16 | - | Must be configured |
| 6060h | 00 | control mode | RW | INT8 | - | Recommended configuration |
| 60FFh | 00 | target speed | RW | INT32 | command unit/S | Must be configured |
| 607Fh | 00 | Maximum speed | RW | UDINT32 | command unit/S | Configure when needed |
| 60B1h | 00 | speed bias | RW | INT32 | command unit/S | Configure when needed |
| 60B2h | 00 | Torque bias | RW | INT32 | 0.1% | Configure when needed |
| 6072h | 00 | Maximum torque | RW | UINT16 | 0.1% | Configure when needed |
| 60E0h | 00 | Forward torque limit | RW | UINT16 | 0.1% | Configure when needed |
| 60E1h | 00 | Reverse torque limit | RW | UINT16 | 0.1% | Configure when needed |

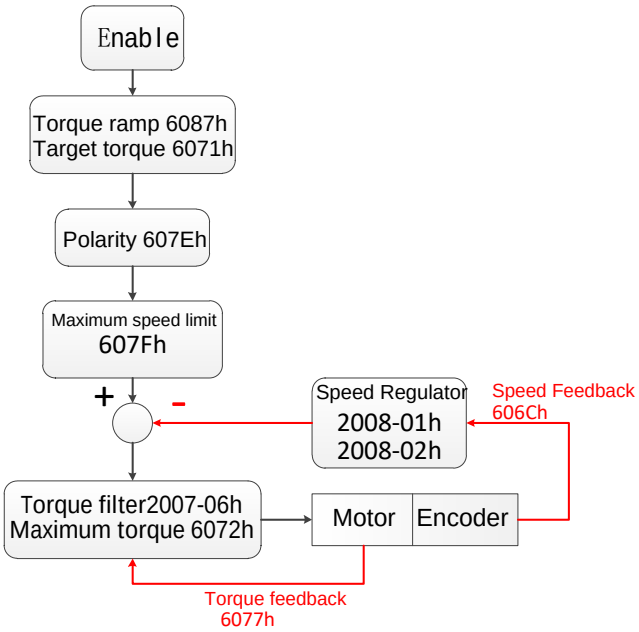



CSV mode control block diagram

## 7.5 Periodic synchronous torque mode (CST mode)

Set 6060h to 10, and the drive is in CST mode. In the periodic synchronous torque mode, the upper controller periodically and synchronously sends the calculated target torque 6071h to the servo drive, and the torque adjustment is performed internally by the servo. When the speed reaches the limit value, it will enter the speed adjustment stage. This mode is suitable for multi-axis synchronous torque control. The common object dictionary used in CST mode is as follows:

| index | subindex | name | access type | type of data | Unit | Configuration recommendations |
|---|---|---|---|---|---|---|
| 603Fh | 00 | error code | RO | UINT16 | - | Suggested configuration |
| 6041h | 00 | status word | RO | UINT16 | - | Must be configured |
| 6061h | 00 | Mode display | RO | INT8 | - | Configure when needed |
| 606Ch | 00 | actual speed | RO | INT32 | command unit/S | Configure when needed |
| 6074h | 00 | Torque command | RO | INT16 | 0.1% | Configure when needed |
| 6077h | 00 | actual torque | RO | INT16 | 0.1% | Configure when needed |
| 6040h | 00 | control word | RW | UINT16 | - | Must be configured |
| 6060h | 00 | control mode | RW | INT8 | - | Configure when needed |
| 6071h | 00 | target torque | RW | INT16 | 0.1% | Must be configured |
| 607Fh | 00 | Maximum speed | RW | UDINT32 | command unit/S | Suggested configuration |
| 60B2h | 00 | Torque bias | RW | INT32 | 0.1% | Configure when needed |
| 6072h | 00 | Maximum torque | RW | UINT16 | 0.1% | Configure when needed |
| 60E0h | 00 | Forward torque limit | RW | UINT16 | 0.1% | Configure when needed |
| 60E1h | 00 | Reverse torque limit | RW | UINT16 | 0.1% | Configure when needed |



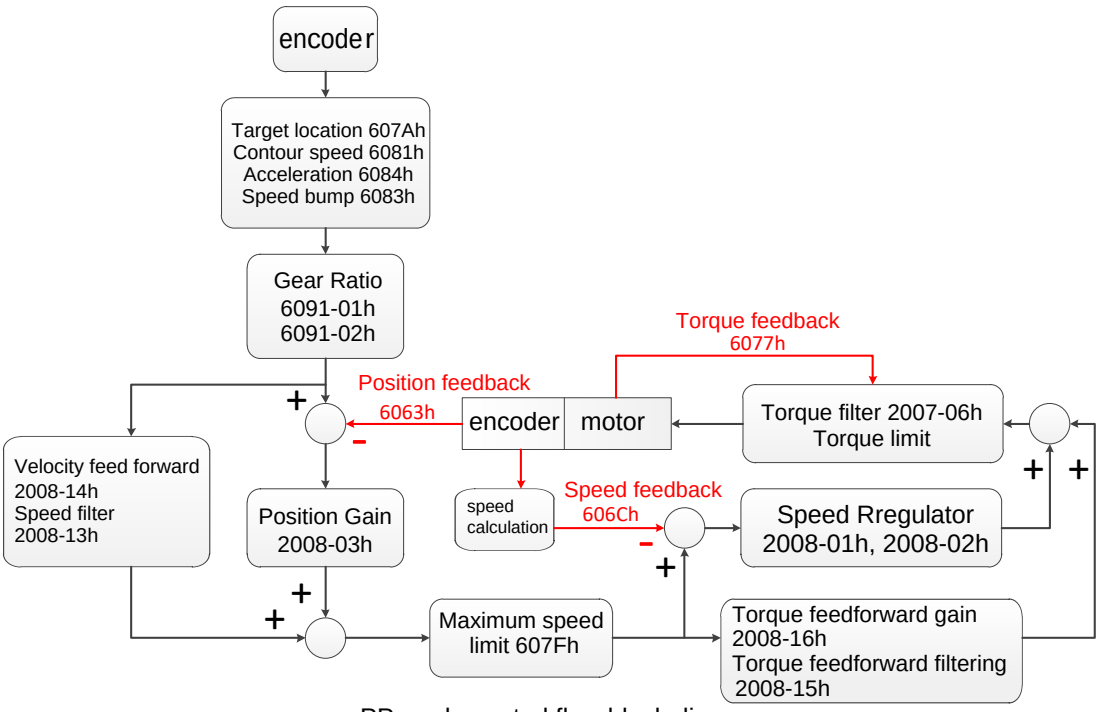

CSTMode control flow block diagram

## 7.6 Profile position mode (PP mode)

Set 6060h to 1 and the drive is in pp mode. This mode is mainly used for point-to-point positioning applications. In this mode, the host computer gives the target position (absolute or relative), the speed of the position curve, acceleration and deceleration, and deceleration. The trajectory generator inside the servo will generate the target position curve command according to the settings. The driver completes position control and speed control internally. Torque control. Commonly used object dictionaries using pp mode are as follows:

| index | subindex | Name | access type | type of data | Unit | Configuration recommendations |
|---|---|---|---|---|---|---|
| 603Fh | 00 | error code | RO | UINT16 | – | Recommended configuration |
| 6041h | 00 | status word | RO | UINT16 | – | Must be configured |
| 6061h | 00 | Mode display | RO | INT8 | – | Configure when needed |
| 6062h | 00 | position command | RO | INT32 | command unit | Configure when needed |
| 6063h | 00 | position feedback | RO | INT32 | encoder unit | Configure when needed |
| 6064h | 00 | position feedback | RO | INT32 | command unit | Configure when needed |
| 606Ch | 00 | actual speed | RO | INT32 | command unit/S | Configure when needed |
| 60F4h | 00 | position deviation | RO | INT32 | command unit | Configure when needed |
| 60FCh | 00 | position command | RO | INT32 | encoder unit | Configure when needed |
| 60FDh | 00 | Enter IO status | RO | UINT32 | – | Configure when needed |
| 6077h | 00 | actual torque | RO | INT16 | 0.1% | Configure when needed |
| 6040h | 00 | control word | RW | UINT16 | – | Must be configured |
| 6060h | 00 | control mode | RW | INT8 | – | Configure when needed |
| 607Ah | 00 | target location | RW | INT32 | command unit | Must be configured |
| 6081h | 00 | Profile speed | RW | UDINT32 | Command unit/S | Must be configured |
| 6083h | 00 | acceleration | RW | UDINT32 | Command unit/S² | Recommended configuration |
| 6084h | 00 | deceleration | RW | UDINT32 | Command unit/S² | Recommended configuration |
| 6065h | 00 | Position deviation excessive threshold | RW | UINT32 | command unit | Configure when needed |
| 6067h | 00 | Position reaches threshold | RW | UINT32 | encoder unit | Configure when needed |
| 6068h | 00 | location arrival window | RW | UINT16 | ms | Configure when needed |
| 6072h | 00 | Maximum torque | RW | UINT16 | 0.1% | Configure when needed |
| 6091h | 01 | Motor resolution | RW | UINT32 | – | Configure when needed |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 02 | Axis resolution | RW | UINT32 | - | Configure when needed |
| 60E0h | 00 | Forward torque limit | RW | UINT16 | 0.1% | Configure when needed |
| 60E1h | 00 | Reverse torque limit | RW | UINT16 | 0.1% | Configure when needed |

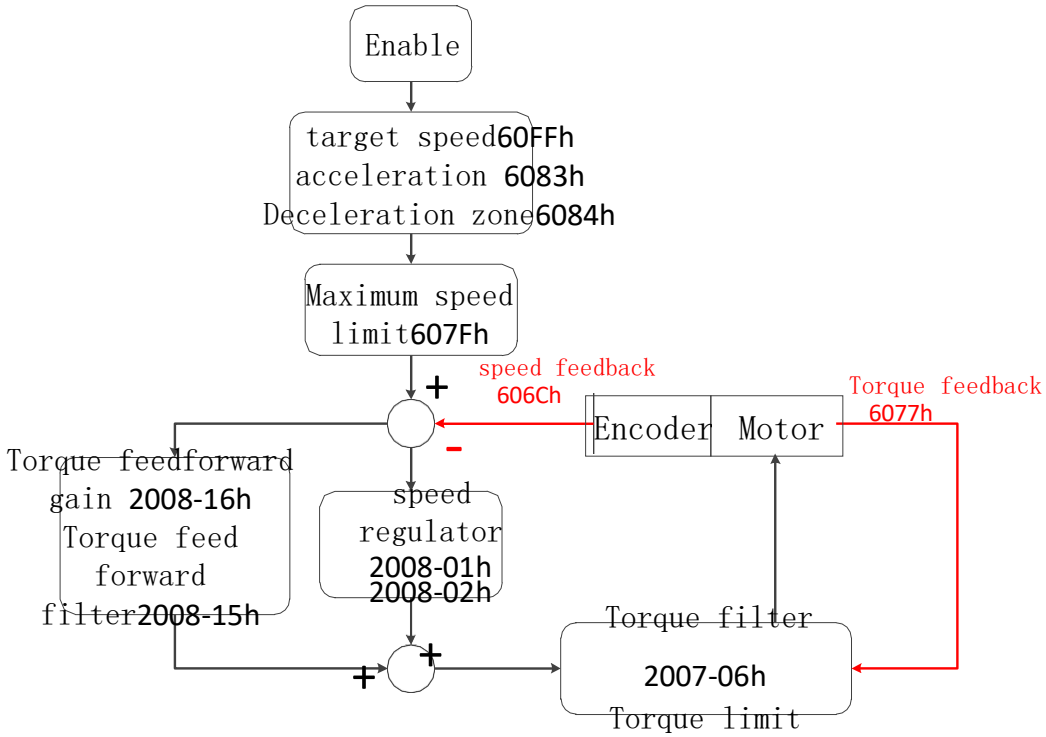



PP mode control flow block diagram

## 7.7 Profile speed mode (PV mode)

Set 6060h to 3 and the drive is in pv mode. In this mode, the upper controller sends the target speed, acceleration, and deceleration to the servo driver, and the speed and torque adjustment are performed internally by the servo. Commonly used object dictionaries using pv mode are as follows:

| index | subindex | Name | Access type | type of data | Unit | Configuration recommendations |
|---|---|---|---|---|---|---|
| 603Fh | 00 | error code | RO | UINT16 | - | Recommended configuration |
| 6041h | 00 | status word | RO | UINT16 | - | Must be configured |
| 6061h | 00 | Mode display | RO | INT8 | - | Configure when needed |
| 6063h | 00 | position feedback | RO | INT32 | Encoder unit | Configure when needed |
| 6064h | 00 | position feedback | RO | INT32 | command unit | Configure when needed |
| 606Ch | 00 | actual speed | RO | INT32 | command unit/S | Configure when needed |
| 6077h | 00 | actual torque | RO | INT16 | 0.1% | Configure when needed |
| 6040h | 00 | control word | RW | UINT16 | - | Must be configured |
| 6060h | 00 | control mode | RW | INT8 | - | Configure when needed |
| 60FFh | 00 | target speed | RW | INT32 | command unit/S | Must be configured |
| 6083h | 00 | acceleration | RW | UDINT32 | command unit/S | Recommended configuration |
| 6084h | 00 | deceleration | RW | UDINT32 | command unit/S | Recommended configuration |
| 607Fh | 00 | Maximum speed | RW | UDINT32 | command unit/S | Recommended configuration |
| 606Dh | 00 | speed reaches threshold | RW | INT32 | command unit/S | Configure when needed |
| 606Eh | 00 | speed arrival window | RW | INT32 | ms | Configure when needed |
| 60B1h | 00 | speed bias | RW | INT32 | command unit/S | Configure when needed |
| 60B2h | 00 | Torque bias | RW | INT32 | 0.1% | Configure when needed |
| 60E0h | 00 | Forward torque limit | RW | UINT16 | 0.1% | Configure when needed |
| 60E1h | 00 | Reverse torque limit | RW | UINT16 | 0.1% | Configure when needed |

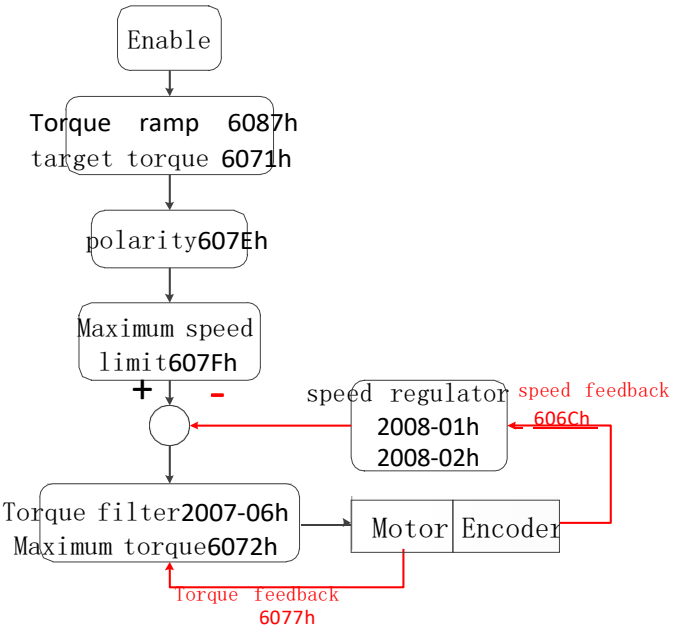



( PV mode control flow block diagram )

## 7.8 Profile torque mode (PT mode)

Set 6060h to 4 and the drive is in pt mode. In this mode, the upper controller sends the target torque 6071h and torque ramp constant :

| index | subindex | Name | access type | type of data | Unit | Recommended configuration |
|---|---|---|---|---|---|---|
| 603Fh | 00 | error code | RO | UINT16 | - | Recommended configuration |
| 6041h | 00 | status word | RO | UINT16 | - | Must be configured |
| 6061h | 00 | Mode display | RO | INT8 | - | Configure when needed |
| 606Ch | 00 | actual speed | RO | INT32 | command unit/S | Configure when needed |
| 6074h | 00 | Torque command | RO | INT16 | 0.1% | Configure when needed |
| 6077h | 00 | actual torque | RO | INT16 | 0.1% | Configure when needed |
| 6040h | 00 | control word | RW | UINT16 | - | Must be configured |
| 6060h | 00 | control mode | RW | INT8 | - | Configure when needed |
| 6071h | 00 | target torque | RW | INT16 | 0.1% | Must be configured |
| 6087h | 00 | Torque ramp | RW | UDINT32 | 0.1%/S | Recommended configuration |
| 607Fh | 00 | Maximum speed | RW | UDINT32 | command unit/S | Recommended configuration |
| 6072h | 00 | Maximum torque | RW | UINT16 | 0.1% | Recommended configuration |
| 60B2h | 00 | Torque bias | RW | INT32 | 0.1% | Configure when needed |
| 60E0h | 00 | Forward torque limit | RW | UINT16 | 0.1% | Configure when needed |
| 60E1h | 00 | Reverse torque limit | RW | UINT16 | 0.1% | Configure when needed |



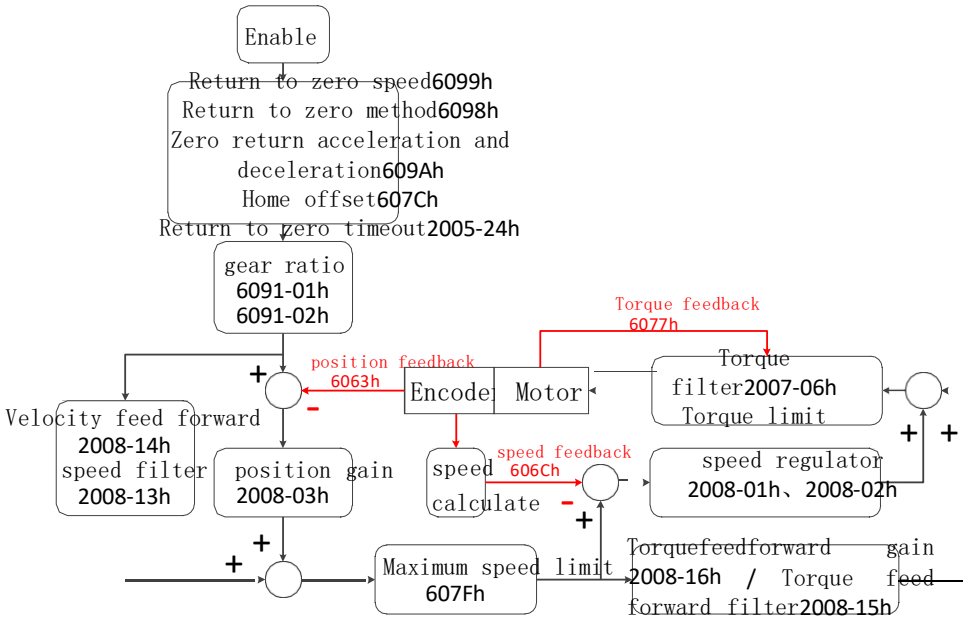

PT mode control block diagram

## 7.9 Return to zero mode (HOME mode)

Set 6060h to 6 and the drive is in HOME mode. The origin return mode is used to find the mechanical origin and locate the positional relationship between the mechanical origin and the mechanical zero point. Mechanical origin: a fixed position on the machine, which can correspond to a certain origin switch and the motor Z signal. Mechanical zero point: Mechanically the absolute 0 position. After the origin is returned to zero, the motor stop position is the mechanical origin. By setting 607Ch, the relationship between the mechanical origin and the mechanical zero can be set: mechanical origin = mechanical zero + 607Ch (origin offset). When 607Ch = 0, the mechanical origin and Mechanical zero point coincidence. Zero return mode 6098h Please refer to the appendix. The dictionary of commonly used objects using hm mode is as follows :

| index | subindex | Name | access type | type of data | Unit | Recommended configuration |
|---|---|---|---|---|---|---|
| 603Fh | 00 | error code | RO | UINT16 | - | Recommended configuration |
| 6041h | 00 | status word | RO | UINT16 | - | Must be configured |
| 6061h | 00 | Mode display | RO | INT8 | - | Configure when needed |
| 6064h | 00 | position feedback | RO | INT32 | command unit | Configure when needed |
| 606Ch | 00 | actual speed | RO | INT32 | command unit/S | Configure when needed |
| 6077h | 00 | actual torque | RO | INT16 | 0.1% | Configure when needed |
| 60FDh | 00 | Enter IO status | RO | UINT32 | - | Configure |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | when needed |
| 60F4h | 00 | position deviation | RO | DINT32 | command unit | Recommended configuration |
| 6040h | 00 | control word | RW | UINT16 | - | Must be configured |
| 6060h | 00 | control mode | RW | INT8 | - | Configure when needed |
| 6098h | 00 | Zero return method | RW | INT8 | - | Must be configured |
| 6099h | 01 | Return to Zero Expressway | RW | UINT32 | command unit/S | Must be configured |
| | 02 | Return to zero low speed | RW | UINT32 | command unit/S | Must be configured |
| 609Ah | 00 | acceleration | RW | UDINT32 | command unit/$S^2$ | Must be configured |
| 2005h | 24 | Return to zero timeout | RW | UINT16 | 10ms | Recommended configuration |
| 6065h | 00 | Position deviation excessive threshold | RW | UINT32 | command unit | Configure when needed |
| 6067h | 00 | Position reaches threshold | RW | UINT32 | Encoder unit | Configure when needed |
| 6068h | 00 | location arrival window | RW | UINT16 | ms | Configure when needed |




HOME mode control flow block diagram

## 7.9 Probe function description

The probe function is the position latch function. It can latch the position information (command unit) when the external DI signal or motor Z signal changes. This series of servo supports enabling 2 probes at the same time, and can simultaneously record the position information corresponding to the rising and falling edges of each probe signal, and can latch 4 position information at the same time. Probe 1 can choose DI3 or motor Z signal as the probe signal, and probe 2 can choose DI4 or motor Z signal as the probe signal. When using DI8 or DI9 as the probe trigger signal, the logic setting of the DI terminal must be consistent with the 60B8 (probe function) setting, otherwise, the probe function is invalid. The relevant parameters for using the probe function are as follows:

| index | subindex | Name | default value | Setting | access type | type of data | Unit |
|---|---|---|---|---|---|---|---|
| 2003h | 09 | DI3 function selection | 0 | 38 | RW | UINT16 | - |
| 2003h | 0A | DI3 logic selection | 0 | 2 | RW | UINT16 | - |
| 2003h | 0B | DI4 function selection | 0 | 39 | RW | UINT16 | - |
| 2003h | 0C | DI4 logic selection | 0 | 2 | RW | UINT16 | - |
| 60B8 | 00 | Probe function | 0 | 4883 | RW | UINT16 | - |
| 60B9 | 00 | Probe status | 0 | - | RO | UINT16 | - |
| 60BA | 00 | Probe 1 rising edge latch position | 0 | - | RO | INT32 | command unit |
| 60BB | 00 | Probe 1 falling edge latch position | 0 | - | RO | INT32 | command unit |
| 60BC | 00 | Probe 2 rising edge latch position | 0 | - | RO | INT32 | command unit |
| 60BD | 00 | Probe 2 falling edge latch position | 0 | - | RO | INT32 | command unit |

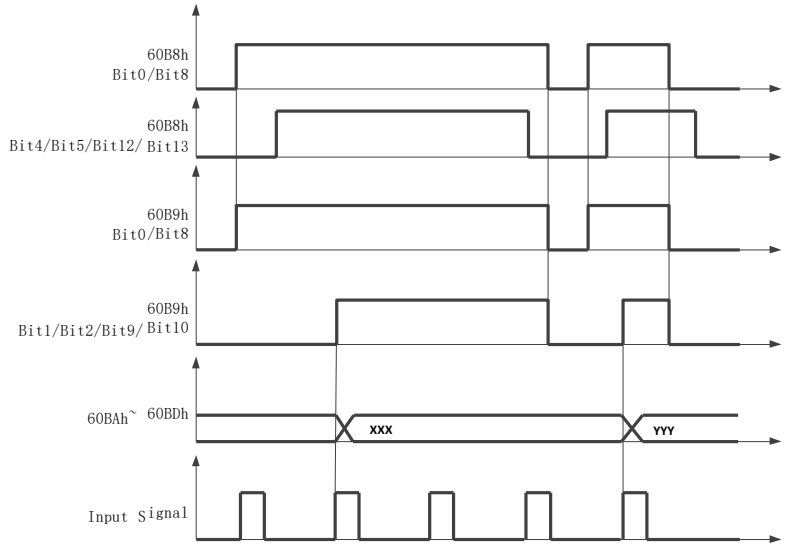
### 7.7.1 Functional description of 60B8h and 60B9h

| index | subindex | Function Description | |
|---|---|---|---|
| 60B8h | 00h | Bit0 | 0: Probe 1 is disabled; 1: Probe 1 is enabled; |
| | | Bit1 | 0: Probe 1 single mode; 1: Probe 1 continuous mode; |
| | | Bit2 | Probe 1 trigger signal selection: 0: DI3; 1: Z signal; |
| | | Bit3 | reserve |
| | | Bit4 | 0: The rising edge of probe 1 is not enabled; 1: The rising edge of probe 1 is enabled; |
| | | Bit5 | 0: The falling edge of probe 1 is not enabled; 1: The falling edge of probe 1 is enabled; |
| | | Bit6～ Bit7 | reserve; |
| | | Bit8 | 0: Probe 2 is not enabled; 1: Probe 2 is enabled; |
| | | Bit9 | 0: Probe 2 single mode; 1: Probe 2 continuous mode; |
| | | Bit10 | Probe 2 trigger signal selection: 0: DI4; 1: Z signal; |
| | | Bit11 | reserve; |
| | | Bit12 | 0: The rising edge of probe 2 is not enabled; 1: The rising edge of probe 2 is enabled; |
| | | Bit13 | 0: The falling edge of probe 2 is not enabled; 1: The falling edge of probe 2 is enabled; |
| | | Bit14～ Bit15 | reserve; |

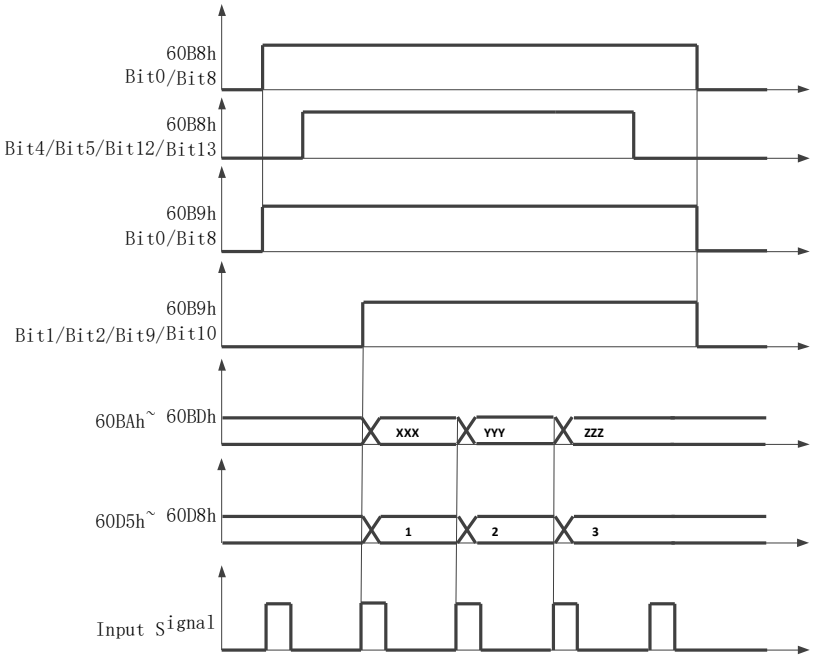
| | | | |
|---|---|---|---|
| 60B9h | 00h | Bit0 | 0: Probe 1 is not in action; 1: Probe 1 is working; |
| | | Bit1 | 0: The rising edge capture of probe 1 is not completed; 1: The rising edge capture of probe 1 is completed; |
| | | Bit2 | 0: Probe 1 falling edge capture is not completed; 1: Probe 1 falling edge capture is completed; |
| | | Bit3～Bit5 | reserve; |
| | | Bit6 | Probe 1 trigger signal selection: 0: DI3; 1: Z signal; |
| | | Bit7 | Probe 1 trigger signal monitoring: 0: DI3 low level; 1: DI3 high level; |
| | | Bit8 | 0: Probe 2 is not in action; 1: Probe 2 is working; |
| | | Bit9 | 0: Probe 2 rising edge capture is not completed; 1: Probe 2 rising edge capture is completed; |
| | | Bit10 | 0: Probe 2 falling edge capture is not completed; 1: Probe 2 falling edge capture is completed; |
| | | Bit11～Bit13 | reserve; |
| | | Bit14 | Probe 2 trigger signal selection: 0: DI4; 1: Z signal; |
| | | Bit15 | Probe 2 trigger signal monitoring: 0: DI4 low level; 1: DI4 high level; |

## 7.8.2 Reading the probe latch position

The four position information of the probe are recorded in objects 0x60BA~0x60BD respectively. As shown in the figure below, the probe 1 rising edge position latch function has been executed. By reading 0x60BA (probe 1 rising edge position feedback latch value, command unit) Location information can be read. The single probe works as follows：




The continuous probe works as follows:



# Chapter 8 Parameter Description

## 8.1 1000 Group of object dictionary parameters

| index | subindex | Name | Unit | Change method | illustrate | Attributes |
|---|---|---|---|---|---|---|
| 1000 | 00 | Equipment type | - | cannot be changed | CIA standards | RO |
| 1001 | 00 | error register | - | cannot be changed | CIA designated error register | RO |
| 1008 | 00 | Manufacturer equipment name | - | cannot be changed | | RO |
| 1009 | 00 | Manufacturer hardware version | - | cannot be changed | | RO |
| 100A | 00 | Manufacturer software version | - | cannot be changed | | RO |
| 1018 | 00 | Number of sub-indexes | - | cannot be changed | NONE | RO |
| | 01 | Vendor ID | - | cannot be changed | NONE | RO |
| | 02 | Product Code | - | cannot be changed | NONE | RO |
| | 03 | Modify encoding | - | cannot be changed | NONE | RO |
| | 04 | serial number | - | cannot be changed | NONE | RO |
| 1C00 | 00 | Synchronization management communication type maximum sub-index number | - | cannot be changed | - | RO |
| | 01 | SM0 communication type | - | cannot be changed | - | RO |
| | 02 | SM1 communication type | - | cannot be changed | - | RO |
| | 03 | SM2 communication type | - | cannot be changed | - | RO |
| | 04 | SM3 communication type | - | cannot be changed | - | RO |
| 1600 | 00 | Number of mapping objects supported by RPD01 | - | Live changes | NONE | RW |
| | 01～0A | RxPDO mapping object group 1 | - | Live changes | Default RxPDO mapping group 1 | RW |
| 1701 | 00 | Number of mapping objects supported by RPD0258 | - | cannot be changed | - | RO |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 01～04 | mapping object | - | cannot be changed | - | RO |
| 1702 | 00 | Number of mapping objects supported by RPDO259 | - | cannot be changed | - | RO |
| | 01～07 | mapping object | - | cannot be changed | - | RO |
| 1703 | 00 | Number of mapping objects supported by RPDO260 | - | cannot be changed | - | RO |
| | 01～07 | mapping object | - | cannot be changed | - | RO |
| 1704 | 00 | Number of mapping objects supported by RPDO261 | - | cannot be changed | - | RO |
| | 01～09 | mapping object | - | cannot be changed | - | RO |
| 1705 | 00 | Number of mapping objects supported by RPDO262 | - | cannot be changed | - | RO |
| | 01～08 | mapping object | | cannot be changed | | RO |
| 1A00 | 00 | Number of mapping objects supported by TPD01 | - | Live changes | NONE | RW |
| | 01～0A | TxPDO mapping object group 1 | - | Live changes | Default TxPDO mapping group 1 | RW |
| 1B01 | 00 | Number of mapping objects supported by TPDO258 | - | cannot be changed | - | RO |
| | 01～08 | mapping object | - | cannot be changed | - | RO |
| 1B02 | 00 | Number of mapping objects supported by TPDO259 | - | cannot be changed | - | RO |
| | 01～09 | mapping object | - | cannot be changed | - | RO |
| 1B03 | 00 | Number of mapping objects supported by TPDO260 | - | cannot be changed | - | RO |
| | 01～0A | mapping object | - | cannot be changed | - | RO |
| 1B04 | 00 | Number of mapping objects supported by TPDO261 | - | cannot be changed | - | RO |
| | 01～0A | mapping object | - | cannot be changed | - | RO |
| 1C12 | 00～01 | RxPDO allocation | - | Live changes | NONE | RW |
| 1C13 | 00～01 | TxPDO allocation | - | Live changes | NONE | RW |
| 1C32 | 00～0A | RxPDO management parameters | - | Live changes | NONE | RO |
| 1C33 | 00～0A | TxPDO management parameters | - | Live changes | NONE | RO |

# 8.2 2000 Group Object Dictionary Parameters

## 8.2.1 2001 Group object dictionary (P01 group parameter)

| function code | index | subindex | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P01.02 | 2001 | 03 | Servo drive number | 0～65535 | - | - | Stop setting and power on again | RW | Uint16 |
| P01.50 | 2001 | 32 | Software version number | - | - | - | - | RO | Uint16 |

## 8.2.2 2002 Group Object Dictionary (P02 Group Parameters)

| function code | index | subindex | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P02.00 | 2002 | 01 | Control mode selection | 9: EtherCAT Mode | - | 9 | The shutdown setting takes effect immediately | RO | Uint16 |
| P02.01 | 2002 | 02 | Encoder type selection | 0: Incremental encoder<br>1: Absolute encoder | - | 0 | shutdown settings Power on again | RW | Uint16 |
| P02.02 | 2002 | 03 | Rotation direction selection | 0: Take the CCW direction as the forward direction<br>1: Take the CW direction as the forward direction | - | 0 | shutdown settings Power on again | RW | Uint16 |
| P02.03 | 2002 | 04 | Output pulse phase | 0: Take the CCW direction as the forward direction (A leads B)<br>1: Take the CW direction as the forward direction (A lags B) | - | 0 | shutdown settings Power on again | RW | Uint16 |
| P02.05 | 2002 | 06 | Servo enable OFF shutdown mode selection | 0: Coast to stop, maintain free running state<br>1: Stop at zero speed and maintain free running state | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P02.07 | 2002 | 08 | Overtravel stop mode selection | 0: Coast to stop, maintain free running state<br>1: Stop at zero speed, the position remains locked<br>2: Stop at zero speed and maintain free running state | - | 1 | The shutdown setting takes effect immediately | RW | Uint16 |
| P02.08 | 2002 | 09 | Fault No.1 shutdown mode selection | 0: Coast to stop, maintain free running state | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P02.09 | 2002 | 0A | Delay from brake output ON to command reception | 0～500 | ms | 250 | Run settings take effect immediately | RW | Uint16 |
| P02.10 | 2002 | 0B | In static state, delay from brake output OFF to motor de-energization | 1～1000 | ms | 150 | Run settings take effect immediately | RW | Uint16 |
| P02.11 | 2002 | 0C | Rotating state, speed threshold when brake output is OFF | 0～3000 | rpm | 30 | Run settings take effect immediately | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P02.12 | 2002 | 0D | Rotating state, delay from servo enable OFF to brake output OFF | 1～1000 | ms | 500 | Run settings take effect immediately | RW | Uint16 |
| P02.15 | 2002 | 10 | LED warning display selection | 0: Output warning information immediately<br>1: No warning message is output | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P02.21 | 2002 | 16 | The minimum value of the braking resistor allowed by the driver | - | Ω | 40 | - | RO | Uint16 |
| P02.22 | 2002 | 17 | Built-in braking resistor power | - | W | 50 | - | RO | Uint16 |
| P02.23 | 2002 | 18 | Built-in braking resistor resistance | - | Ω | 50 | - | RO | Uint16 |
| P02.24 | 2002 | 19 | Resistor heat dissipation coefficient | 10～100 | % | 30 | The shutdown setting takes effect immediately | RW | Uint16 |
| P02.25 | 2002 | 1A | Braking resistor settings | 0: Use built-in braking resistor<br>1: Use external braking resistor and natural cooling<br>2: Use external braking resistor and forced air cooling<br>3: No braking resistor is needed, all depends on capacitor absorption. | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P02.26 | 2002 | 1B | External braking resistor power | 1～65535 | W | - | The shutdown setting takes effect immediately | RW | Uint16 |
| P02.27 | 2002 | 1C | External braking resistor resistance | 1～1000 | Ω | - | The shutdown setting takes effect immediately | RW | Uint16 |
| P02.31 | 2002 | 20 | System parameter initialization | 0: No operation<br>1: Restore factory values (except P00/P01 group)<br>2: Clear fault records | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P02.32 | 2002 | 21 | Panel default display function | 0~99, corresponding to the PB group parameter number, setting bit 0 corresponds to speed monitoring, setting bit 13 corresponds to pulse monitoring | - | 50 | Run settings take effect immediately | RW | Uint16 |

## 8.2.3 2003 Group Object Dictionary (P03 Group Parameters)

| function code | index | subindex | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P03.00 | 2003 | 01 | DI function assignment effective at power on 1 | Set the hexadecimal code (0000~FFFF) corresponding to the DI function (FunIN.1~FunIN.16). After the control power is turned on again, the DI function will be effective immediately. | - | 0 | Run Settings Power on again | RW | Uint16 |
| P03.01 | 2003 | 02 | DI function assignment effective at power on 2 | Set the corresponding hexadecimal code (0000~FFFF) of the DI function (FunIN.17~FunIN.32). After the control power is turned on again, the DI function will be available immediately. effect. | - | 0 | Run Settings Power on again | RW | Uint16 |
| P03.02 | 2003 | 03 | DI0 terminal function selection | 0～39, Refer to Chapter 4.5.1 for instructions | - | 14 | Run settings | RW | Uint16 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Downtime takes effect | | |
| P03.03 | 2003 | 04 | DI0 Terminal logic selection | Input polarity: 0~4 0. Indicates low level is active<br>1. Indicates that high level is effective<br>2. Indicates that the rising edge is valid<br>3. Indicates that the falling edge is valid<br>4 Indicates that both rising and falling edges are valid | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| P03.04 | 2003 | 05 | DI1 Terminal function selection | 0～39, Refer to Chapter 4.5.1 for instructions | - | 15 | Operation setting shutdown takes effect | RW | Uint16 |
| P03.05 | 2003 | 06 | DI1 Terminal function selection | Refer to P03.03 instructions | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| P03.06 | 2003 | 07 | DI2 Terminal function selection | 0～39, Refer to Chapter 4.5.1 for instructions | - | 31 | Operation setting shutdown takes effect | RW | Uint16 |
| P03.07 | 2003 | 08 | DI2 Terminal function selection | Refer to P03.03 instructions | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| P03.08 | 2003 | 09 | DI3 Terminal function selection | 0～39, Refer to Chapter 4.5.1 for instructions | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| P03.09 | 2003 | 0A | DI3 Terminal function selection | Refer to P03.03 instructions | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| P03.10 | 2003 | 0B | DI4 Terminal function selection | 0～39, Refer to Chapter 4.5.1 for instructions | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| P03.11 | 2003 | 0C | DI4 Terminal function selection | Refer to P03.03 instructions | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| P03.34 | 2003 | 23 | DI function assignment effective at power-on 3 | Set the corresponding hexadecimal code (0000~FFFF) of the DI function (FunIN.33~FunIN.48). After the control power is turned on again, the DI function will be available immediately. effect. | - | 0 | Run Settings Power on again | RW | Uint16 |

## 8.2.4 2004 Group Object Dictionary (P04 Group Parameters)

| function code | index | subindex | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P04.00 | 2004 | 01 | DO0terminal function selection | 0～20, Refer to Chapter 5.4.2 | - | 1 | Operation setting shutdown takes effect | RW | Uint16 |
| P04.01 | 2004 | 02 | DO0terminal logic selection | Output polarity reversal setting: 0～1<br>0. Indicates that the output is low level when it is valid (the optocoupler is turned on)<br>1. Indicates that the output is high level when valid (optocoupler is turned off) | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| P04.02 | 2004 | 03 | DO1terminal function selection | 0～20, Refer to Chapter 5.4.2 | - | 5 | Operation setting shutdown takes effect | RW | Uint16 |
| P04.03 | 2004 | 04 | DO1terminal logic selection | Refer to P04.01 instructions | - | 0 | Operation setting shutdown takes effectOperation setting shutdown takes effect | RW | Uint16 |
| P04.04 | 2004 | 05 | DO2 terminal function selection | 0～20, Refer to Chapter 5.4.2 | - | 3 | Operation setting shutdown takes effect | RW | Uint16 |
| P04.05 | 2004 | 06 | DO2 terminal logic selection | Refer to P04.01 instructions | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| P04.22 | 2004 | 17 | DO source selection | Set whether the DO function logic selected by the hardware DO terminals (DO1~DO3) is determined by the actual status of the drive or communication settings. | - | 0 | Run settings take effect immediately | RW | Uint16 |

## 8.2.5 2005 Group Object Dictionary (P05 Group Parameters)

| function code | index | subindex | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P05.04 | 2005 | 05 | First-order low-pass filter time constant | 0～6553.5 | ms | 0.0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P05.06 | 2005 | 07 | Average filter time constant | 0.0～128.0 | ms | 0.0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P05.16 | 2005 | 11 | Clear position deviation action selection | 0～2 | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P05.17 | 2005 | 12 | Encoder frequency division pulse number | Set the number of pulses for one revolution of the motor. | Encoder unit | 2500 | Stop setting and power on again | RW | Uint16 |
| P05.19 | 2005 | 14 | Speed feed forward control selection | 0. No speed feedforward<br>1. Internal speed feed forward<br>2Use 60B1 as speed feed forward | - | 1 | The shutdown setting takes effect immediately | RW | Uint16 |

<table>
<tr><td>P05.31</td><td>2005</td><td>20</td><td>Return to origin mode</td><td><table><tr><td></td><td>direction</td><td>deceleration point</td><td>origin</td></tr><tr><td>0</td><td>forward</td><td>origin</td><td>origin</td></tr><tr><td>1</td><td>reverse</td><td>origin</td><td>origin</td></tr><tr><td>2</td><td>forward</td><td>Z signal</td><td>Z signal</td></tr><tr><td>3</td><td>reverse</td><td>Z signal</td><td>Z signal</td></tr><tr><td>4</td><td>forward</td><td>origin</td><td>Z signal</td></tr><tr><td>5</td><td>reverse</td><td>origin</td><td>Z signal</td></tr><tr><td>6</td><td>forward</td><td>Positive limit</td><td>Positive limit</td></tr><tr><td>7</td><td>reverse</td><td>Negative limit</td><td>Negative limit</td></tr><tr><td>8</td><td>forward</td><td>Positive limit</td><td>Z signal</td></tr><tr><td>9</td><td>reverse</td><td>Negative limit</td><td>Z signal</td></tr></table>Set the default motor rotation, deceleration point, and origin when returning to zero.</td><td>Encoder unit</td><td>0</td><td>The shutdown setting takes effect immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.35</td><td>2005</td><td>24</td><td>Limit the time to find the origin</td><td>0～65535</td><td>10ms</td><td>5000</td><td>Run settings take effect immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.44</td><td>2005</td><td>2D</td><td>Encoder multi-turn data offset</td><td>0～65535</td><td>Encoder unit</td><td>0</td><td>shutdown settings Effective immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.46</td><td>2005</td><td>2F</td><td>absolute position linear mode positionBias low 32-bit</td><td>-2147483648～2147483647</td><td>Encoder unit</td><td>0</td><td>shutdown settings Effective immediately</td><td>RW</td><td>Int32</td></tr>
<tr><td>P05.48</td><td>2005</td><td>31</td><td>absolute position linear mode positionBias low 32-bit</td><td>-2147483648～2147483647</td><td>Encoder unit</td><td>0</td><td>shutdown settings Effective immediately</td><td>RW</td><td>Int32</td></tr>
<tr><td>P05.50</td><td>2005</td><td>33</td><td>Absolute position rotation mode Mechanical gear ratio (numerator)</td><td>1～65535</td><td>-</td><td>1</td><td>shutdown settings Effective immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.51</td><td>2005</td><td>34</td><td>Absolute position rotation mode Mechanical gear ratio (denominator)</td><td>1～65535</td><td>-</td><td>1</td><td>shutdown settings Effective immediately</td><td>RW</td><td>Uint16</td></tr>
</table>

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P05.52 | 2005 | 35 | Absolute position rotation mode, rotation The number of pulses in one circle is the lower 32 bits | 0～2147483647 | Encoder unit | 0 | shutdown settings Effective immediately | RW | Uint32 |
| P05.54 | 2005 | 37 | Absolute position rotation mode, rotation The number of pulses in one circle is the lower 32 bits | 0～127 | Encoder unit | 0 | shutdown settings Effective immediately | RW | Uint32 |
| P05.61 | 2005 | 3E | Position arrival threshold unit selection | 0. Encoder unit<br>1. Command unit | - | 1 | shutdown settings Effective immediately | RW | Uint16 |

## 8.2.6 2006 Group Object Dictionary (P06 Group Parameters)

| function code | index | subindex | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P06.04 | 2006 | 05 | Jog speed setting value | 0～6000 | rpm | 100 | Run settings take effect immediately | RW | Uint16 |
| P06.11 | 2006 | 0C | Torque feedforward control selection | 1. 1. Internal torque feedforward<br>2. 2Use 60B2 as external torque feedforward | - | 1 | Run settings take effect immediately | RW | Uint16 |
| P06.15 | 2006 | 10 | Zero position fixed speed threshold | 0～6000; When the speed command amplitude is less than or equal to the 2006-10h setting value, the servo motor enters Zero position locked state | rpm | 10 | Run settings take effect immediately | RW | Uint16 |

## 8.2.7 2007 Group Object Dictionary (P07 Group Torque Control Parameters)

| function code | index | subindex | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P07.05 | 2007 | 06 | Torque command filter time constant | 0～30.00 | ms | 0.79 | Run settings take effect immediately | RW | Uint16 |
| P07.06 | 2007 | 07 | Second torque command filter time constant | 0～30.00 | ms | 0.79 | Run settings take effect immediately | RW | Uint16 |
| P07.07 | 2007 | 08 | Torque limit source | 0. Positive and negative internal torque limits1. Positive and negative external torque limits2.EtherCAT positive and negative external torque limits3. The minimum value of the positive and negative external torque and the positive and negative external torque limit of ETherCAT is the torque limit (P-CL, N-CL)4. Positive and negative internal torque and ETherCAT positive and negative external torqueSwitching between partial torque limit (P-CL, N-CL) | - | 2 | Run settings take effect immediately | RW | Uint16 |
| P07.09 | 2007 | 0A | Positive internal torque limit | 0.0～300.0 | % | 300.0 | Run settings take effect immediately | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P07.10 | 2007 | 0B | Negative internal torque limit | 0.0～300.0 | % | 300.0 | Run settings take effect immediately | RW | Uint16 |
| P07.11 | 2007 | 0C | Positive external torque limit | 0.0～300.0 | % | 300.0 | Run settings take effect immediately | RW | Uint16 |
| P07.12 | 2007 | 0D | Negative external torque limit | 0.0～300.0 | % | 300.0 | Run settings take effect immediately | RW | Uint16 |
| P07.15 | 2007 | 10 | emergency stop torque | 0.0～300.0 | % | 300.0 | Run settings take effect immediately | RW | Uint16 |
| P07.17 | 2007 | 12 | Speed limit source selection | 0: Internal speed limit<br>1: EtherCAT external speed limit<br>2: Select via FunIN.36<br>2007-14h/2007-15h as internal speed limit | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P07.19 | 2007 | 14 | Torque control forward speed limit /Torque control speed limit 1 | 0～6000 | rpm | 3000 | Run settings take effect immediately | RW | Uint16 |
| P07.20 | 2007 | 15 | Torque control negative speed limit/Torque control speed limit 2 | 0～6000 | rpm | 3000 | Run settings take effect immediately | RW | Uint16 |
| P07.21 | 2007 | 16 | Torque reaches reference value | 0.0～300.0 | % | 0.0 | Run settings take effect immediately | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P07.22 | 2007 | 17 | Torque reaches effective value | 0.0～300.0 | % | 20.0 | Run settings take effect immediately | RW | Uint16 |
| P07.23 | 2007 | 18 | Torque reaches invalid value | 0.0～300.0 | % | 10.0 | Run settings take effect immediately | RW | Uint16 |
| P07.40 | 2007 | 29 | Speed limited window in torque mode | 0.5～30.0 | ms | 1.0 | Run settings take effect immediately | RW | Uint16 |

## 8.2.8 2008 Group Object Dictionary (P08 Group Gain Parameters)

| function code | index | subindex | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P08.00 | 2008 | 01 | Speed loop gain | 0.1～2000.0 | Hz | 25.0 | Run settings take effect immediately | RW | Uint16 |
| P08.01 | 2008 | 02 | Speed loop integration time constant | 0.15～512.00 | ms | 31.83 | Run settings take effect immediately | RW | Uint16 |
| P08.02 | 2008 | 03 | Position loop gain | 0.0～2000.0 | Hz | 40.0 | Run settings take effect immediately | RW | Uint16 |
| P08.03 | 2008 | 04 | 2nd speed loop gain | 0.1～2000.0 | Hz | 40.0 | Run settings take effect immediately | RW | Uint16 |
| P08.04 | 2008 | 05 | 2nd speed loop integration time constant | 0.15～512.00 | ms | 40.00 | Run settings take effect immediately | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P08.05 | 2008 | 06 | 2nd position loop gain | 0.0～2000.0 | Hz | 64.0 | Run settings take effect immediately | RW | Uint16 |
| P08.08 | 2008 | 09 | 2nd gain mode setting | 0. The first gain is fixed, use external DI for P/PI switching<br>1 Use gain switching according to the condition setting of P08.09 | - | 1 | Run settings take effect immediately | RW | Uint16 |
| P08.09 | 2008 | 0A | Gain switching condition selection | 0.First gain fixed (PS)<br>1.Use external DI switching (PS)<br>2. Large torque command (PS)<br>3. Large speed command (PS)<br>4. Large change rate of speed command (PS)<br>5. Speed command high and low speed threshold (PS)<br>6. Large position deviation (P)<br>7.With position command (P)<br>8. Positioning completed (P)<br>9.High actual speed (P)<br>10. With position command + actual speed (P) | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P08.10 | 2008 | 0B | Gain switching delay time | 0.0～1000.0 | ms | 5.0 | Run settings take effect immediately | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P08.11 | 2008 | 0C | Gain switching level | 0～20000 | According to switching conditions  | 50 | Run settings take effect immediately | RW | Uint16 |
| P08.12 | 2008 | 0D | Gain switching time lag | 0～20000 | According to switching conditions  | 30 | Run settings take effect immediately | RW | Uint16 |
| P08.13 | 2008 | 0E | Position gain switching time | 0.0～1000.0 | ms | 3.0 | Run settings take effect immediately | RW | Uint16 |
| P08.15 | 2008 | 10 | Load inertia ratio | 0.00～120.00 | 倍 | 1.00 | Run settings take effect immediately | RW | Uint16 |
| P08.18 | 2008 | 13 | Speed feedforward filter time constant | 0.00～64.00 | ms | 0.50 | Run settings take effect immediately | RW | Uint16 |
| P08.19 | 2008 | 14 | Speed feedforward gain | 0.0～100.0 | % | 0.0 | Run settings take effect immediately | RW | Uint16 |
| P08.20 | 2008 | 15 | Torque feedforward filter time constant | 0.00～64.00 | ms | 0.50 | Run settings take effect immediately | RW | Uint16 |
| P08.21 | 2008 | 16 | Torque feedforward gain | 0.0～200.0 | % | 0.0 | Run settings take effect immediately | RW | Uint16 |
| P08.22 | 2008 | 17 | Speed feedback filtering options | 0. Disable speed feedback average filtering1. Speed feedback 2 times average filtering2. Speed feedback 4 times average filtering3. Speed feedback 8 times average filtering4 Speed feedback 16 times average filtering | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P08.23 | 2008 | 18 | Speed feedback low-pass filter cutoff frequency | 100～4000 | Hz | 4000 | Run settings take effect immediately | RW | Uint16 |
| P08.24 | 2008 | 19 | Pseudo-differential | 0.0～100.0 | - | 100.0 | Run settings take | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | feedforward control coefficient | | | | effect immediately | | |

## 8.2.9 2009 Group Object Dictionary (P09 Group Self-tuning Parameters)

| function code | index | sub index | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P09.00 | 2009 | 01 | Self-adjusting mode selection | 0. Parameter self-adjustment is invalid, manually adjust the gain parameters;<br>1. Parameter self-adjusting mode, using the rigidity table to automatically adjust the gain parameters;<br>2. Positioning mode, use the rigidity table to automatically adjust the gain parameters;<br>3. Parameter self-adjusting mode with friction compensation;<br>4. Positioning mode with friction compensation | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P09.01 | 2009 | 02 | Group 1 rigidity level selection | 0～31 | - | 12 | Run settings take effect immediately | RW | Uint16 |
| P09.02 | 2009 | 03 | Adaptive notch mode selection | 0. The adaptive notch filter is no longer updated<br>1. Adaptive notches are effective (the third group of notches)<br>2.2 adaptive notches are effective (3rd and 4th set of notches)<br>3. Only test the resonance point, which is displayed in P09.24<br>4 Restore the values of the 3rd and 4th groups of notches to factory settings | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P09.03 | 2009 | 04 | Online inertia identification mode | 0. Turn off online inertia identification<br>1. Turn on online inertia identification and change slowly<br>2. Turn on online inertia identification, general changes<br>3 Turn on online inertia identification and change quickly | | | | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P09.04 | 2009 | 05 | Low frequency resonance suppression mode selection | 0. Manually set vibration frequency<br>1. Automatically identify vibration frequency | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P09.05 | 2009 | 06 | Offline inertia identification mode selection | 0. Positive and negative triangle wave mode<br>1.JOG jog mode | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P09.06 | 2009 | 07 | Inertia identification maximum speed | 100～1000 | rpm | 500 | The shutdown setting takes effect immediately | RW | Uint16 |
| P09.07 | 2009 | 08 | Accelerate to the maximum during inertia identification speed time constant | 20～800 | ms | 125 | The shutdown setting takes effect immediately | RW | Uint16 |
| P09.08 | 2009 | 09 | Waiting time after completion of single inertia identification | 50～10000 | ms | 800 | The shutdown setting takes effect immediately | RW | Uint16 |
| P09.09 | 2009 | 0A | Complete single inertia identification of motor Number of turns | 0.00～2.00 | r | - | - | RO | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P09.12 | 2009 | 0D | Group 1 notch frequency | 50～4000 | Hz | 4000 | Run settings take effect immediately | RW | Uint16 |
| P09.13 | 2009 | 0E | Group 1 Notch Width Class | 0～20 | - | 2 | Run settings take effect immediately | RW | Uint16 |
| P09.14 | 2009 | 0F | Group 1 Notch Depth Rating | 0～99 | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P09.15 | 2009 | 10 | Group 2 notch frequency | 50～4000 | Hz | 4000 | Run settings take effect immediately | RW | Uint16 |
| P09.16 | 2009 | 11 | Group 2 Notch Width Class | 0～20 | - | 2 | Run settings take effect immediately | RW | Uint16 |
| P09.17 | 2009 | 12 | Group 2 Notch Depth Rating | 0～99 | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P09.18 | 2009 | 13 | Group 3 notch frequency | 50～4000 | Hz | 4000 | Run settings take effect immediately | RW | Uint16 |
| P09.19 | 2009 | 14 | Group 3 Notch Width Class | 0～20 | - | 2 | Run settings take effect immediately | RW | Uint16 |
| P09.20 | 2009 | 15 | Group 3 Notch Depth Rating | 0～99 | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P09.21 | 2009 | 16 | Group 4 notch frequency | 50～4000 | Hz | 4000 | Run settings take effect immediately | RW | Uint16 |
| P09.22 | 2009 | 17 | Group 4 Notch Width Class | 0～20 | - | 2 | Run settings take effect immediately | RW | Uint16 |
| P09.23 | 2009 | 18 | Group 4 Notch Depth Rating | 0～99 | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P09.24 | 2009 | 19 | Resonance frequency identification results | 0～2 | Hz | 0 | - | RO | Uint16 |
| P09.30 | 2009 | 1F | Torque disturbance compensation gain | 0.0～100.0 | % | 0.0 | Run settings take effect immediately | RW | Uint16 |
| P09.31 | 2009 | 20 | Torque disturbance observer filter time constant | 0.00～25.00 | ms | 0.50 | Run settings take effect immediately | RW | Uint16 |
| P09.38 | 2009 | 27 | low frequency resonance frequency | 1.0～100.0 | Hz | 100.0 | Run settings take effect immediately | RW | Uint16 |
| P09.39 | 2009 | 28 | Low frequency resonance frequency filter setting | 0～10 | - | 2 | Run settings take effect immediately | RW | Uint16 |

## 8.2.10 200A group object dictionary (P0A group fault and protection parameters)

| function code | index | sub index | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P0A.00 | 200A | 01 | Power input phase loss protection selection | 0. Enable fault prohibition warning<br>1. Enable faults and warnings<br>2. Disable faults and warnings | - | 0 | Run settings take effect immediately | RW | Uint 16 |
| P0A.01 | 200A | 02 | Absolute position limit settings | 0. Disable absolute position limit<br>1. Enable absolute position limit<br>2. Enable absolute position limit after origin return | - | 0 | The shutdown setting takes effect immediately | RW | Uint 16 |
| P0A.03 | 200A | 04 | Power-off save function enable selection | 0.Do not perform power-off save<br>1. Execute power-off save | - | 0 | Run settings take effect immediately | RW | Uint 16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P0A.04 | 200A | 05 | Motor overload protection gain | 50～300 | % | 100 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0A.08 | 200A | 09 | Overspeed fault threshold | 0：Max speed ×1.2;<br>1～10000：200A-09h～Max speed×1.2; | rpm | 0 | Run settings take effect immediately | RW | Uint16 |
| P0A.12 | 200A | 0D | Overrun protection function enabled | 0. No speed protection<br>1. Turn on speed protection | - | 1 | Run settings take effect immediately | RW | Uint16 |
| P0A.16 | 200A | 11 | Judgment of low frequency resonance position deviation threshold | 1～1000 | Encoder unit | 5 | Run settings take effect immediately | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P0A.25 | 200A | 1A | Speed Feedback display value filter time constant | 0～5000 | ms | 50 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0A.26 | 200A | 1B | Motor overload shield enable | 0. Open motor overload detection<br>1. Shield motor overload warning and fault detection | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0A.27 | 200A | 1C | Speed DO filter time constant | 0～5000 | ms | 10 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0A.28 | 200A | 1D | Quadrature encoder filter time constant | 0～255 | 25ns | 30 | shutdown settings Power on again | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P0A.32 | 200A | 21 | Locked rotor over-temperature protection time window | 10～65535 | ms | 200 | Run settings take effect immediately | RW | Uint16 |
| P0A.33 | 200A | 22 | Stalled rotor over-temperature protection enabled | 0. Shield motor stalled rotation over-temperature protection detection<br>1 Enable motor stall over-temperature protection detection | - | 1 | Run settings take effect immediately | RW | Uint16 |
| P0A.36 | 200A | 25 | Encoder multi-turn overflow fault selection | 0. No shielding<br>1. Shield | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |

## 8.2.11 200B group object dictionary (P0B group monitoring parameters)

**For specific parameters, please refer to Chapter 5.1.6**

## 8.2.12 200C group object dictionary (P0C group communication parameters)

| function code | index | subindex | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P0C.00 | 200C | 01 | drive address | 1～247 | - | 1 | Run settings take effect immediately | RW | Uint16 |
| P0C.02 | 200C | 03 | Serial port baud rate setting | 0.2400 Kbp/s<br>1.4800 Kbp/s<br>2.9600 Kbp/s<br>3.19200 Kbp/s<br>4.38400 Kbp/s<br>5.57600 Kbp/s | - | 5 | Run settings take effect immediately | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P0C.03 | 200C | 04 | MODBUS data format | 0. No parity, 2 end bits<br>1. Even parity, 1 end bit<br>2. Odd parity, 1 end bit<br>3. No parity, 1 end bit | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P0C.04 | 200C | 05 | Site name corrected | For the master station whose station number is automatically assigned, the station number assigned to the slave station when using EtherCAT communication is displayed. | - | - | - | RO | Uint16 |
| P0C.05 | 200C | 06 | site alias | For a master station that cannot automatically assign a station number, when using EtherCAT communication, set the slave station number through this object. | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0C.13 | 200C | 0E | Whether the communication write function code value is updated to EEPROM | 0.Do not save<br>1.2000h series object dictionary is written and stored in EEPROM after communication<br>2.6000h series object dictionary is written and stored in EEPROM after communication<br>3. The object dictionary of 2000h series and 6000h series is written and stored in EEPROM after communication. | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P0C.35 | 200C | 24 | EtherCAT sync interrupt lost Disallowed times | 4～20 | 1ms | 9 | Run settings take effect immediately | RW | Uint16 |
| P0C.36 | 200C | 25 | Port0 port CRC check error | 0～65535 | W | 0 | - | RO | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P0C.37 | 200C | 26 | Port1 port CRC check error error | 0～65535 | W | 0 | - | RO | Uint16 |
| P0C.38 | 200C | 27 | Port 0, 1 data forwarding error | 0～65535 | W | 0 | - | RO | Uint16 |
| P0C.39 | 200C | 28 | Processing unit and PDI errors | 0～65535 | W | 0 | - | RO | Uint16 |
| P0C.40 | 200C | 29 | Port 0, 1 link lost | 0～65535 | W | 0 | - | RO | Uint16 |
| P0C.42 | 200C | 2B | Synchronization error monitoring mode setting | 0～1 | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0C.43 | 200C | 2C | Sync mode settings | 0: The driver working sequence is asynchronous with the host computer synchronization clock. 1: Suitable for the host computer synchronization performance indicators to meet In the case of lus jitter (standard performance index of EtherCAT master station). 2: Suitable for host computer synchronization performance indicators exceeding In the case of lus jitter (standard performance indicator of EtherCAT master station) | - | 2 | The shutdown setting takes effect immediately | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P0C.44 | 200C | 2D | Synchronization error threshold | 0～2000: Used to set the jitter range of the synchronization signal allowed when the driver works in synchronization 1 mode (200C-2Ch=1). | 1nm | 500 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0C.45 | 200C | 2E | Location cache settings | 0: Disable location caching<br>1: Enable location cache | - | 1 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0C.46 | 200C | 2F | CSP position command increment excessive threshold | 1～7; the counting threshold when the position command increment exceeds the maximum position command increment | - | 3 | Run settings take effect immediately | RW | Uint16 |
| P0C.47 | 200C | 30 | CSP position command increment too large times | 0~65535; the count value when the position command increment exceeds the maximum position command increment threshold | - | 0 | - | RO | Uint16 |

## 8.2.13 200D group object dictionary (P0D group auxiliary function parameters)

| function code | index | sub index | Name | Predetermined area | Unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|---|
| P0D.00 | 200D | 01 | software reset | 0. No operation<br>1. Enable | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0D.01 | 200D | 02 | Fault reset | 0. No operation<br>1. Enable | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |
| P0D.02 | 200D | 03 | Offline inertia identification function | - | - | - | Run settings take effect immediately | RW | Uint16 |
| P0D.03 | 200D | 04 | Initial angle recognition | 1. Enable | - | - | - | RW | Uint16 |
| P0D.05 | 200D | 06 | Emergency shutdown | 0. No operation<br>1. Enable emergency shutdown | - | 0 | Run settings take effect immediately | RW | Uint16 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P0D.11 | 200D | 0C | JOG trial operation function | (comes with filter) | - | - | - | RW | Uint16 |
| P0D.17 | 200D | 12 | DIDO forced input and output enable | 0.No operation<br>1. Force DI to be enabled and force DO to be disabled.<br>2. Force DO to enable, force DI to disable<br>3. Force DIDO to be enabled<br>4. EtherCAT control forces DO to be enabled and forces DI to disable. | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P0D.18 | 200D | 13 | DI forced input given | 0～0x01FF | - | 0x01FF | Run settings take effect immediately | RW | Uint16 |
| P0D.19 | 200D | 14 | DO forces output given | 0～0x001F | - | 0 | Run settings take effect immediately | RW | Uint16 |
| P0D.20 | 200D | 15 | Absolute encoder reset enable | 0.No operation<br>1.Reset fault<br>2. Reset fault and multi-turn data | - | 0 | The shutdown setting takes effect immediately | RW | Uint16 |

## 8.3 6000 Group of object dictionary parameters

| object dictionary | subindex | Name | scope | unit | Factory set up | Setting takes effect | Attributes | Type |
|---|---|---|---|---|---|---|---|---|
| 603F | 00 | error code | 0～65535 | - | 0 | - | RO | Uint16 |
| 6040 | 00 | control word | 0～65535 | - | 0 | Operation setting shutdown takes effect | RW | Uint16 |
| 6041 | 00 | status word | 0～xFFFF | - | 0 | - | RO | Uint16 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 605A | 00 | Quick shutdown mode selection choose | 0～7; Refer to Appendix 1 | - | 2 | Operation setting shutdown takes effect | RW | INT16 |
| 605D | 00 | Temporary shutdown method selection | 1～3; Refer to Appendix 1 | - | 1 | Operation setting shutdown takes effect | RW | INT16 |
| 6060 | 00 | Servo mode selection | 0～10; Refer to section 7.2.1 | - | 0 | Operation setting shutdown takes effect | RW | INT8 |
| 6061 | 00 | Run mode display | 0～10 | - | 0 | - | RO | INT8 |
| 6062 | 00 | position command | - | command unit | - | - | RO | Dint32 |
| 6063 | 00 | position feedback | - | Encoder unit | - | - | RO | Dint32 |
| 6064 | 00 | position feedback | - | command unit | - | - | RO | Dint32 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6065 | 00 | Position deviation excessive threshold | 0～2147483647 | command unit | 1048576 | Operation setting shutdown takes effect | RW | UDint32 |
| 6067 | 00 | Position reaches threshold | 0～2147483647 | Encoder unit | 734 | Operation setting shutdown takes effect | RW | UINT32 |
| 6068 | 00 | Location arrival window time | 0～65535 | ms | 16 | Operation setting shutdown takes effect | RW | UINT16 |
| 606C | 00 | actual speed | - | command unit/S | - | - | RO | INT32 |
| 606D | 00 | speed reaches threshold | 0～65535 | rpm | 10 | Operation setting shutdown takes effect | RW | UINT16 |
| 606E | 00 | Speed arrival window time | 0～65535 | ms | 0 | Operation setting shutdown takes effect | RW | UINT16 |
| 6071 | 00 | target torque | -4000～4000 | 0.1% | 0 | Operation setting shutdown takes effect | RW | UINT16 |
| 6072 | 00 | Maximum torque command | 0～4000 | 0.1% | 5000 | Operation setting shutdown takes effect | RW | UINT16 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6074 | 00 | Torque command | -5000～5000 | 0.1% | 0 | - | RO | INT16 |
| 6077 | 00 | actual torque | -5000～5000 | 0.1% | 0 | - | RO | INT16 |
| 607A | 00 | target location | -2147483648～2147483647 | command unit | 0 | Operation setting shutdown takes effect | RW | INT32 |
| 607C | 00 | Origin offset | -2147483648～2147483647 | command unit | 0 | Operation setting shutdown takes effect | RW | INT32 |
| 607D | 01 | Minimum location limit | -2147483648～2147483647 | user bit setting unit | $-2^{31}$ | Operation setting shutdown takes effect | RW | INT32 |
| 607D | 02 | Maximum location limit | -2147483648～2147483647 | user bit setting unit | $2^{31}$ | Operation setting shutdown takes effect | RW | INT32 |
| 607E | 00 | Command polarity | Set the polarity of position command, speed command and torque command. Bit0~Bit4: Undefined; Bit5: Torque command polarity; Bit6: Speed command polarity; Bit7: Position command polarity; ON: Negate the command. | - | 0 | Operation setting shutdown takes effect | RW | UINT8 |
| 607F | 00 | Maximum speed | 0～2147483647 | command unit/S | 104857600 | Operation setting shutdown takes effect | RW | UINT32 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6081 | 00 | Contour running speed | 0～2147483647 | User speed unit | 0 | Operation setting shutdown takes effect | RW | UINT32 |
| 6083 | 00 | Profile acceleration | 0～2147483647 | command unit/$S^2$ | 100000 | Operation setting shutdown takes effect | RW | UINT32 |
| 6084 | 00 | Profile deceleration | 0～2147483647 | command unit/$S^2$ | 100000 | Operation setting shutdown takes effect | RW | UINT32 |
| 6085 | 00 | Emergency stop deceleration | 0～2147483647 | command unit/$S^2$ | 100000 | Operation setting shutdown takes effect | RW | UINT32 |
| 6086 | 00 | Operating curve selection | 0-Linear | - | 0 | - | RW | INT16 |
| 6087 | 00 | Torque ramp | 0～2147483647 | 0.1%/S | $2^{32}$-1 | Operation setting shutdown takes effect | RW | UINT32 |
| 6091 | 01 | Motor resolution | 1～2147483647 | - | 1 | Run settings take effect immediately | RW | UINT32 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6091 | 02 | Axis resolution | 1～2147483647 | - | 1 | Run settings take effect immediately | RW | UINT32 |
| 6098 | 00 | Zero return method | 1～35; Refer to Appendix 2 for return to zero mode. | - | 0 | Operation setting shutdown takes effect | RW | INT8 |
| 6099 | 01 | Return to Zero Expressway | 0～2147483647 | command unit/S | 131072 | Operation setting shutdown takes effect | RW | UINT32 |
| 6099 | 02 | Return to zero low speed | 10～2147483647) | command unit/S | 13107 | Operation setting shutdown takes effect | RW | INT32 |
| 609A | 00 | Return to zero acceleration | 0～2147483647 | command unit/$S^2$ | 100000 | Operation setting shutdown takes effect | RW | DUINT32 |
| 60B0 | 00 | position offset | -2147483648～2147483647 | command unit | 0 | Operation setting shutdown takes effect | RW | INT32 |
| 60B1 | 00 | speed bias | -2147483648～2147483647 | command unit/S | 0 | Operation setting shutdown takes effect | RW | INT32 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 60B2 | 00 | Torque bias | -5000～5000 | 0.1% | 0 | Operation setting shutdown takes effect | RW | INT16 |
| 60B8 | 00 | probe mode | 0～65535 | - | 0 | Operation setting shutdown takes effect | RW | UINT16 |
| 60B9 | 00 | Probe status | 0～65535 | - | 0 | - | RO | UINT16 |
| 60BA | 00 | Probe 1 rising edge position value | -2147483648～2147483647 | command unit | 0 | - | RO | INT32 |
| 60BB | 00 | Probe 1 falling edge position value | -2147483648～2147483647 | command unit | 0 | - | RO | INT32 |
| 60BC | 00 | Probe 2 rising edge position value | -2147483648～2147483647 | command unit | 0 | - | RO | INT32 |
| 60BD | 00 | Probe 2 falling edge position value | -2147483648～2147483647 | command unit | 0 | - | RO | INT32 |
| 60E0 | 00 | Forward torque limit | 0～5000 | 0.1% | 5000 | Operation setting shutdown takes effect | RW | UINT16 |
| 60E1 | 00 | Reverse torque limit | 0～5000 | 0.1% | 5000 | Operation setting shutdown takes effect | RW | UINT16 |
| 60E3 | 01～1F | Supported zero return method 1~Supported zero return method 31 | bit0~bit7: The lower 8 bits are used to display the supported zero return method. Bit8: Whether to support relative position zero return<br>Bit9: Whether to support absolute position zero return | - | - | - | RO | UINT16 |
| 60E6 | 00 | Actual position calculation method | 0: Absolute position return to zero. After the origin return is completed, position feedback 6064 is set to origin offset 607Ch;<br>1: Relative position return to zero. After the origin return is completed, the position feedback 6064 will superimpose the position offset 607Ch on the original basis. | - | 0 | Operation setting shutdown takes effect | RW | UINT8 |
| 60F4 | 00 | position deviation | Display position deviation | command unit | - | - | RO | DINT32 |

<table>
<tr><td>60FC</td><td>00</td><td>position command</td><td>Position command 60FC (encoder unit) = position command 6062 (command unit) × electronic gear ratio (6091)</td><td>Encoder unit</td><td>-</td><td>-</td><td>RO</td><td>DINT32</td></tr>
<tr><td>60FD</td><td>00</td><td>DI state</td><td><table><tr><th>Bit</th><th>2</th></tr><tr><td>0</td><td>Reverse overtravel switch</td></tr><tr><td>1</td><td>Forward overtravel switch</td></tr><tr><td>2</td><td>Origin switch</td></tr><tr><td>16</td><td>Z Signal</td></tr><tr><td>17</td><td>probe 1</td></tr><tr><td>18</td><td>probe 2</td></tr><tr><td>20</td><td>DI0</td></tr><tr><td>21</td><td>DI1</td></tr><tr><td>22</td><td>DI2</td></tr><tr><td>23</td><td>DI3</td></tr><tr><td>24</td><td>DI4</td></tr></table></td><td>-</td><td>0</td><td>-</td><td>RO</td><td>DINT32</td></tr>
<tr><td>60FE</td><td>01</td><td>physical output</td><td rowspan="2">Bit0 of 60FE-01h: brake output; when 200D-12h=4, the DO output is controlled by the bits of 60FE-01h and 60FE-02h:<br><table><tr><td></td><td>60FE-01h</td><td>60FE-02h</td></tr><tr><td>DO0</td><td>Bit16</td><td>Bit16</td></tr><tr><td>DO1</td><td>Bit17</td><td>Bit17</td></tr><tr><td>DO2</td><td>Bit18</td><td>Bit18</td></tr></table></td><td>-</td><td>0</td><td>Operation setting shutdown takes effect</td><td>RW</td><td>UINT32</td></tr>
<tr><td>60FE</td><td>02</td><td>Physical output enable</td><td>-</td><td>0</td><td>Operation setting shutdown takes effect</td><td>RW</td><td>UINT32</td></tr>
<tr><td>60FF</td><td>00</td><td>target speed</td><td>-2147483648～2147483647</td><td>command unit/S</td><td>0</td><td>Operation setting shutdown takes effect</td><td>RW</td><td>INT32</td></tr>
</table>

# Chapter 9 Troubleshooting

## 9.1 Fault and warning code table

### 9.1.1 Fault code table (to reset the fault, you need to cancel the enable first)

| Display | Error code (603Fh) | Warning name | Reset | Warning phenomena and treatment methods |
|---|---|---|---|---|
| Er.101 | 0x6320 | P02 and above group parameter abnormality | no | 1. If the function code parameter value of group P02 and subsequent groups exceeds the upper and lower limits, re-initialize the parameters;<br>2. If the power is lost during the process of writing parameters, the parameters will be rewritten after powering on;<br>3. Reset the motor model and driver model, and initialize the parameters;<br>4. The drive EEPROM is abnormal, replace the drive. |
| Er.102 | 0x7500 | Programmable logic configuration failure | no | MCU related hardware is damaged, replace the driver. |
| Er.104 | 0x7500 | Programmable logic interrupt fault | no | MCU related hardware is damaged, replace the driver |
| Er.105 | 0x6320 | Internal program exception | no | 1. When EEPROM reads/writes function codes, the total number of function codes is abnormal and the parameters are initialized;<br>2. The range of the function code setting value is abnormal, and the parameters are initialized;<br>3. Initialize and power on again. If the alarm still occurs, replace the driver. |
| Er.108 | 0x5530 | Parameter storage failure | no | 1. Unable to write parameter values to EEPROM and initialize parameters;<br>2. Initialize and power on again. If the alarm still occurs, replace the driver. |
| Er.111 | 0x6320 | Internal failure | no | Initialize and power on again. If the alarm still occurs, replace the driver. |
| Er.120 | 0x7122 | Product matching failure | no | The motor model and driver model match incorrectly. Please contact after-sales personnel to check the motor model. |
| Er.121 | 0x5441 | Servo ON command invalid fault | yes | DI port parameter configuration failure, recheck the DI function and VDI function configuration |
| Er.122 | 0x7122 | Absolute position mode product matching failure | no | The absolute value motor model does not match, or the motor model is set incorrectly. Please contact after-sales personnel to check the motor model. |
| Er.130 | 0x6320 | DI function duplicate assignment | yes | DI port parameter configuration failure, recheck the DI function and VDI function configuration or initialization parameters. |
| Er.131 | 0x6320 | DO function allocation exceeded | yes | The DO function number exceeds the number of DO functions. Recheck the DO function configuration or initialization parameters. |
| Er.136 | 0x7305 | The data in the motor ROM is checked incorrectly or the parameters are not stored. | no | When the driver reads the parameters in the encoder ROM area, it finds that the parameters are not stored, or the parameters are inconsistent with the agreed values.<br>1. Check the motor model and driver model;<br>2. Check whether the motor encoder line is correct and check whether the connector is reliably connected; |

| | | | | |
|---|---|---|---|---|
| | | | | 3. Check whether the encoder line receives interference and rewire it. |
| Er.201 | 0x2312 | Overcurrent 2 | no | Hardware detects overcurrent;<br>1. Check whether the motor power wire U V W is connected correctly and whether there is any reverse connection or phase loss;<br>2. There is a short circuit in the U V W wire, or there is leakage in the connection between the motor coil and the shell. Replace the motor wire or test the motor;<br>3. Caused by poor contact of the encoder wire, check or replace the encoder wire;<br>4. The load is too heavy, first test the motor without load to see if it is normal;<br>5. The acceleration and deceleration are too fast, increase the acceleration and deceleration time of the program;<br>6. If the gain parameters have been adjusted, check whether the gain is set too high, reduce the gain and then test;<br>7. If the braking resistor is too small or short-circuited, use the internal braking resistor to test first;<br>8. The drive is damaged, replace the drive; |
| Er.207 | 0x0FFF | D/Q axis current overflow fault | yes | Abnormal current feedback causes the internal register of the driver to overflow. Replace the driver; |
| Er.208 | 0x0FFF | System sampling operation timed out | no | 1. MCU communication timeout, replace the driver<br>2. Encoder communication times out, check whether the encoder cable is connected properly, or replace the encoder and reconnect it;<br>3. The motor encoder is faulty, replace the motor and test;<br>4. The current sampling times out, check whether there is any interference from large equipment on site, add an isolation transformer, and re-wiring;<br>5. When the high-precision AD conversion times out, check the analog input wiring to see if there is any interference, and connect it with a shielded wire;<br>6. The drive is damaged, replace the drive; |
| Er.210 | 0x2330 | Output short circuit to ground | no | During the power-on self-test of the driver, an abnormality in the motor phase current or bus voltage was detected.<br>1. The power line U V W is short-circuited to the ground, check the motor line;<br>2. The motor coil is short-circuited to the casing, replace the motor;<br>3. The drive fails. Replace the drive. |
| Er.220 | 0x0FFF | Phase sequence error | no | The driver performs angle identification and finds that the phase sequence of the driver UVW and the motor UVW does not match.<br>1. The electrical angle of the motor encoder does not match, reset the motor parameters and perform self-learning;<br>2. The U V W phase sequence is reversed, so check the motor power line; |
| Er.234 | 0x0FFF | Motor stalls | no | In the torque control mode, the direction of the torque command is opposite to the direction of the speed feedback; or in the position or speed control mode, the direction of the speed feedback is opposite to the speed command;<br>1. The U V W phase sequence is reversed, so check the motor power line;<br>2. Interference signals cause the initial phase detection of the motor rotor to be incorrect. Power on again and check the wiring;<br>3. The encoder model is wrong or the wiring is wrong. Replace the motor or encoder wire;<br>4. Driver failure, replace the driver; |

| | | | | |
|---|---|---|---|---|
| Er.400 | 0x3210 | Main circuit electrical overvoltage | yes | DC bus voltage exceeds fault value 420V<br>1. Measure the power supply voltage. If the grid voltage is too high or unstable, a voltage regulator needs to be added;<br>2. The braking resistor fails. When the power is completely cut off, measure the resistance between driver B1 and B3. If it is infinite, the internal braking resistor is damaged and the driver needs to be replaced;<br>3. The resistance of the braking resistor is too large. Replace it with a 40 ohm or 50 ohm braking resistor. Please contact after-sales personnel;<br>4. The grid voltage is high, and the motor accelerates and decelerates too fast, increase the acceleration and deceleration time;<br>5. Monitor P0B-26 to see if the bus voltage matches the grid voltage. If the difference is too large, the driver may be damaged and the driver needs to be replaced. The corresponding bus voltage of 220V AC is 310V. |
| Er.410 | 0x3220 | Main circuit electrical undervoltage | yes | The DC bus voltage is 200V lower than the fault value<br>1. The main circuit power supply is unstable or loses power. Recheck the wiring or add a voltage regulator;<br>2. Monitor P0B-26 to see if the bus voltage matches the grid voltage. If the difference is too large, the driver may be damaged and the driver needs to be replaced. The corresponding bus voltage of 220V AC is 310V. |
| Er.420 | 0x3130 | Main circuit electrical phase loss | yes | The servo drive is faulty, replace the drive. |
| Er.430 | 0x3120 | Control voltage undervoltage | yes | The servo drive is faulty, replace the drive. |
| Er.500 | 0x8400 | speed alarm | yes | The actual speed of the servo motor exceeds the overspeed fault threshold<br>1. The U V W phase sequence of the motor cable is wrong, check the motor wiring;<br>2. The motor parameters are incorrect. Reset the motor parameters and perform self-learning;<br>3. The input command exceeds the overspeed fault threshold;<br>4. The motor speed is overshooting and the gain parameter setting is unreasonable. Test after initializing the driver parameters;<br>5. Driver failure, replace the driver. |
| Er.510 | 0x0FFF | Pulse output too fast | yes | The output pulse frequency exceeds the frequency upper limit allowed by the hardware<br>Reduce P05-17 (encoder frequency division pulse number) so that the output pulse frequency is less than the allowed frequency upper limit。 |
| Er.602 | 0x0FFF | Angle recognition failed | yes | The motor self-learning fails. Check whether the encoder cable is normal and whether the encoder type is correct. |
| Er.610 | 0x3230 | Drive overload | yes | 1. The motor model or driver model is set incorrectly. Please contact after-sales personnel to check the parameters;<br>2. Monitor the drive load rate PB-02 to see if overload causes an alarm;<br>3. If the motor is stalled, first rule out the motor stall condition before testing, or remove the motor and test without load;<br>4. The gain parameter setting is too large, test after initializing the parameters;<br>5. The motor accelerates and decelerates too fast, increase the acceleration and deceleration time;<br>6. The motor cable U V W phase sequence is wrong, check the motor wiring;<br>7. The drive is damaged, replace the drive. |
| Er.620 | 0x3230 | Motor overload | yes | |

| | | | | |
|---|---|---|---|---|
| Er.630 | 0x7121 | Motor stalled and overheated | yes | The actual motor speed is lower than 10rpm, but the torque command reaches the limit value and the duration reaches the P0A-32 setting value.<br>1. The UVW output of the driver is missing phase, disconnected, or the phase sequence is incorrectly connected;<br>2. The motor parameters are incorrect. Reset the motor parameters and perform self-learning;<br>3. If the motor is stalled, first rule out the motor stall condition before testing, or remove the motor and test without load; |
| Er.650 | 0x4210 | Radiator overheated | yes | The temperature of the drive power module is higher than the over-temperature protection point. The servo drive is faulty. Replace the drive. |
| Er.731 | 0x7305 | Encoder battery failure | yes | The encoder battery voltage of the absolute encoder is lower than 3.0V,<br>1. If the encoder line is disconnected, set P0D-20=2, then set P0D-01=1 to clear the fault;<br>2. The battery is dead, replace the battery. |
| Er.733 | 0x7305 | Encoder multiturn count error | yes | Initialize driver parameters, reset motor parameters and driver parameters, set encoder type,<br>Then set P0D-20=2 and P0D-01=1 to clear the fault and power on again. If the alarm still occurs, replace the motor and test。 |
| Er.735 | 0x7305 | Encoder multi-turn count overflow | yes | Initialize driver parameters, reset motor parameters and driver parameters, set encoder type,<br>Then set P0D-20=2 and P0D-01=1 to clear the fault and power on again. If the alarm still occurs, replace the motor and test。 |
| Er.740 | 0x7305 | Encoder interference | no | The encoder Z signal is interfered, causing the electrical angle corresponding to the Z signal to change too large.<br>1. The encoder wiring is wrong or the connector is loose. Check or replace the encoder wire and then test;<br>2. The encoder Z signal is interfered, rewiring and ensure good grounding;<br>3. Encoder failure, replace the motor; |
| Er.A33 | 0x7305 | Encoder data abnormality | no | Encoder internal parameter abnormality<br>1. The serial encoder cable is disconnected or loose. Check or replace the encoder cable for testing;<br>2. Encoder failure, replace the motor. |
| Er.A34 | 0x7305 | Encoder feedback verification exception | no | 1. The driver and motor types do not match, reset the motor model;<br>2. The encoder cable is disconnected, check the encoder cable. |
| Er.A35 | 0x7305 | Z signal lost | no | Encoder Z signal is lost or AB signal edges jump at the same time<br>1. The serial encoder cable is disconnected or loose. Check or replace the encoder cable for testing;<br>2. Encoder failure, replace the motor. |
| Er.B00 | 0x8611 | Position deviation is too large | yes | In position control mode, the position deviation is greater than the P0A-10 setting value<br>1. The driver U V W output phase is missing or the phase sequence is wrongly connected, check the motor wire;<br>2. If the motor is stalled, first rule out the motor stall condition before testing, or remove the motor and test without load;<br>3. The gain of the servo driver is low, so test after initializing the parameters;<br>4. The position command increment is too large;<br>5. Whether the position deviation fault value 6065h is set too small;<br>6. The torque limit value is set too small, test after initializing the parameters;<br>7. Servo driver/motor failure, replace the driver or motor. |

| | | | | |
|---|---|---|---|---|
| Er.B01 | 0x0FFF | Position command too large | yes | 1. Is the position deviation fault value 6065h set too small?<br>2. Before mode switching or when servo is enabled, the target position (607A target position) is not aligned with the current position;<br>3. Synchronization cycle phase crossover leads to excessive position command accumulation;<br>4. Motor speed limit error; |
| Er.B03 | 0x6320 | Electronic gear ratio setting exceeds limit | yes | 1. The gear ratio 6091-01h/6091-02h exceeds the limit value;<br>2. Parameter change order problem; |
| Er.D09 | 0x6320 | Software position upper and lower limit setting error | yes | The software position upper and lower limit settings are wrong, check 0x607D-01h and 0x607D-02h |
| Er.D10 | 0x6320 | Origin offset setting error | yes | The origin offset is outside the upper and lower limits of the software position, check 0x607D-01h, 0x607D-02h, 0x607Ch |
| Er.E07 | 0x0FFF | Abnormal network status switching | yes | Check whether the network port is normal and whether the communication line is normal; |
| Er.E08 | 0x0FFF | Sync lost | yes | 1. The slave station receives abnormally, check whether the network port is normal and whether the communication line is normal;<br>2. The master station sends abnormally, and the upper computer synchronization clock error is too large. You can try increasing 200E-21h; |
| Er.E11 | 0x0FFF | XML configuration file not burned | yes | 1. The device configuration file is not burned;<br>2. Drive failure; |
| Er.E12 | 0x0E12 | Network initialization failed | yes | 1. The device configuration file is not burned;<br>2. Drive failure; |
| Er.E13 | 0x0E13 | Synchronization cycle setting error | yes | Check whether the synchronization period is 125us or an integer multiple of 250us |
| Er.E15 | 0x0E15 | Synchronization cycle error is too large | yes | 1.XML files do not match;<br>2. The controller synchronization cycle error is large; |

## 9.1.2 Warning code table (warnings can be reset directly without canceling the enable)

| Display | Error code (603Fh) | Warning name | Reset | Warning phenomena and treatment methods |
|---|---|---|---|---|
| Er.110 | 0x6320 | Frequency division pulse output setting failure | yes | The number of encoder frequency-divided pulses does not meet the range, reset the encoder frequency-divided pulse number (2005-12h); |
| Er.601 | 0x0FFF | Failed to return to origin | yes | 1. Origin switch failure;<br>2. The time limit for searching the origin is too short;<br>3. The speed of high-speed search for origin switch signal is too small;<br>4. The switch setting is unreasonable; |
| Er.730 | 0x7305 | Encoder battery warning | yes | The encoder battery voltage of the absolute encoder is lower than 3.0V. Replace the battery with a new one with matching voltage while the power is on. |
| Er.900 | 0x5442 | DI emergency brake | yes | The corresponding DI terminal of DI function 34 (FunIN.34: Brake, Emergency) is triggered (including hardware DI and virtual DI), check the DI wiring. |

| | | | | |
|---|---|---|---|---|
| Er.909 | 0x3230 | Motor overload warning | yes | The load rate is too high, causing a warning. Check whether the load is too heavy or blocked. |
| Er.920 | 0x3210 | Braking resistor overload | yes | Warning of excessive braking resistor current,<br>1. If the bus voltage is too high, causing energy to be discharged too quickly, a warning will appear. Add a voltage regulator to reduce the voltage;<br>2. Whether the motor decelerates too fast, increase the deceleration time;<br>3. The internal braking resistor has insufficient power. Replace the external braking resistor. It is recommended that the resistance value should not be lower than 40 ohms;<br>4. When using an external resistor, check the parameter values of P02-25 ~ P2-27, and set the value of P2-27 to be consistent with the resistance value of the selected resistor;<br>4. The driver braking circuit is damaged, replace the driver; |
| Er.922 | 0x6320 | External braking resistor is too small | yes | P02-27 (resistance value of external braking resistor) is smaller than P02-21 (minimum value of external braking resistor allowed by the driver) |
| Er.939 | 0x3331 | Motor power line is broken | yes | The actual phase current of the motor is less than 10% of the rated current, and the actual speed is small, but the internal torque command is large. Check the motor power cable wiring, rewire it, and replace the cable if necessary. |
| Er.941 | 0x6320 | Parameter changes need to be powered on again to take effect. | yes | When the function code attribute "validity time" of the servo drive is "power on again", after the function code parameter value is changed, the drive reminds the user that he needs to power on again. |
| Er.942 | 0x7600 | Parameters are stored frequently | yes | If the number of function codes modified at the same time exceeds 200, check the operating mode. For parameters that do not need to be stored in EEPROM, set P0C-13 to 0 before the host computer writes the operation. |
| Er.950 | 0x5443 | Forward overtravel warning | yes | The corresponding DI terminal of DI function 14 (FunIN.14: P-OT, forward overtravel switch) is triggered. |
| Er.952 | 0x5444 | Reverse overtravel warning | yes | The corresponding DI terminal of DI function 15 (FunIN.15: N-OT, reverse overtravel switch) is triggered. |
| Er.980 | 0x7305 | Encoder internal fault | yes | If a fault still occurs after turning on the power several times, the encoder is faulty. |
| Er.990 | 0x3130 | Input phase loss warning | yes | Driver power supply circuit failure; |
| Er.998 | 0x0FFF | Zero return mode setting error | yes | When using the zero return mode, 6098h inputs non-existent zero return modes such as 15/16/31/32. |
| Er.A40 | 0x0FFF | Internal failure | yes | Motor self-learning failed,<br>1. Check the motor encoder line error;<br>2. The encoder model is incorrect. Reset the motor model and encoder type;<br>3. The motor encoder is faulty, replace the motor. |

# Appendix 1 Shutdown method

<table>
<tr><th>Object dictionary</th><th>Subindex</th><th>Name</th><th>Scope</th><th>Unite</th><th>Factory settings</th><th>Setting takes effect</th><th>Attributes</th><th>type</th></tr>
<tr><td>605A</td><td>00</td><td>Quick Shut Down Mode Selection</td><td>PP model：
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>0</td><td>Free stop and maintain free running status</td></tr>
<tr><td>1</td><td>Stop at 6084h ramp and maintain free running status</td></tr>
<tr><td>2</td><td>Stop at 6085h ramp and maintain free running status</td></tr>
<tr><td>3</td><td>Stop with 2007-10h emergency stop torque and maintain free running state</td></tr>
<tr><td>5</td><td>Stop at 6084h ramp and maintain position locked state</td></tr>
<tr><td>6</td><td>Stop at 6085h ramp and maintain position locked state</td></tr>
<tr><td>7</td><td>Stop with 2007-10h emergency stop torque and maintain position locked state</td></tr>
</table>
CSP model：
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>0</td><td>Free stop and maintain free running status</td></tr>
<tr><td>1</td><td rowspan="3">Stop with 2007-10h emergency stop torque and maintain free running state</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
<tr><td>5</td><td rowspan="3">Stop with 2007-10h emergency stop torque and maintain position locked state</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
</table>
CSV/PV/HM model：
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>0</td><td>Free stop and maintain free running status</td></tr>
<tr><td>1</td><td>Stop at 6084h (HM: 609Ah) ramp and maintain free running status</td></tr>
<tr><td>2</td><td>Stop at 6085h ramp and maintain free running status</td></tr>
<tr><td>3</td><td>Emergency stop torque to stop and maintain free running state</td></tr>
<tr><td>5</td><td>Stop at 6084h (HM: 609Ah) slope and maintain position locked state</td></tr>
<tr><td>6</td><td>Stop at 6085h ramp and maintain position locked state</td></tr>
<tr><td>7</td><td>Stop with 2007-10h emergency stop torque and maintain position locked state</td></tr>
</table>
CST/PT model:
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>0</td><td>Free stop and maintain free running status</td></tr>
<tr><td>1</td><td rowspan="2">Stop at 6087h ramp and maintain free running status</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Free stop and maintain free running status</td></tr>
<tr><td>5</td><td rowspan="2">Stop at 6087h ramp and maintain position locked state</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td><td>Coast to stop and maintain position lock state</td></tr>
</table></td><td>-</td><td>2</td><td>Run settings<br><br>Downtime takes effect</td><td>RW</td><td>INT16</td></tr>
</table>

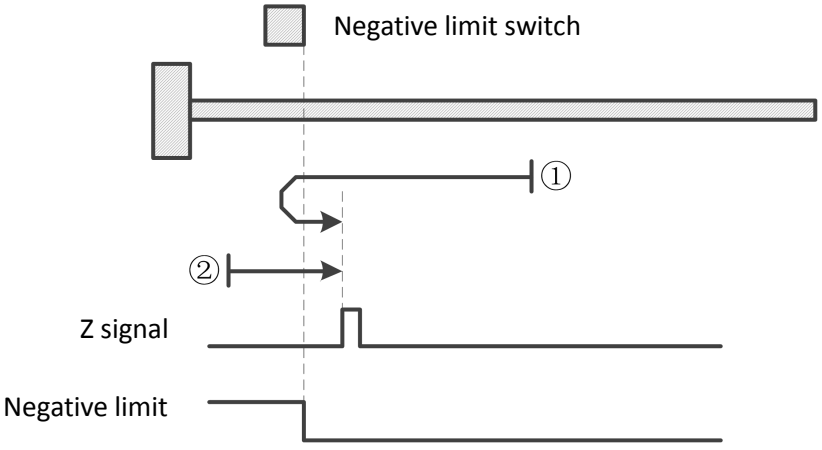
<table>
<tr>
<td>605D</td>
<td>00</td>
<td>Temporary Shutdown Method selection</td>
<td>
PP model:
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>1</td><td>Stop at 6084h ramp and maintain free running status</td></tr>
<tr><td>2</td><td>Stop at 6085h ramp and maintain free running status</td></tr>
<tr><td>3</td><td>Stop with 2007-10h emergency stop torque and maintain free running state</td></tr>
</table>
CSP model
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>1</td><td rowspan="3">Stop with 2007-10h emergency stop torque and maintain free running state</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
</table>
CSV/PV/HM model
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>1</td><td>Stop at 6084h (HM: 609Ah) ramp and maintain free running status</td></tr>
<tr><td>2</td><td>Stop at 6085h ramp and maintain free running status</td></tr>
<tr><td>3</td><td>Emergency stop torque to stop and maintain free running state</td></tr>
</table>
CST/PT model
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>1</td><td rowspan="2">Stop at 6087h ramp and maintain free running status</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Free stop and maintain free running status</td></tr>
</table>
</td>
<td>-</td>
<td>1</td>
<td>Run settings Downtime Takes effect</td>
<td>RW</td>
<td>INT16</td>
</tr>
</table>

# Appendix 2 Servo zero return method

**6098=1: Reference negative limit and return-to-origin mode of Z-phase signal**

Situation 1: The negative limit is invalid when starting to return to zero, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the negative limit, the motor decelerates and runs in the positive direction at low speed. When encountering the negative limit, it decreases. The position of the first Z pulse after the edge is the origin position.

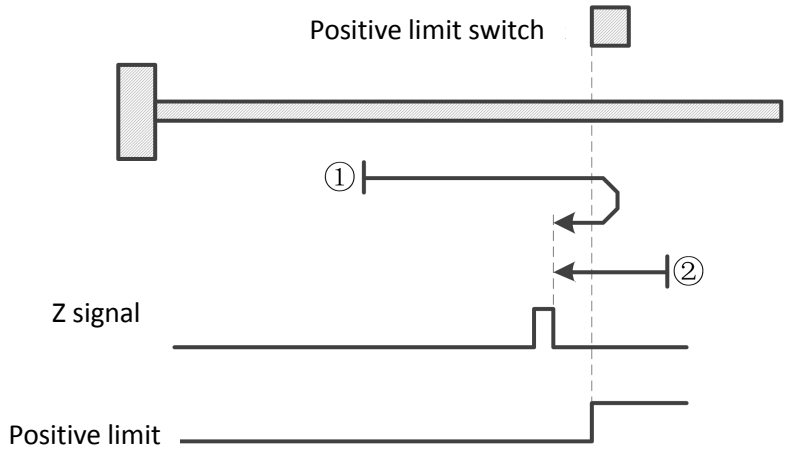
Situation 2: The negative limit is valid when starting to return to zero, and the axis begins to return to zero in the positive direction at low speed. When encountering the negative limit falling edge, the position of the first Z pulse is the origin position.



**6098=2: Reference positive limit and Z-phase signal return-to-origin mode**

Situation 1: The positive limit is invalid when starting to return to zero, and the axis begins to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at low speed. When encountering the positive limit The position of the first Z pulse after the falling edge is the origin position.

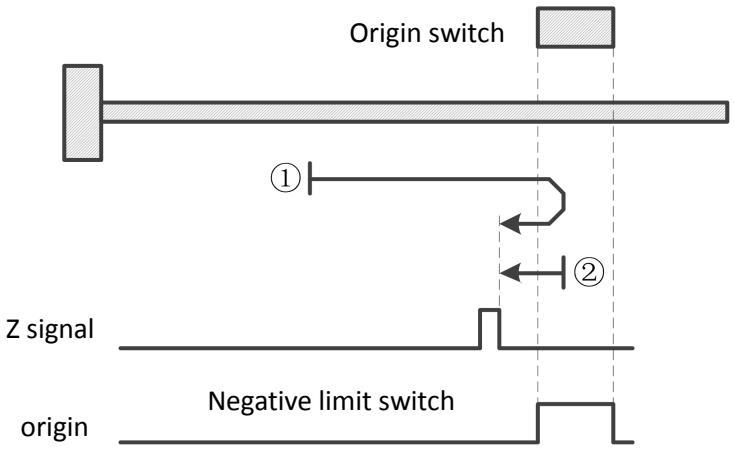
Scenario 2: The positive limit is valid when starting to return to zero, and the axis begins to return to zero in the negative direction at a low speed. When encountering the falling edge of the positive limit, the position of the firs Negative limit igin position.




**6098=3: Reference origin switch and forward return-to-origin mode of Z-phase signal**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis begins to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When encountering the falling edge of the origin, the motor The position of one Z pulse is the origin position.

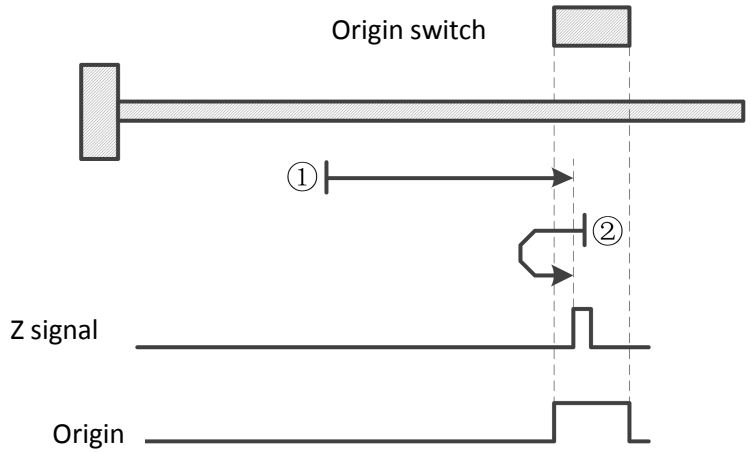
Situation 2: When the zero return is started, the origin signal is valid, and the axis begins to return to zero in the negative direction at a low speed. When it encounters the falling edge of the origin, the position of the first Z pulse is the origin position.




**6098=4: Reference origin switch and forward return-to-origin mode of Z-phase signal**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis begins to return to zero in the positive direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. The position when encountering the first Z pulse is the origin position.

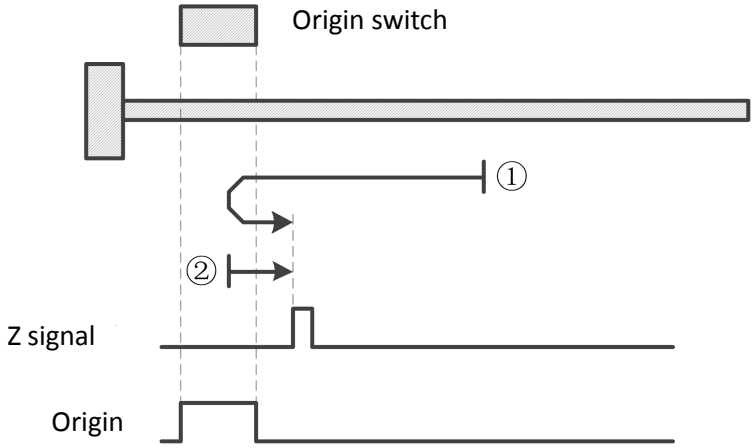
Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When it encounters the falling edge of the origin, it decelerates and runs in the positive direction at a low speed. When it encounters the first rising edge of the origin, The position of the Z pulse is the origin position.




**6098=5: Negative return-to-origin mode of reference origin switch and Z-phase signal**

Situation 1: When the zero return is started, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the positive direction at low speed. When encountering the falling edge of the origin, the motor The position of one Z pulse is the origin position.

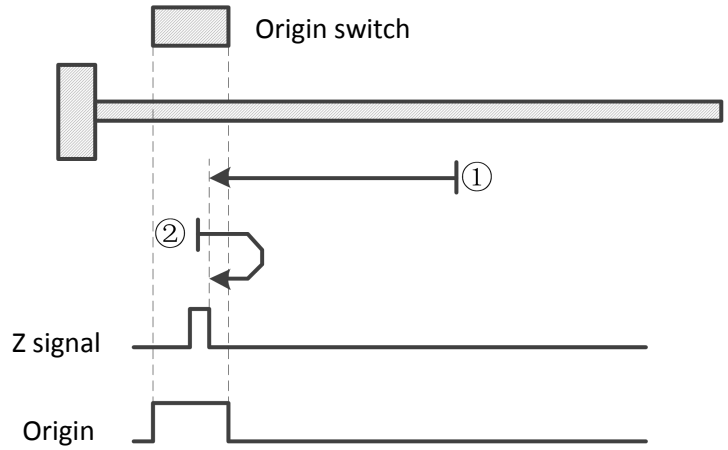
Situation 2: When the zero return is started, the origin signal is valid, and the axis begins to return to zero at a low speed in the positive direction. The position of the first Z pulse after encountering the falling edge of the origin is the origin position.




**6098=6: Negative return-to-origin mode of reference origin switch and Z-phase signal**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis begins to return to zero in the negative direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. The position when encountering the first Z pulse is the origin position.

Situation 2: When starting the zero return, the origin signal is valid. The axis starts to return to zero at a low speed in the positive direction. When it encounters the falling edge of the origin, it decelerates and runs in the negative direction at a low speed. When it encounters the first Z after the origin signal The position of the pulse is the origin position.

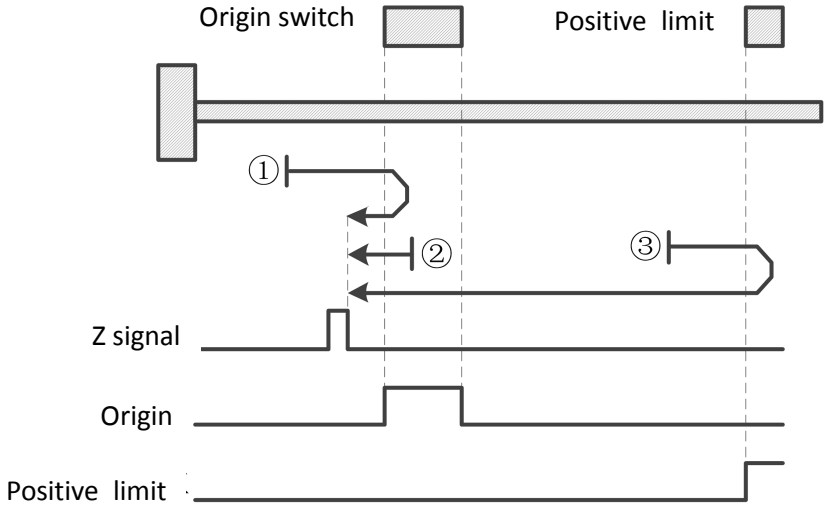



**6098=7: Reference origin switch, positive limit and Z-phase signal return-to-origin mode 1**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis begins to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When encountering the falling edge of the origin, the motor The position of one Z pulse is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis begins to return to zero in the negative direction at a low speed. When it encounters the falling edge of the origin, the position of the first Z pulse is the origin position.

Situation 3: When the zero return is started, the origin signal is invalid, and the axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin, , the motor starts to decelerate and run at low speed. When encountering the falling edge of the origin, the position of the first Z pulse is the origin position.



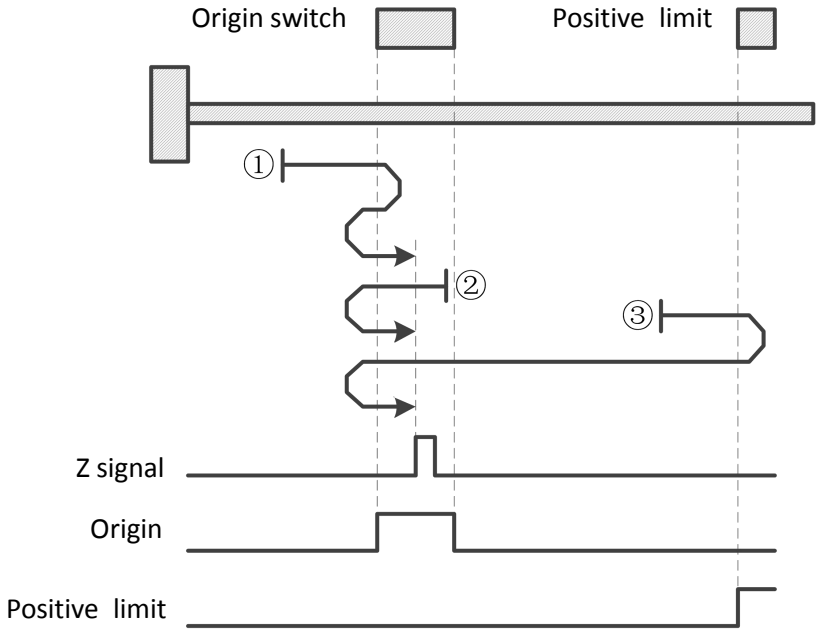

**6098=8: Reference origin switch, positive limit and return-to-origin mode 2 of Z-phase signal**

Situation 1: When the zero return is started, the origin signal is invalid, and the axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, it decelerates again. Reverse direction, and then run in the forward direction at low speed. When encountering the rising edge of the origin, the position to the first Z pulse is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When it encounters the falling edge of the origin, it decelerates and runs in the positive direction at a low speed. When it encounters the first rising edge of the origin, The position of the Z pulse is the origin position.

Situation 3: When the zero return is started, the origin signal is invalid, and the axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin, , the motor starts to run at low speed. When it encounters the falling edge of the origin, the motor

decelerates and reverses and runs toward the square at low speed. When it encounters the rising edge of the origin, the position of the first Z pulse is the origin position.

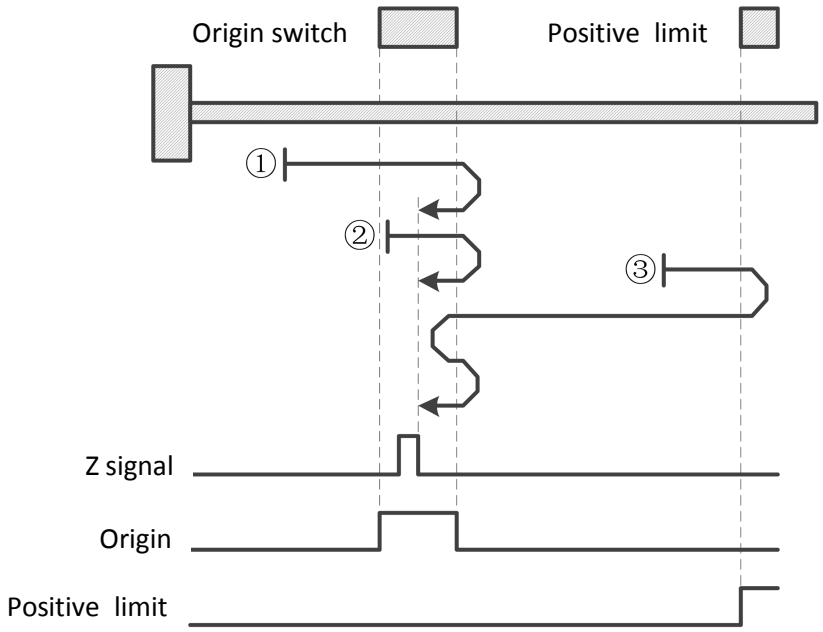



**6098=9: Reference origin switch, positive limit and return-to-origin mode 3 of Z-phase signal**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero in the forward direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs forward at low speed. After encountering the falling edge of the origin, the motor reverses and runs at low speed. Running in the negative direction, the position of the first Z pulse after encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return starts, the origin signal is valid, and the axis starts to return to zero at a low speed in the positive direction. When encountering the falling edge of the origin, the motor decelerates and runs in the negative direction at low speed. After encountering the first rising edge of the origin, The position of the first Z pulse is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. After encountering the rising edge of the origin, the motor The deceleration reverse direction moves in the forward direction at a low speed. After encountering the falling edge of the origin, it reverses and then moves in the negative direction at a low speed. The position of the first Z pulse after encountering the rising edge of the origin is the origin position.

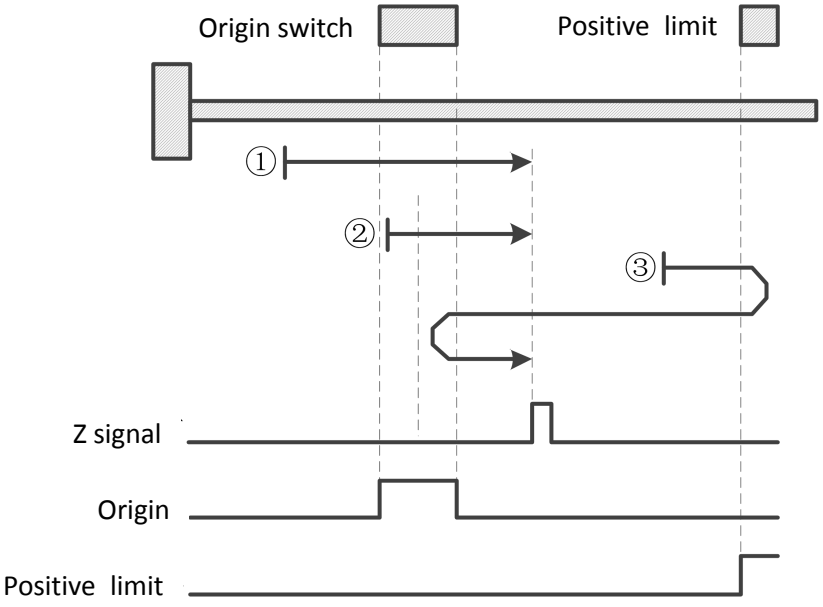



**6098=10: Reference origin switch, positive limit and Z-phase signal return-to-origin mode 4**

Situation 1: The origin signal is invalid when starting the zero return. The axis starts to return to zero in the forward direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the first Z pulse The position is the origin position.

Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero at a low speed in the forward direction. The position of the first Z pulse when encountering the falling edge of the origin is the origin position.

Situation 3: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the positive direction at high speed. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin opening, When , the motor decelerates and runs in the forward direction at low speed. When it encounters the falling edge of the origin, the position of the first Z pulse is the origin position.

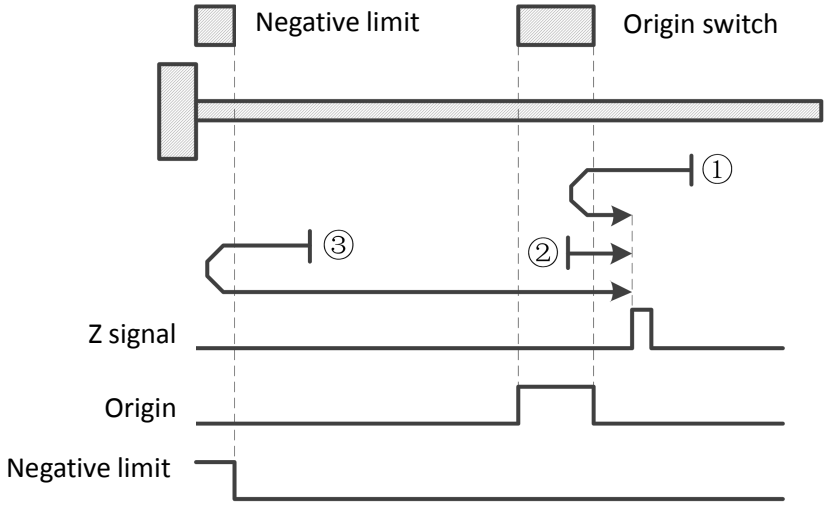


**6098=11: Reference origin switch, negative limit and Z-phase signal return-to-origin mode 1**

Situation 1: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the forward direction at low speed. When encountering the falling edge of the origin, the motor The position of one Z pulse is the origin position.

Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero at a low speed in the forward direction. The position of the first Z pulse after encountering the falling edge of the origin is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the position of the first Z pulse is the origin position.

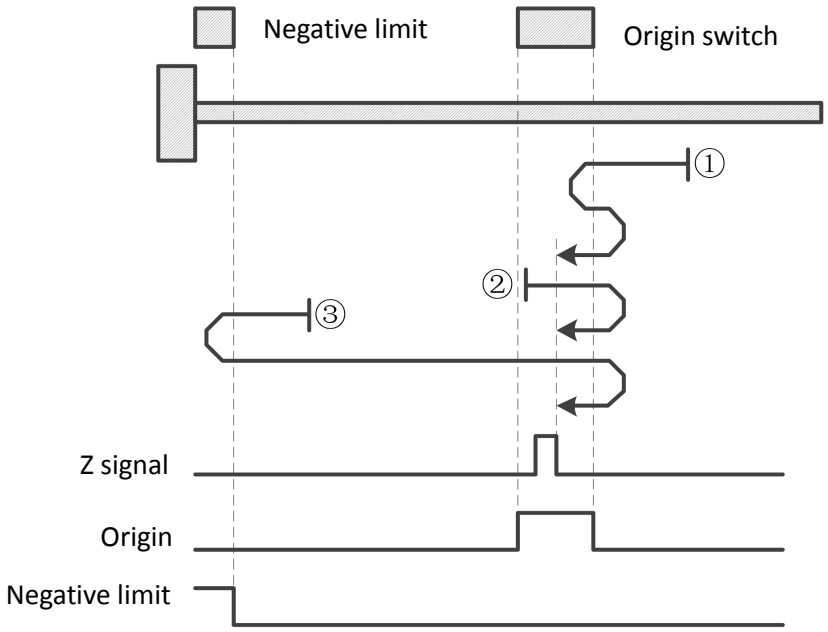



**6098=12: Reference origin switch, negative limit and return-to-origin mode 2 of Z-phase signal**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the forward direction at low speed. When encountering the falling edge of the origin, the motor The deceleration reverse direction runs in the negative direction at low speed. When encountering the rising edge of the origin, the position of the first Z pulse is the origin position.

Situation 2: When starting the zero return, the origin signal is valid, and the axis starts to return to zero at a low speed in the positive direction. When encountering the falling edge of the origin, the motor decelerates and runs in the negative direction at a low speed. When it encounters the rising edge of the origin, the The position of one Z pulse is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the negative limit, the motor decelerates and moves in the positive direction at high speed. When encountering the rising edge of the origin, , the motor decelerates and runs at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the negative direction at low speed. When it encounters the rising edge of the origin, the position of the first Z pulse is the origin position.

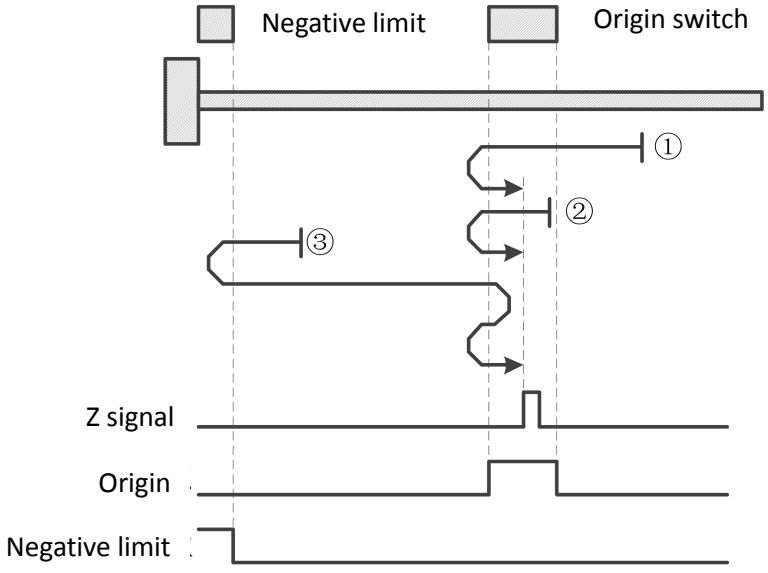



**6098=13: Reference origin switch, negative limit and return-to-origin mode 3 of Z-phase signal**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the motor decelerates and reverses to low speed. Running in the forward direction, the position of the first Z pulse after encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return starts, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When encountering the falling edge of the origin, the motor decelerates and runs in the forward direction at low speed. When it encounters the rising edge of the origin, the The position of one Z pulse is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the forward direction at low speed. When it encounters the rising edge of the origin, the position of the first Z pulse is the origin position.



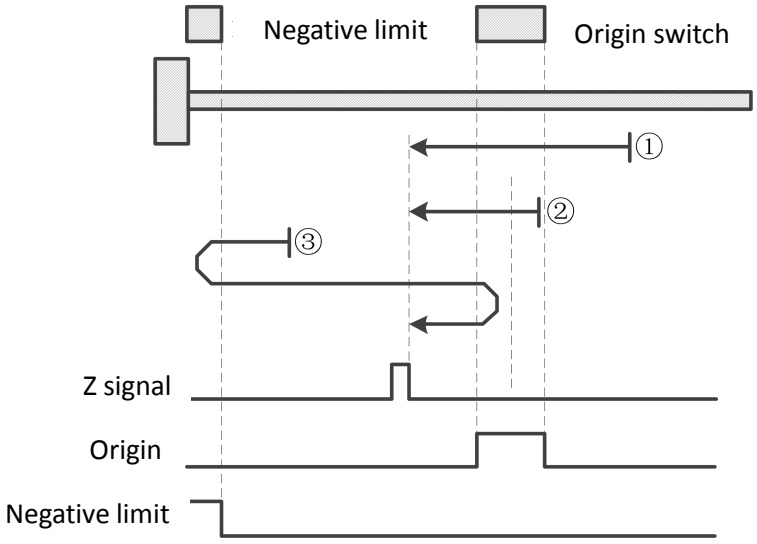

**6098=14: Reference origin switch, negative limit and return-to-origin mode 4 of Z-phase signal**

Situation 1: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the negative direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at

low speed. When encountering the falling edge of the origin, the first Z pulse The position is the origin position.

Situation 2: When the origin signal is valid when the zero return is started, the axis starts to return to zero at a low speed in the negative direction. The position of the first Z pulse after encountering the falling edge of the origin is the origin position.

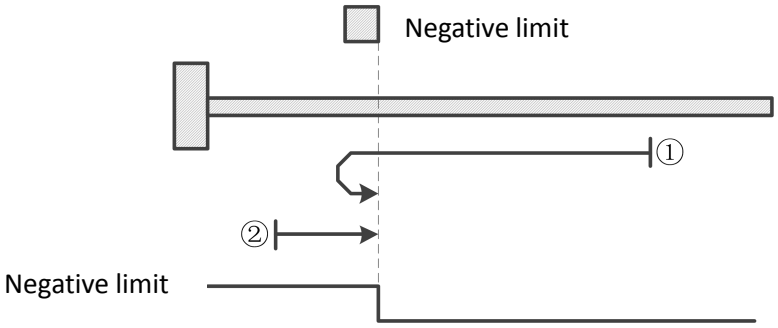
Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the position of the first Z pulse is the origin position.




**6098=17: Reference negative limit return-to-origin mode**

Situation 1: The negative limit signal is invalid when starting to return to zero. The axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the negative limit, the motor decelerates and runs in the forward direction. When encountering the falling edge of the negative limit, the motor decelerates and runs in the forward direction. The position at time is the origin position.

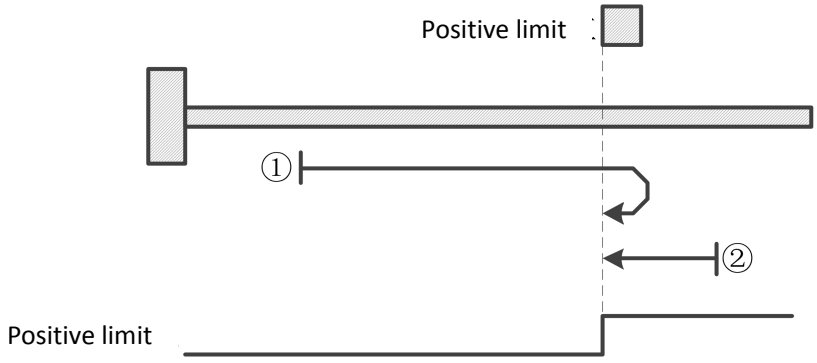
Situation 2: When starting the zero return, the negative limit signal is valid, and the axis starts to return to zero at a low speed in the positive direction. The position when it encounters the negative limit falling edge is the origin position.




**6098=18: Reference positive limit return-to-origin mode**

Situation 1: The positive limit signal is invalid when starting to return to zero. The axis starts to return to zero in the positive direction at high speed. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction. When encountering the falling edge of the positive limit, the motor decelerates and runs in the negative direction. The position at time is the origin position.

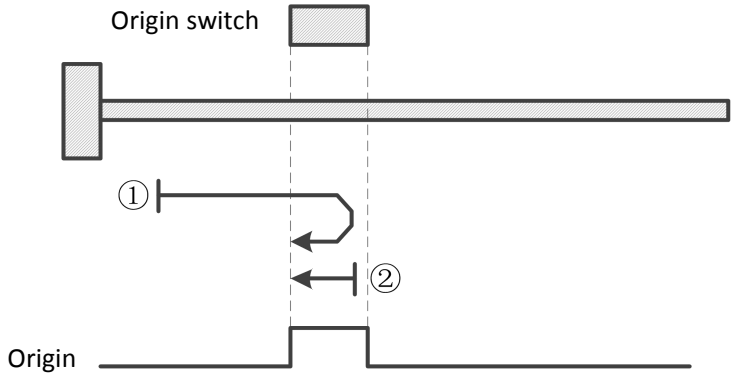
Situation 2: When starting the zero return, the positive limit signal is valid, and the axis starts to return to zero in the negative direction at low speed. The position when it encounters the falling edge of the positive limit is the origin position.




**6098=19: Reference origin switch return-to-origin mode 1**

Situation 1: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the positive direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction. The position when encountering the falling edge of the origin is the origin position. .

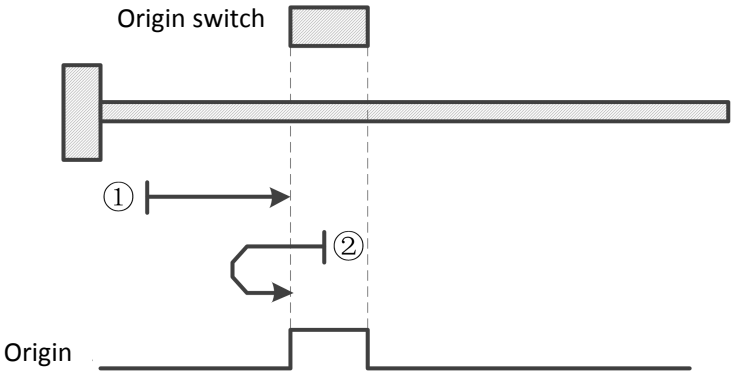
Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero at a low speed in the negative direction. The position when it encounters the falling edge of the origin is the origin position.




**6098=20: Reference origin switch return-to-origin mode 2**

Situation 1: The origin signal is invalid when the zero return is started. The axis starts to return to zero at a low speed in the forward direction. The position when it encounters the rising edge of the origin is the origin position.

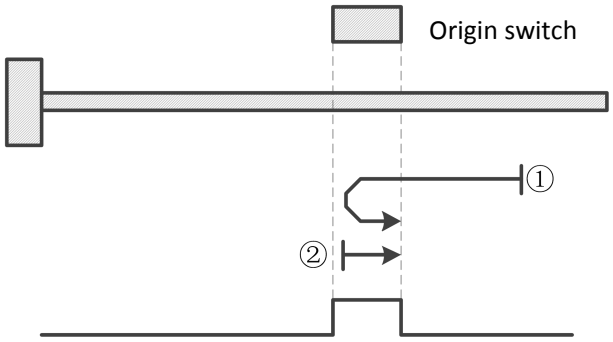
Situation 2: When the origin signal is valid when the zero return is started, the axis starts to return to zero at a low speed in the negative direction. When encountering the falling edge of the origin, the motor decelerates and runs in the forward direction. When it encounters the rising edge of the origin, the position is the origin position.



**6098=21: Return to origin mode of reference origin switch**

Situation 1: The origin signal is invalid when the zero return is started. The axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the origin, the motor decelerates and runs in the forward direction. When it encounters the falling edge of the origin, the position is the origin position. .

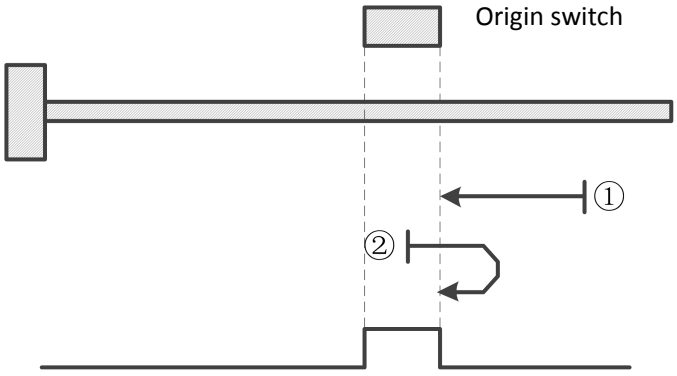
Situation 2: When the origin signal is valid when the zero return is started, the axis starts to return to zero at a low speed in the forward direction. The position when it encounters the falling edge of the origin is the origin position.




**6098=22: Reference origin switch return-to-origin mode**

Scenario 1: The origin signal is invalid when the zero return is started. The axis starts to return to zero at a low speed in the negative direction. The position when it encounters the rising edge of the origin is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the positive direction. When it encounters the falling edge of the origin, the motor decelerates and runs in the negative direction. When it encounters the rising edge of the origin, the position is the origin position.

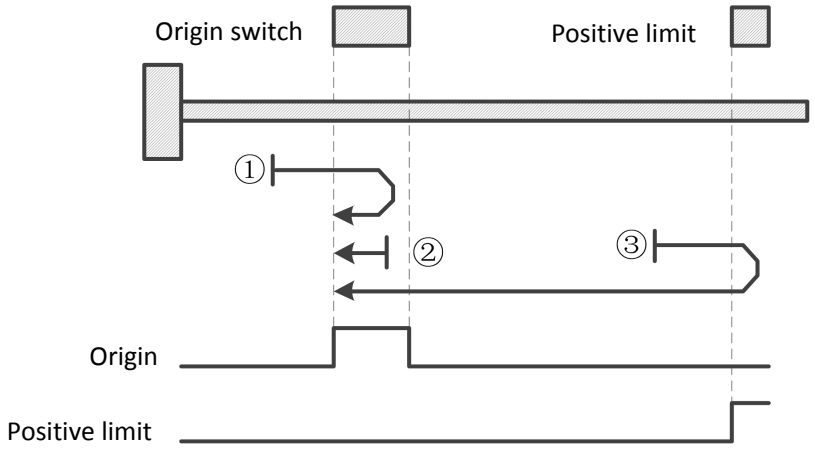



**6098=23: Reference origin switch and positive limit return-to-origin mode**

Situation 1: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the position is origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When it encounters the falling edge of the origin, it is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. The position when it encounters the falling edge of the origin is the origin position.

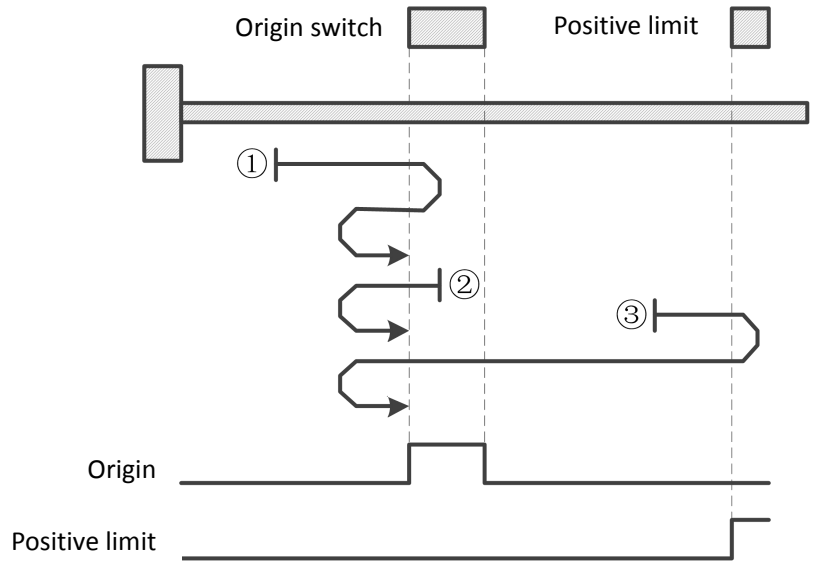



**6098=24: Reference origin switch and positive limit return-to-origin mode**

Situation 1: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When encountering the falling edge of the origin, the motor The deceleration reverse direction runs in the forward direction at low speed. The position after encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return starts, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When encountering the falling edge of the origin, the motor decelerates and runs in the positive direction at low speed. When it encounters the rising edge of the origin, the position is origin position.

Situation 3: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin, , the motor decelerates and runs at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the forward direction at low speed. When it encounters the rising edge of the origin, the position is the origin position.



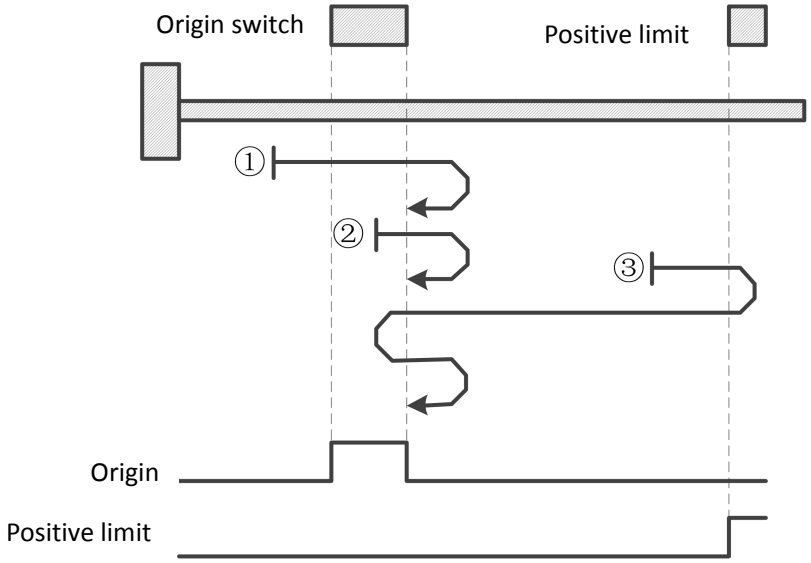

**6098=25: Reference origin switch and positive limit return-to-origin mode**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero in the forward direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs forward at low speed. After encountering the falling edge of the origin, the motor reverses and runs at low speed. Running in the negative direction, the position when encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the positive direction. When encountering the falling edge of the origin, the motor decelerates and runs in the negative direction at low speed. The position where it encounters the rising edge of the origin is

the origin. Location.

Situation 3: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. After encountering the rising edge of the origin, the motor The deceleration reverse direction moves in the positive direction at a low speed. When it encounters the falling edge of the origin, it reverses and then moves in the negative direction at a low speed. The position when it encounters the rising edge of the origin is the origin position.

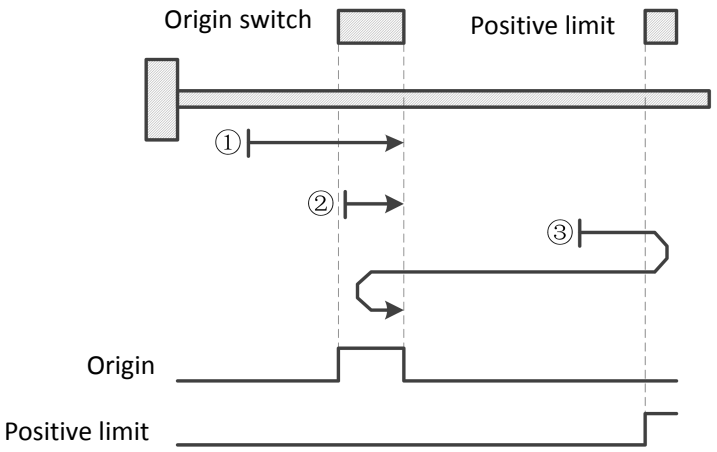



**6098=26: Reference origin switch and positive limit return-to-origin mode**

Situation 1: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the forward direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the position is the origin position.

Situation 2: When the origin signal is valid when the zero return is started, the axis starts to return to zero at a low speed in the forward direction. The position when it encounters the falling edge of the origin is the origin position.

Situation 3: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the positive direction at high speed. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin opening, When , the motor decelerates and runs in the forward direction at low speed. When it encounters the falling edge of the origin, the position is the origin position.

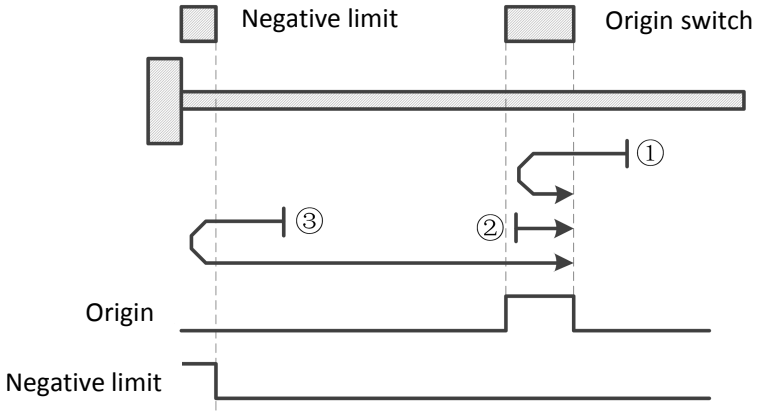



**6098=27: Reference origin switch and negative limit return-to-origin mode**

Situation 1: When starting to return to zero, the origin signal is invalid. The axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the forward direction at low speed. When encountering the falling edge of the origin, the position is origin position.

Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero in the forward direction at a low speed. When it encounters the falling edge of the origin, it is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs at low speed. When it encounters the falling edge of the origin, the position is the origin position.

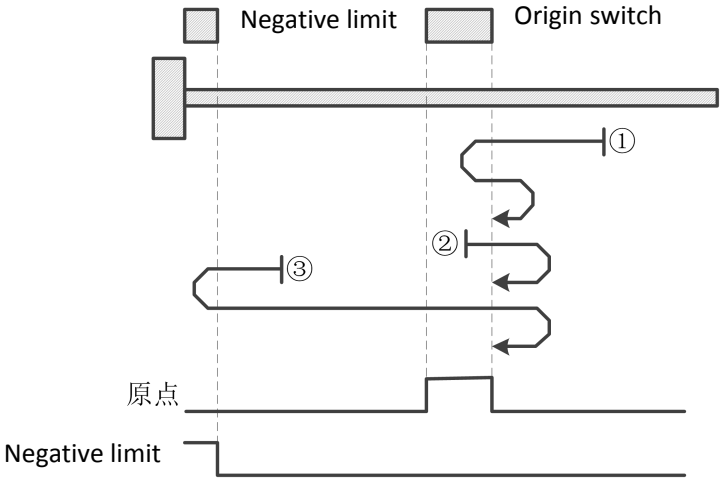



**6098=28: Reference origin switch and negative limit return-to-origin mode**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the forward direction at low speed. When encountering the falling edge of the origin, the motor The deceleration reverse direction runs in the negative direction at low speed. When it encounters the rising edge of the origin, the position is the origin position.

Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero at a low speed in the positive direction. When encountering the falling edge of the origin, the motor decelerates and runs in the negative direction at a low speed. When it reaches the rising edge of the origin, it is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the negative limit, the motor decelerates and moves in the positive direction at high speed. When encountering the rising edge of the origin, , the motor decelerates and runs at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the negative direction at low speed. When it encounters the rising edge of the origin, it is the origin position.

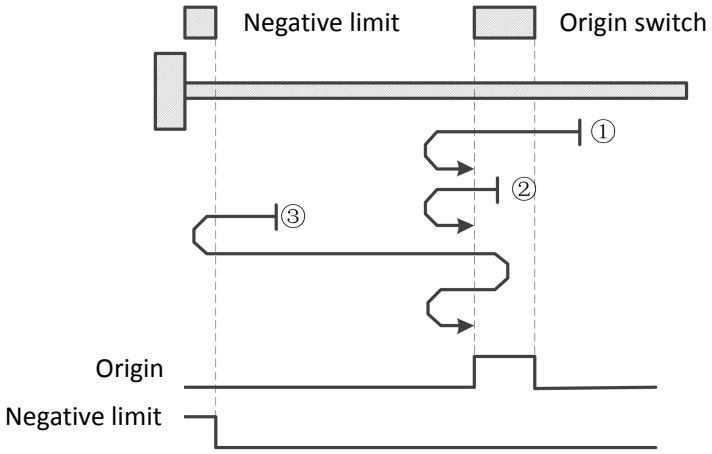



**6098=29: Reference origin switch and negative limit return-to-origin mode**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the motor decelerates and reverses to low speed. Running in the forward direction, the position when encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return starts, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When encountering the falling edge of the origin, the motor decelerates and runs in the positive direction at low speed. When it encounters the rising edge of the origin, the position is origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the forward direction at low speed. When it encounters the rising edge of the origin, the position is the origin position.

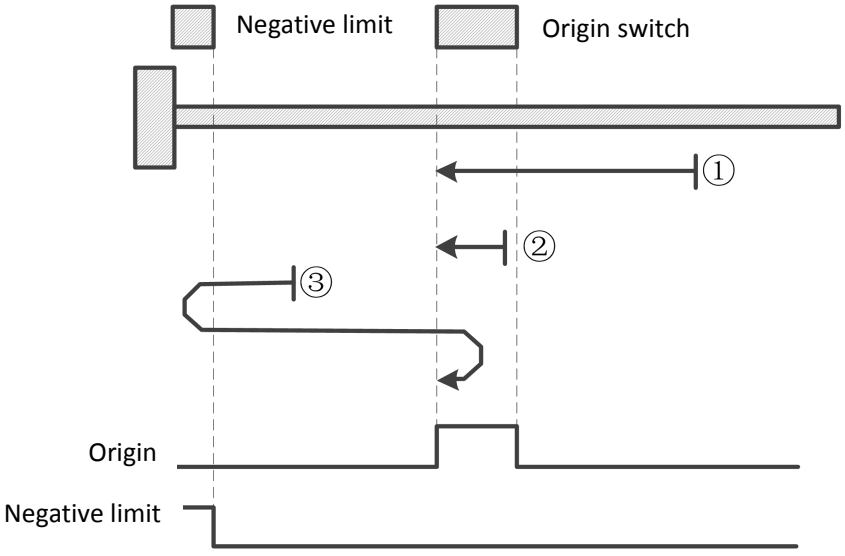



**6098=30: Reference origin switch and negative limit return-to-origin mode**

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the position is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When it encounters the falling edge of the origin, it is the origin position.

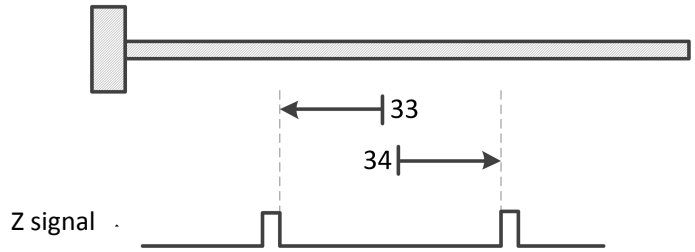
Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the position is the origin position.




**6098=33/34: Reference Z signal return-to-origin mode**

Zero return method 33: The axis starts to return to zero in the negative direction at low speed. The position of the first Z pulse encountered is the origin position.

Zero return mode 34: The axis starts to return to zero in the forward direction at low speed, and the position of the first Z pulse encountered is the origin position.




**6098=35: Take the current position as the origin**

Taking the current position as the mechanical origin, after triggering the origin return (6040 control word: 0x0F→ 0x1F):

1. When 60E6=0, set the current position 6064 to the value of the origin offset 606C;
2. When 60E6=1, the current position 6064 is superimposed on the original position offset 606C.