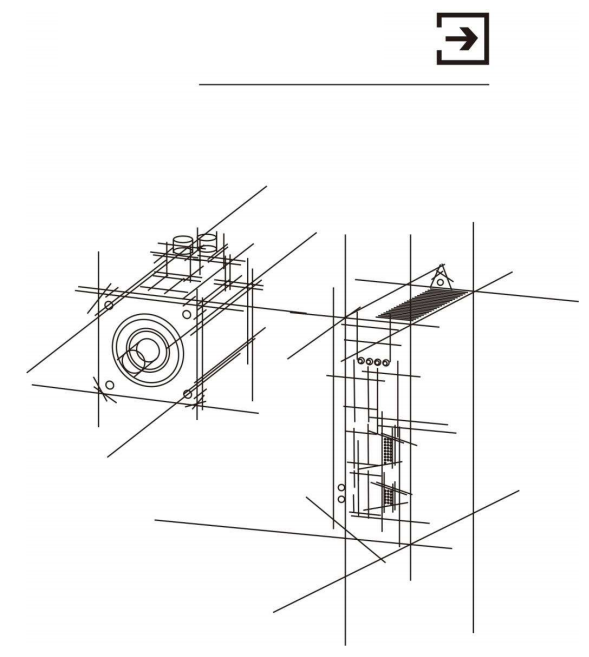




****

**SV2** **series**

**AC Servo Manual**

* **Thank you very much for purchasing the products of SINSEGYE**
* **Please read this manual carefully before using the product correctly**
* **Please keep this manual in a safe place**

**Safety Precautions**

**Before storing, installing, wiring, operating, inspecting, or repairing the product, users must be familiar with and comply with the following important matters to ensure the safe use of this product.**

|  |  |  |
| --- | --- | --- |
|  | **Danger** | Incorrect operation may cause danger and result in personal injury or death. |
|  | **Notice** | Incorrect operation may damage the device. |
|  | **Prohibit** | Actions that are strictly prohibited and will result in damage to the device or unusability. |

1. Use occasion

|  |
| --- |
| Danger |
| 1. It is forbidden to expose the product to water, corrosive gas, and flammable gases. Failure to do so may result in electric shock or fire. 2. It is forbidden to use the product in places with direct sunlight, dust, salt and metal powder. 3. It is forbidden to use the product in places where water, oil and medicine are dripping. |

2. Wiring

|  |
| --- |
| Danger |
| 1. Please ground the grounding terminal reliably, and poor grounding may cause electric shock or fire. 2. Do not connect the 220V drive power supply to the 380V power supply, as this will cause damage to the equipment and electric shock or fire. 3. The output terminals of U, V and W motors must be connected to the three-phase power supply and must correspond to the motor terminals U, V and W one by one, otherwise it will cause motor running, casualties or fire. 4. Please tighten the power supply and motor output terminals, otherwise it may cause fire. 5. Please refer to the textbook for wiring, otherwise it may cause fire. |

3. Operation

|  |
| --- |
| Notice |
| 1. Before the mechanical equipment starts to operate, the set value of parameters must be right. If it is not adjusted to the appropriate set value, it may lead to machinery device loses control or malfunctions. 2. Before starting operation, check whether the emergency switch can be activated and shut down at any time. 3. Please test whether the servo motor operates smoothly without load first, and then add the load to avoid unnecessary losses. 4. Do not turn the power on or off frequently, otherwise it will cause overheating inside the drive. |

4. Run

|  |
| --- |
| Prohibit |
| 1. When the motor is running, it is forbidden to touch any rotating parts, otherwise it will cause casualties. 2. When the equipment is running, it is forbidden to touch the driver and motor, otherwise it will cause electric shock or scalding. 3. When the equipment is running, it is forbidden to move the connecting cable, otherwise it will cause injury or damage to the equipment. |

5. Maintenance and inspection

|  |
| --- |
| Prohibit |
| 1. Do not touch the inside of the drive and its motor, otherwise it will cause electric shock. 2. When the power is started, it is forbidden to disassemble the drive panel, otherwise it will cause electric shock. 3. Do not touch the terminal blocks within 5 minutes of the power being turned off, otherwise the residual high voltage may cause electric shock. 4. It is forbidden to change the wiring or disassemble the servo motor when the power is on, otherwise it will cause electric shock. |

6. Scope of use

|  |
| --- |
| Notice |
| The products mentioned in this manual are for general industrial use, and should not be used on devices that may directly endanger personal safety. |

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SV2 series

Bus-type servo drives

1 Product introduction

1.1 Overview

SV2 series servo adopts EtherCAT bus communication interface, based on EtherCAT slave technology, the transmission rate of 100Mb/s realizes real-time control and real-time data transmission of the servo system. The driver has rich input and output interfaces, and supports CSP, CSV, CST, PP, PV, PT, HM operation modes. Compared with the traditional pulse servo drive, this drive is especially suitable for long-distance and multi-axis linkage applications, which can greatly reduce wiring and enhance the reliability of drive operation.

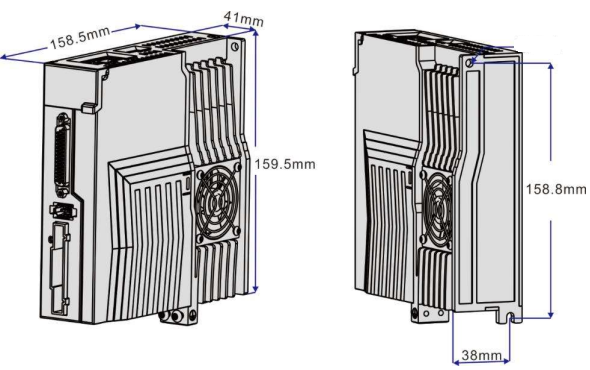
1.2 Features

* The working voltage is AC220V±10%, single/three-phase, 50/60Hz;
* The EtherCAT communication protocol is supported, and the address is automatically assigned via the master;
* 8 single-ended common anode isolation inputs with a maximum input frequency of 10KHz and input voltage of 24V;
* 6 channel optocoupler isolated outputs, with a maximum output capacity of 50mA and a maximum withstand voltage of 30Vdc.

1.3 Application area

Suitable for various small and medium-sized automation equipment and instruments with multi-axis linkage control: such as manipulators, packaging machinery, textile machinery, photovoltaics, and lithium batteries.

1.4 Mechanical dimensions



Screw hole

Figure 1.1 SV2 Installation size diagram

1.5 Usage environment and parameters

|  |  |  |
| --- | --- | --- |
| Cooling method | | Natural cooling or forced air cooling |
| Operating environment | Usage scenario | Can be placed next to other heat-generating equipment, to avoid dust, oil mist, corrosive gases, places with too high humidity and strong vibration of the place, prohibit the presence of combustible gases and conductive dust. |
| Temperature | 0~50℃ |
| Humidity | 40~90%RH |
| Storage temperature | | -20℃~65℃ |
| Weight | | 1.3Kgs |

1.6 Heat dissipation method

* The reliable ambient operating temperature of the drive is typically within 50°C, and the operating temperature of the motor is within 120°C;
* When installing the driver, please install it vertically on the side to make the heat dissipation teeth form a strong air convection; If necessary, a fan is installed close to the driver to force heat dissipation to ensure that the driver works within a reliable operating temperature range.

2 Driver specifications

2.1 Servo drive nameplate

SV 2 –E S 2R8 -XX

Sequence ① ②③ ④ ⑤

① Series: SV2 series

② Communication method:E:EtherCAT

③ Voltage level: S:220V T:380V

④ Rated current: 2R8:2.8A 3R5:3.5A 7R6:7.6A 014:14A 018:18A

⑤ Customized function D: Dual EtherCAT chips

2.2 Servo motor nameplate

SM 2-DB 80 - 024 30 A7 – A B

Sequence ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Series: SM2 series motors with SV2 drive

② Motor type DN: DN series 220VAC motor

DB: DB Series 220VAC Motors (5 Pair of Poles)

DNH: DN Series 380VAC Motors (4 Pair of Poles)

DHB: DB Series 380VAC Motors (5 Pair of Poles)

③ Flange size

40: 40 flange 60: 60 flange 80: 80 flange

130: 130 flange 150: 150 flange 180: 180 flange

④ Rated torque(×0.1N.m) 024: Indicates rated torque of 2.4N/m

⑤ Rated speed (x100rpm) 30: Rated speed 3000rpm

⑥ Encoder resolution

I2: 2500 line incremental encoder

A1: Economical multiturn absolute 17-bit encoder

A7: Economical single turn absolute 21-bit encoder

B4: High-performance multiturn absolute 23-bit encoder

⑦ Connector Type: A: AMP Plug H: Aviation Plug HZ: Aviation Straight Plug

⑧ Brake type: B: with brake Blank: without brake

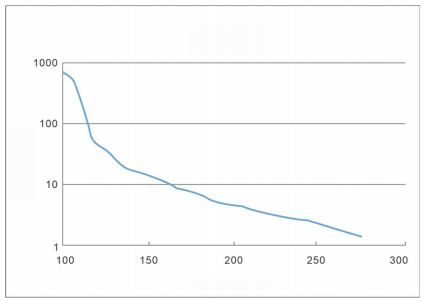
2.3 Servo motor and servo drive adaptation table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Base (mm) | Model | Power (W) | Rotating speed (rpm) | Adapter drive | Match Encoder |
| 40 | SM2-DB40-00330A6-A | 100 | 3000 | 400W  SV2S-ES2R8 |  |
| 60 | SM2-DB60-00630A6-A | 200 | 3000 |
| SM2-DB60-01330A6-A | 400 | 3000 |
| 80 | SM2-DB80-01330A6-A | 400 | 3000 | 400W  SV2S-ES2R8 750W  SV2S-ES3R5 |
| SM2-DB80-02430A6-A | 750 | 3000 | 750W  SV2S-ES3R5 |
| SM2-DB80-03230A6-A | 1000 | 3000 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Base (mm) | Model | Power (W) | Rotating speed (rpm) | Adapter drive | Match Encoder |
| 80 | SM2-DN80-04025A6-MH(B) | 1000 | 2500 | 2000W  SV2S-ES7R6 |  |
| 90 | SM2-DN90-04025A6-MH(B) | 1000 | 2500 |
| 100 | SM2-DN100-03230A6-MH(B) | 1000 | 3000 |
| SM2-DN100-06430A6-MH(B) | 1800 | 3000 |
| 110 | SM2-DN110-02030A6-MH(B) | 600 | 3000 |
| SM2-DN110-04020A6-MH(B) | 800 | 2000 |
| SM2-DN110-04030A6-MH(B) | 1200 | 3000 |
| SM2-DN110-05030A6-MH(B) | 1500 | 3000 |
| SM2-DN110-06020A6-MH(B) | 1200 | 2000 |
| SM2-DN110-06030A6-MH(B) | 1800 | 3000 |
| 130 | SM2-DN130-04025A6-MH(B) | 1000 | 2500 |
| SM2-DN130-05025A6-MH(B) | 1300 | 2500 |
| SM2-DN130-06025A6-MH(B) | 1500 | 2500 |
| SM2-DN130-07725A6-MH(B) | 2000 | 2500 |
| SM2-DN130-10010A6-MH(B) | 1000 | 1000 |
| SM2-DN130-10015A6-MH(B) | 1500 | 1500 |
| SM2-DN130-10020A6-MH(B) | 1500 | 2000 |
| SM2-DN130-10025A6-MH(B) | 2600 | 2500 |
| SM2-DN130-15015A6-MH(B) | 2300 | 1500 |
| SM2-DN130-15025A6-MH(B) | 3800 | 2500 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Output power | 50W~7500W | | Monitoring function | Rotational speed / current position / command pulse accumulation / position deviation / motor torque / motor current / operating state, etc |
| Main circuit Input power supply | Single-/three-phase AC220V-15%~+10% 50/60Hz | | Control method | 0: position control mode  1: Speed control mode  2: Trial operation control mode  3: JOG control mode  6: Torque control mode |
| Protection function | Overspeed/mains power overvoltage, undervoltage/overcurrent/overload/encoder abnormality/control power abnormality/position out-of-tolerance, etc | | Control inputs | 1: Negative limit  2: Positive limit  3: Origin signal  4: CCW Driver Prohibition  5: CW Driver Prohibition  6: Deviation Counter Zero  7: Command Pulse Prohibition  8: CCW Torque Limit  9: CW Torque Limit |
| Energy consumption Braking | Built-in/External | | Applicable load | Less than 3 times the motor inertia |
| Control output | Servo ready output / servo alarm output / positioning completion output / mechanical brake output | | Display Operation | 5-digit LED digital tube with 4 buttons |
| Position control | Input method | Bus-based communication | | |
| Input electronic gear ratio | Gear ratio shaft accuracy: 1-131072  Gear ratio motor accuracy: 17-bit, 23-bit absolute | | |

2.4 Servo motor overload characteristics



Overload curve

Overload time/s

Overload multiple/%

3 Operation and display interface

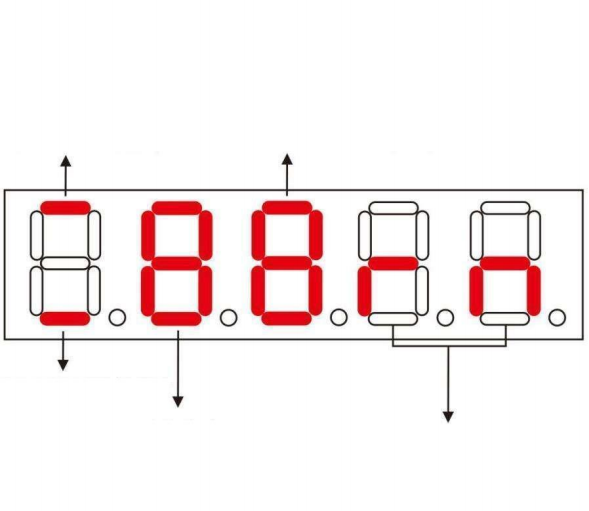
3.1 Key names and functions

The panel consists of 5 LED digital tube displays and 4 buttons ↑, ↓, ←, and SET keys to display various statuses of the system, setting parameters, etc. The operation is a hierarchical operation, ←, the SET key represents the backward and forward of the hierarchy, the SET key has the meaning of entering, definite, and the ← key has the meaning of exiting and canceling; The ↑ and ↓ keys indicate an increase or decrease in the size of the ordinal number or numeric value. If you press the ↑ or ↓ keys and hold, it has a repeat effect, and the longer you hold it, the higher the repetition rate.

3.2 Parameter setting process

Select "PA-" in the first layer and press the SET key to enter the parameter setting method. Use the ↑ / ↓ keys to select a parameter. Press the SET key to display the value of the parameter, and use the ↑ / ↓ keys to modify the parameter value. Press the ↑ / ↓ keys once to increase/ decrease the parameter by 1, and press and hold the ↑/↓ keys to increase/decrease the parameter continuously. When the parameter value is modified, press the SET key, and the LED display value flashes twice, that is, the modification is completed. The device will run in terms of the set parameters when it is re-powered on.

3.3 Panel status indication



Control mode

1: Contour Position Control (PP)

3: Contour Speed Control (PV)

4: Contour Torque Control (PT)

6: Return to Zero Mode (HM)

8: Periodic Synchronous Position Mode (CSP)

9: Periodic Synchronous Speed Mode (CSV)

A: Periodic Synchronous Torque Mode (CST)

Port (ECAT IN) connection indication

Port (ECAT OUT) connection indication

Communication status

1: Initialization state

2: Pre-running

4: Safe running

8: Running status

Servo status

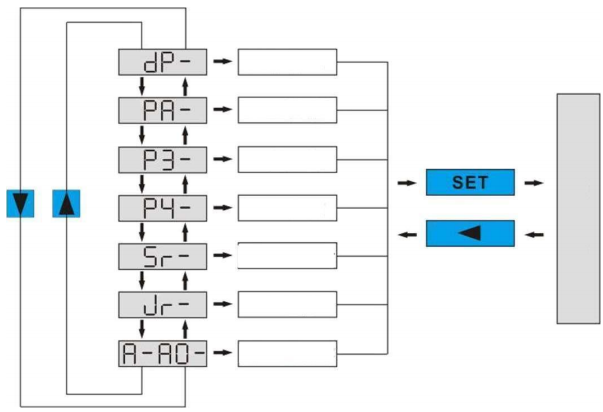
nr: not ready

ry: ready

Rn: run

3.4 Monitor status content

The first layer is used to select the operation mode, there are 4 ways, use the ↑/ ↓ keys to change the mode. Press the SET key to enter the second layer of the selected way, and press the ← key to return from the second layer to the first layer.



Monitoring method

PA group parameters

P3 group parameters

P4 group parameters

Speed trial operation

JOG operation

Analog Homing

Tier 2

Figure 3.2 Block diagram of mode selection operation

Select “dp --” in the first layer and press the SET key to enter the second layer of monitoring. There are a total of 16 display states, users use the ↑/ ↓ keys to select the desired display mode, and then press the SET key to enter the specific display state.

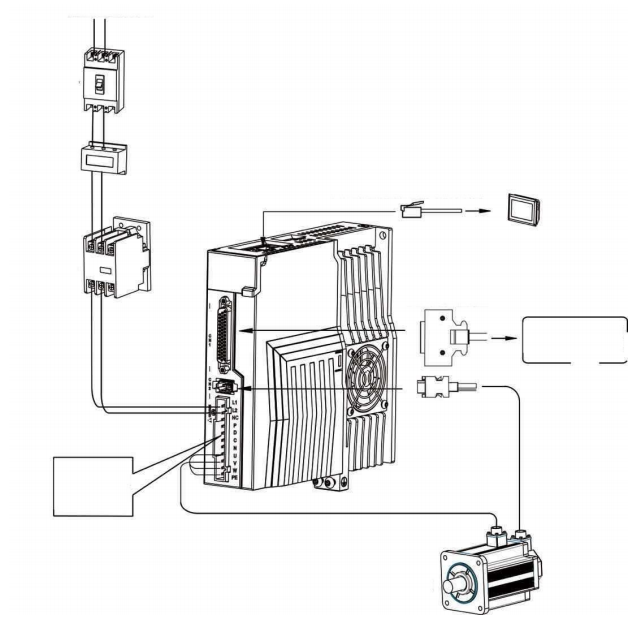
|  |  |  |  |
| --- | --- | --- | --- |
| **Monitoring method** | **Operation** | **Monitoring Example** | **Description** |
|  | **SET** |  | **Motor speed 1000r / min** |
|  |  | **Current location 1245806** |
|  |  |
|  |  | **Position command 1245810** |
|  |  |
|  |  | **Position deviation 4 pulses** |
|  |  |
|  |  | **Motor torque 70%** |
|  |  | **Motor current 2.3A** |
|  |  | **Control mode 0** |
|  |  | **Rotor absolute position 3265** |
|  |  | **Input terminals** |
|  |  | **Output terminals** |
|  |  | **Bus status display** |
|  |  | **Operational status** |
|  |  | **No. 9 alarm** |

4 Wiring and composition of the drive system

4.1 System wiring

**4.1.1 Servo drive wiring diagram**

Power supply single-phase 220VAC



AC servo motor

Motor power cable

Numerical control systems, programmable controllers, or other devices

**Crystal Heads for EtherCAT Bus Communication Network Ports**

**Braking resistor**

The default built-in braking resistor. When the bus capacitance is insufficient, the P-C terminal is connected to the external braking resistor

**Electromagnetic contactor**

Turn on/off the servo power supply, and an AC surge controller needs to be installed when using

**Noise Filter**

Prevent noise from outside the power line

**Air circuit breaker**

Protect the power line from cutting off the circuit in the event of overcurrent

Encoder cable

Upper computer signal cable

Figure 4.1 System wiring diagram

**4.1.2 Wiring instructions**

Wiring Notes:

* Command cable ≤ 3m encoder length ≤ 20m.
* Check whether the power supply and wiring of L1 and L2 are correct. If only the single-phase 220VAC driver is supported, please do not connect it to the 380VAC power supply.
* The motor outputs the phase sequence of U, V and W terminals, which must correspond to the corresponding terminals of the drive. Unlike asynchronous motors, the motor cannot be reversed by adjusting the three-phase terminals.
* Because the servo motor flows through the high-frequency switching current, the leakage current is relatively high, and the motor grounding terminal must be connected with the servo drive grounding terminal PE and well grounded.
* The relay installed in the output signal should be connected in the correct direction of the diode for absorption, otherwise it will cause failure and the signal cannot be output.
* To prevent malfunction caused by noise, install an insulating transformer or noise filter to the power supply.
* Please wire the power line (strong current circuit of the motor line, power line, etc.) and the signal line at least 30cm, and do not place it in the same wiring pipe.
* Please install a non-fusing circuit breaker so that the external power supply can be cut off in time when the driver fails.
* Because there is a large capacity electrolytic capacitor inside the servo drive, even if the power supply is cut off, there is still a high voltage in the internal circuit, and after the power supply is cut off, wait at least 5 minutes before contacting the driver and motor.

**4.1.3 Wire specifications**

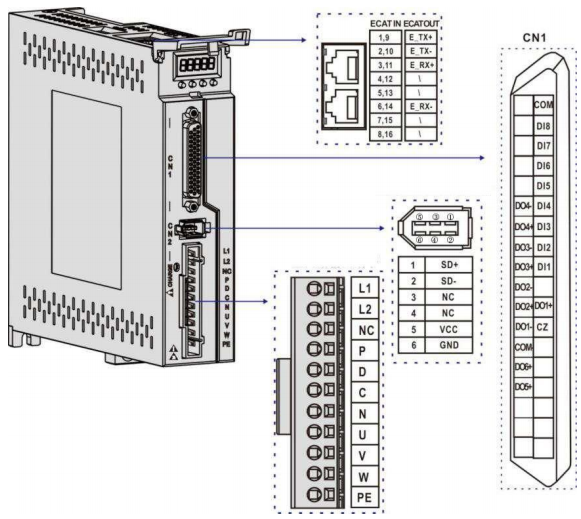
|  |  |  |
| --- | --- | --- |
| **Connection terminals** | **Symbol** | **Wire specifications** |
| Main circuit power supply | L1, L2 | 1.5~4mm2 |
| Motor connection terminals | U, V, W | 1.5~4mm2 |
| Ground terminals |  | 1.5~4mm2 |
| Control signal terminals | CN1 | ≧0.14mm2 (AWG26), Shielded cord included |
| Encoder signal terminals | CN2 | ≧0.14mm2 (AWG26), Shielded cord included |
| Brake resistor terminals | P, D/P, C | 1.5~4mm2 |



* The encoder cable must be twisted pair. If the encoder cable is too long (>20m), it will cause the encoder to be underpowered, and the power supply and ground can be connected with multiple wires or thick wires.

4.2 Pin distribution of servo drive terminal

**4.2.1 Terminal definition**



Encoder signal terminal CN2

Main circuit input terminal

Figure 4.2 SV2 Terminal Pin Distribution Diagram

|  |  |
| --- | --- |
| Terminal number | Description |
| CN1 | Input and output terminals |
| CN2 | Encoder terminal blocks |
| CN3 | EtherCAT bus input terminal |
| CN4 | EtherCAT bus output terminal |

**4.2.2 CN1 input and output terminals**

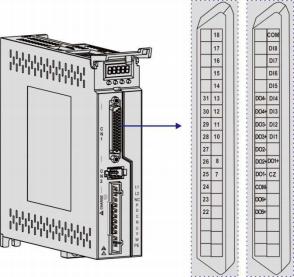
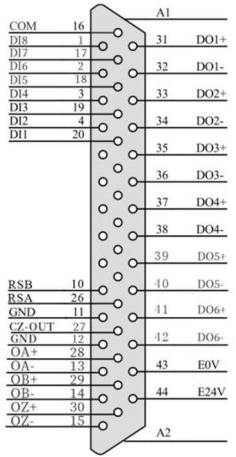


Figure 4.3 CN1 terminal pin distribution



Metal enclosure grounding

Digital output 1

Digital output 3

Digital output 2

Digital output 4

Digital output 5

Digital output 6

Internally isolated 24V power output

Metal enclosure grounding

RS485 communication negative terminal

RS485 communication positive terminal

Internal digital signal ground

Z-phase open-collector output

A-phase signal output

B-phase signal output

Z-phase signal output

Common end of the digital input signal

Digital input 8

Digital input 7

Digital input 6

Digital input 5

Digital input 4

Digital input 3

Digital input 2

Digital input 1

Figure 4.4 CN1 wiring terminal description

* Schematic diagram of digital input circuit

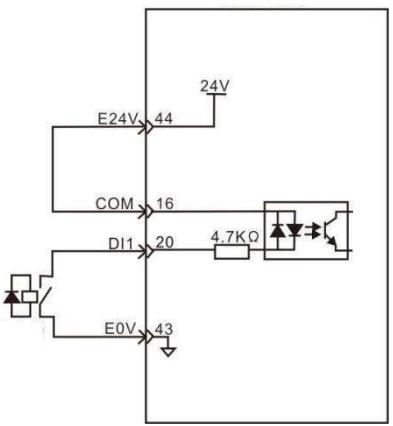
Taking DI1 as an example, DI1~DI4 interface circuits are the same.

1) When the upper device is relay output

A) When using the internal 24V power supply of the servo drive:

Servo drive

Relay



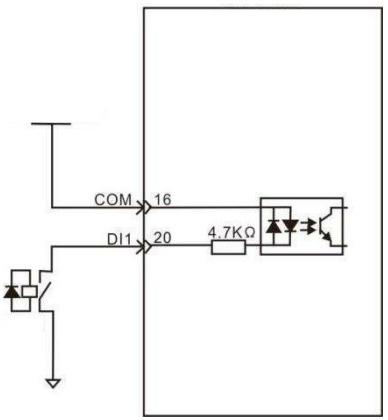
B) When using an external 24V power supply:

Servo drive

External 24V power supply

Relay

External power supply 0V

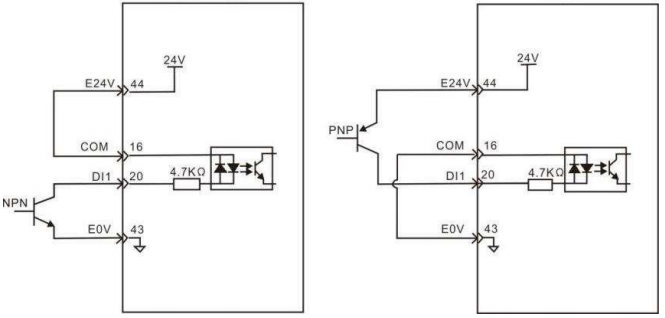


2) When the upper device is an open collector output

A) When using the internal 24V power supply of the servo drive:

Servo drive

Servo drive



B) When using external 24V power supply:

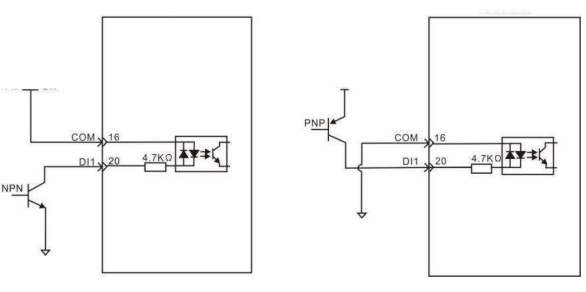
Servo drive

Servo drive

External 24V power supply

External power supply 0V

External power supply 0V



External 24V power supply

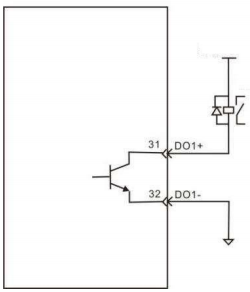
Note:

* Mixed use of PNP and NPN inputs is not supported.
* Schematic diagram of digital output circuit

Taking DO1 as an example, the interface circuits of DO1~DO4 are the same.

1) When the upper device is a relay input:

Servo drive



External 5-24VDC

External 0V

Relay

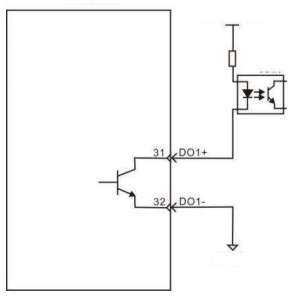
2) When the upper device is optocoupler input

Servo drive

External 5-24VDC

Optocoupler

External 0V



* When the upper device is a relay, be sure to connect the freewheeling diode, otherwise it may damage the DO port or cause strong signal interference.
* The maximum allowable voltage and current capacity of the internal optocoupler output circuit of the servo driver are as follows:
* Voltage: DC30V
* Current: DC50mA

**4.2.3 Encoder terminal block**

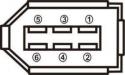


Figure 4.5 Description of CN2 terminal block

Encoder terminal signal description

|  |  |  |  |
| --- | --- | --- | --- |
| Signal name | | Pin No. | Function |
| Encoder signal power | 5V | 5 | The encoder uses a 5V power supply (provided by the driver), and when the cable is more than 20 m, in order to prevent the encoder voltage from dropping, the power supply and ground wire can be connected with multiple wires or thick wires can be used. |
| 0V | 6 |
| Absolute encoder communication positive terminal | SD+ | 1 | Absolute encoder communication positive |
| Absolute encoder communication negative terminal | SD- | 2 | The negative end of the absolute encoder communication |
| Null terminal | NC | 3 | Retain |
| Null terminal | NC | 4 | Retain |
| Shielded wire protection ground | Plug metal housing | | Connect the encoder wire shield |

**4.2.4 Network communication interface terminal**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Terminal No. | Illustration | | Pin No. | | Signal | | Name |
| CN3 |  | | 1, 9 | | E\_T X+ | | EtherCAT data transmission positive terminal |
| 2, 10 | | E\_T X- | | EtherCAT data transmission negative terminal |
| 3, 11 | | E\_R X+ | | EtherCAT data reception positive terminal |
|  | |  | | 4, 12 | | / | / |
| 5, 13 | | / | / |
| 6, 14 | | E\_R X- | EtherCAT data receiving negative terminal |
| 7, 15 | | / | / |
| 8, 16 | | / | / |
| Connector housings | | PE | Shield grounding |
| Remark | | 1. LED1: “Link/Activity IN” status indicator, orange; 2. LED3: “Link/Activity OUT” status indicator, orange; 3. LED2 and LED4: “RUN” status indicator, green. | | | | | |

**4.2.5 Main circuit terminal**

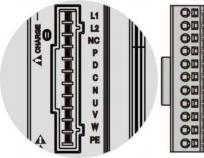


Figure 4.6 Diagram of the pinout distribution of the main circuit terminals

|  |  |  |
| --- | --- | --- |
| Name | Terminal symbol | Detailed description |
| Main circuit power input terminal | L1, L2 | Single-phase 220VAC -15%~+10%, 50/60Hz |
| NC | Empty terminal |
| Braking resistor terminals | P, D | When using an internal braking resistor, make P and D shorted circuit. |
| P, C | When using an external braking resistor, disconnect P and D short circuit, and then connect the external braking resistor wiring between P and C, respectively. P and N are not connected. |
| Motor connection terminals | U, V, W | Connect to servo motors U, V, W phases. |
|  | The driver ground terminal is connected to the power supply and motor ground terminal. |



It is by default internal brake resistor connection at the time of ex-factor: P and D are shorted circuit.

**5 Ether CAT Bus**

**5.1 Communication specifications**

|  |  |  |
| --- | --- | --- |
| Item | | Description |
| EtherCAT  Communication | Physical layer | 100BASE-TX |
| Communication connectors | RJ45 × 2 (Terminal CN3A=IN, CN3B=OUT) |
| Network topology | Bus type |
| Baud rate | 2 × 100 Mbps (Full Duplex) |
| Frame data length | 1484 bytes (maximum value) |
| Synchronization manager | SM0: Mailbox Receiving (Master to Slave)  SM1: Email Sending (Slave to Master)  SM2: Process Data Output (Master to Slave)  SM3: Process Data Entry (Slave to Master) |
| Synchronous mode | DC Synchronization (SYNC0) Free Run (Free run) |
| Communication object | SDO: Service Data Object  PDO: Process Data Object |
| LED indication | L/A IN (Link/Activity IN) × 1  L/A OUT (Link/Activity OUT) × 1 RUN × 1 |
| Communication protocol standards | CoE: CANopen over EtherCAT |
| Device protocol standards | IEC61800-7 CiA402 Drive Profile |
| CiA402  Operating mode | Cyclic Sync Position Mode (CSP), Cyclic Sync Velocity Mode (CSV), Cyclic Sync Torque Mode (CST), Profile Position Mode (PP), Profile Velocity Mode (PV), Profile Torque Mode  (PT), Zero-Back Mode (HM) | |

5.2 LED status indication

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Color | State | Description |
| RUN | Green | OFF | Initialization state |
| Blinking | Pre-run state |
| Single flash | Safe run state |
| ON | Run state |
| L/A IN | Orange green | OFF | Physical layer link not established |
| ON | Physical layer link established |
| Flickering | Interacting data after link establishment |
| L/A OUT | Orange | OFF | Physical layer link not established |
| ON | Physical layer link established |
| Flickering | Interactive data after link establishment |

The indicator status is described as follows:

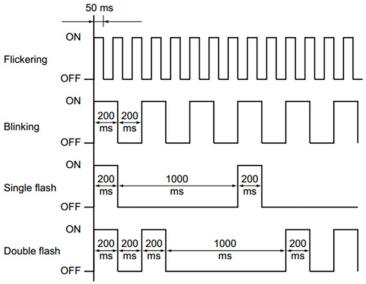


Figure 5.2 Indicator flashing time

5.3 Communication object

Drive parameters include communication parameters, manufacturer-defined parameters, and 402 parameters.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Object dictionary address | Parameter name | Read/Write properties | Default parameter | Setting range | Description |
| 1000h | Device type | R | 0x00040192 |  |  |
| 1001h | Error register | R | 0 |  |  |
| 1008h | Name of device |  | DSX00E |  |  |
| 1009h | Hardware version |  | V1.0 |  |  |
| 100Ah | Software Version |  | V1.0 |  |  |
| 1018h+01 | Vendor ID | R | 0x0044 5653 |  |  |
| 1018h+02 | Product code | R | 0x0000 0001 |  |  |
| 1018h+03 | Modify code | R | 0x0000 0001 |  |  |
| 1018h+04 | SN | R | 0x0000 0001 |  |  |
| 1600h | RXPDO  Mapping object 0 | RW |  |  | The quantity and content of RPDO can be configured |
| 1701h | RXPDO  Mapping object 258 | R | 0x6040 0010  0x607A 0020  0x60B8 0010  0x60FE 0120 |  |  |
| 1702h | RXPDO  Mapping object 259 | R | 0x6040 0010  0x607A 0020  0x60FF 0020  0x6071 0010  0x6060 0008  0x60B8 0010  0x607F 0020 |  |  |
| 1703h | RXPDO  Mapping object 260 | R | 0x6040 0010  0x607A 0020  0x60FF 0020  0x6060 0008  0x60B8 0010  0x60E0 0010  0x60E1 0010 |  |  |
| 1704h | RXPDO  Mapping object 261 | R | 0x6040 0010  0x607A 0020  0x60FF 0020  0x6071 0010  0x6060 0008  0x60B8 0010  0x607F 0020  0x60E0 0010  0x60E1 0010 |  |  |
| 1705h | RXPDO  Mapping object 262 | R | 0x6040 0010  0x607A 0020  0x60FF 0020  0x6060 0008  0x60B8 0010  0x60E0 0010  0x60E1 0010  0x60B2 0010 |  |  |
| 1A00h | TXPDO Mapping object 0 | RW |  |  | The quantity and content of TPDOs can be configured |
| 1B01h | TXPDO  Mapping objects 258 | R | 0x603F 0010  0x6041 0010  0x6064 0020  0x6077 0010  0x60F4 0020  0x60B9 0010  0x60BA 0020  0x60BC 0020  0x60FD 0020 |  |  |
| 1B02h | TXPDO  Mapping object 259 | R | 0x603F 0010  0x6041 0010  0x6064 0020  0x6077 0010  0x6061 0008  0x60B9 0010  0x60BA 0020  0x60BC 0020  0x60FD 0020 |  |  |
| 1B03h | TXPDO  Mapping object 260 | R | 0x603F 0010  0x6041 0010  0x6064 0020  0x6077 0010  0x60F4 0020  0x6061 0008  0x60B9 0010  0x60BA 0020  0x60BC 0020  0x60FD 0020 |  |  |
| 1B04h | TXPDO  Mapping object 261 | R | 0x603F 0010  0x6041 0010  0x6064 0020  0x6077 0010  0x6061 0008  0x60F4 0020  0x60B9 0010  0x60BA 0020  0x60BC 0020  0x606C 0020 |  |  |
| 1C12h | RXPDO  Assignment | RW | 0 | 0x1 600  0x1 701~0x1 705 |  |
| 1C13h | TXPDO  Assignment | RW | 0 | 0x1 A00  0x1 B01~0x1 B04 |  |
| 2000h | Basic control parameters | RO |  |  |  |
| 2000h+1 | Initial status display | RW | 17 | 0-23 |  |
| 2000h+2 | Set the mechanical brake action when the motor stops running | RW | 0 | 0-200 |  |
| 2000h+3 | Set the mechanical brake action when the motor is running | RW | 0 | 0-200 |  |
| 2000h+4 | Mechanical brake action speed when the motor is running | RW | 100 | 0-3000 |  |
| 2000h+ 5 | Velocity limit at the time of torque control | RW | 3000 | 0-5000 |  |
| 2000h+6 | Servo enable delay closing time | RW | 0 | 0-30000 |  |
| 2000h+7 | Active level control word of input terminal | RW | 0 | 0-31 |  |
| 2000h+8 | Active level control word of output terminal | RW | 0 | 0-31 |  |
| 2000h+9 | De-jitter time constant of IO input terminal | RW | 2 | 1-1000 |  |
| 2000h+10 | Encoder type selection | RW | 5 | 1-5 | For selecting the type of encoder:  4: Absolute value without battery (default);  5: Absolute value with battery. |
| 2000h+11 | Quantity of encoder wire | RW | 17 | 0-32 | Select the quantity of motor encoder wires  (17-bit default) |
| 2000h+12 | Quantity of motor pole pair | RW | 4 | 1-360 | Default five |
| 2000h+ 13 | PWM duty cycle | RW | 50 | 5-90 |  |
| 2001h | PID adjustment parameters |  |  |  |  |
| 2001h+1 | Position scale factor | RW | 40 | 1-1000 |  |
| 2001h+2 | Velocity scale factor | RW | 150 | 5-2000 |  |
| 2001h+3 | Velocity integral constant | RW | 75 | 1-1000 |  |
| 2001h+4 | Position command smoothing filter | RW | 200 | 1-1000 |  |
| 2001h+5 | Torque filter | RW | 100 | 20-500 |  |
| 2001h+6 | Speed detection filter | RW | 100 | 20-500 |  |
| 2001h+7 | Acceleration time constant | RW | 100 | 1-10000 |  |
| 2001h+8 | Deceleration time constant | RW | 100 | 1-10000 |  |
| 2002h | Communication parameters |  |  |  |  |
| 2002h+1 | Communication virtual input | RW | 0 | 0-1 |  |
| 2002h+2 | Communication virtual output | RW | 0 | 0-1 |  |
| 2002h+3 | Fixed address | RW | 0 | 0-32767 |  |
| 2003h | Input port function No. |  |  |  |  |
| 2003h+1 | Digital input DI1 function | RW | 3 | 0-99 |  |
| 2003h+2 | Digital input DI2 function | RW | 4 | 0-99 |  |
| 2003h+3 | Digital input DI3 function | RW | 34 | 0-99 |  |
| 2003h+4 | Digital input DI4 function | RW | 5 | 0-99 |  |
| 2003h+5 | Digital input DI5 function | RW | 6 | 0-99 |  |
| 2003h+6 | Digital input DI6 function | RW | 0 | 0-99 |  |
| 2003h+7 | Digital input DI7 function | RW | 0 | 0-99 |  |
| 2003h+8 | Digital input DI8 function | RW | 0 | 0-99 |  |
| 2004h | Output port function No. |  |  |  |  |
| 2004h+1 | Digital output DO1 function | RW | 18 | 0-48 |  |
| 2004h+2 | Digital output DO2 function | RW | 19 | 0-48 |  |
| 2004h+3 | Digital output DO3 function | RW | 2 | 0-48 |  |
| 2004h+4 | Digital output DO4 function | RW | 3 | 0-48 |  |
| 2004h+5 | Digital output DO5 function | RW | 5 | 0-48 |  |
| 2004h+6 | Digital output DO6 function | RW | 8 | 0-48 |  |
| 2005h | Auxiliary function parameters |  |  |  |  |
| 2005h+1 | Fault reset | RW | 0 | 0-1 |  |
| 2005h+2 | Whether the soft limit is turned on | RW | 0 | 0-1 |  |
| 2005h+3 | Whether the parameters are saved to EEPROM | RW | 1 | 0-1 |  |
| 2006h | Monitoring parameters |  |  |  |  |
| 2006h+ 1 | Driver current | RO |  |  |  |
| 2006h+ 2 | Drive temperature | RO |  |  |  |
| 2006h+ 3 | Bus voltage | RO |  |  |  |
| 2007h | Servo motor parameters |  |  |  |  |
| 2007h+1 | Motor type | RW | 1 |  | The motor type corresponding to each index is shown in the following table. |
| 2008h | Step mode parameters |  |  |  |  |
| 2008h+1 | Lock-up current | RW |  |  |  |
| 2008h+2 | Operating current | RW |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Address | Parameter Name | Read and Write  Attributes | Can it be mapped | Initial value | Type | Description |
| 603Fh | Recent error codes | R | TPDO | 0 | Unsigned 16-bit | Recent error codes |
| 6040h | Control word | RW | RPDO | 0 | Unsigned 16-bit | Control word |
| 6041h | Status word | R | TPDO | 0 | Unsigned 16-bit | Status word |
| 605Ah | Quick Stop Code | RW | NO | 1 | Signed 16-bit | 1: Ramp shutdown: enter inactive state after completion.  2: Quick shutdown: enter the disable state.  5: Ramp shutdown completed and quick shutdown maintain.  6: Quick shutdown completed and maintained.  Other: Invalid |
| 6060h | Mode Setting | RW | R PDO | 8 | Unsigned 8-bit | Working Modes:  1: Profile Position Mode  3: Profile Speed Mode  4: Profile Torque Mode  6: Return to Zero Mode  8: Cycle Sync Position Mode  9: Cycle Sync Speed Mode  10: Cycle Sync Torque Mode |
| 6061h | Mode query | R | TPDO | 0 | Unsigned 8 -bit | Displays the operating mode of the drive |
| 6062h | Position command | R | TPDO | 0 | Signed 32-bit | Instruction units |
| 6063h | Position feedback | R | TPDO | 0 | Signed 32-bit | Actual motor position (encoder unit) |
| 6064h | Actual position | R | TPDO | 0 | Signed 32-bit | Display of the actual position of the motor (command unit) |
| 6067h | Position reaching threshold | RW | RPDO | 130 | Unsigned 32-bit | Encoder unit |
| 606Ch | Actual speed | R | TPDO | 0 | Signed 32-bit | Display the actual velocity of the motor (command unit/s) |
| 6071h | Target torque | RW | RPDO | 0 | Signed 16-bit | Torque input value in torque mode (thousands) |
| 6072h | Maximum torque | RW | RPDO | 3000 | Signed 16-bit | Torque input value in torque mode |
| 6077h | Actual torque | R | TPDO | 0 | Signed 16-bit | Displays the actual torque of the motor |
| 607Ah | Target location | RW | RPDO | 0 | Signed 32-bit | Target position in position mode (command unit) |
| 607Ch | Origin offset | RW | RPDO | 0 | Signed 32-bit | Origin offset |
| 607Dh+ 01 | Minimum position limit | RW | RPDO | -200000 0000 | Signed 32-bit | Reverse limit |
| 607Dh+ 02 | Maximum position limit | RW | RPDO | 200000  0000 | Signed 32-bit | Forward limit |
| 607Fh | Maximum speed | RW | RPDO | 600000 | Signed 32-bit | Maximum speed at which the drive operates |
| 6081h | Trapezoidal speed | RW | RPDO | 250000 | Unsigned 32-bit | Uniform segment velocity value for profile position mode inc/s |
| 6083h | Trapezoidal acceleration | RW | RPDO | 250000 | Unsigned 32-bit | Acceleration of trapezoidal curve |
| 6084h | Trapezoidal deceleration | RW | RPDO | 250000 | Unsigned 32-bit | Deceleration of trapezoidal curves (directly with acceleration values) |
| 6085h | Quick shutdown deceleration | RW | RPDO | 300000 | Unsigned 32-bit | Quick shutdown 605A deceleration with 1 or 5 selected |
| 6087h | Torque ramp | RW | RPDO | 1 | Unsigned 32 -bit | Torque change per unit time (1ms) |
| 6091h+2 | Gear ratio: external axis accuracy | RW | RPDO | 10000 | Unsigned 32-bit | The external axis controls the number of commands for one revolution of the motor |
| 6098h | Back to origin mode | RW | RPDO | 17 | Signed 8-bit | Find origin mode (support 17 and 18, forward and reverse limit switches) |
| 6099h+0 1 | Back to origin mode high speed | RW | RPDO | 150000 | Unsigned 32-bit | High-speed Origin Finding Signal Speed Value (Instruction/s) |
| 6099h+0 2 | Back to origin mode Low speed | RW | RPDO | 10000 | Unsigned 32-bit | Low-speed Origin Finding Signal Speed Value (Instruction/s) |
| 609Ah | Zeroing add/detract speed | RW | RPDO | 200000 | Unsigned 32-bit | Acceleration/ Deceleration for Origin Mode (Instruction/S2) |
| 60B8h | Probe function | RW | RPDO | 0x3131 | Unsigned 16-bit | Set the probe function  (See the probe function description for details) |
| 60B9h | Probe status | R | TPDO | 0 | Unsigned 16-bit | Display the probe action status  (See the probe function description for details.) |
| 60BAh | Probe 1 raising edge latch position | R | TPDO | 0 | Signed 32-bit | Probe 1 raising edge latch position data information |
| 60BBh | Probe 1 falling edge latch position | R | TPDO | 0 | Signed 32-bit | Probe 1 falling edge latch position data information |
| 60BCh | Probe 2 raising edge latch position | R | TPDO | 0 | Signed 32-bit | Probe 2 raising edge latch position data information |
| 60BDh | Probe 2 falling edge latch position | R | TPDO | 0 | Signed 32-bit | Probe 2 falling edge latch position data information |
| 60E0h | Forward torque limiting | RW | RPDO | 3000 | Signed 16-bit | Torque value when limiting forward rotation (parts per thousand) |
| 60E1h | Reverse torque limit | RW | RPDO | 3000 | Signed 16-bit | Torque value when limiting reverse rotation (parts per thousand) |
| 60F4h | Position error | R | TPDO |  | Signed 32-bit | Position error (command unit) |
| 60FDh | Input IO status | R | TPDO |  | Unsigned 32 -bit | bit0: Origin signal  bit1: Forward limit  bit2: Negative limit |
| 60FE+0 1 | Physical output | RW | RPDO | 0 | Unsigned 32 -bit |  |
| 60FEh+ 02 | Physical output enabled | RW | NO |  | Unsigned 32-bit | Not used |
| 60FFh | Target velocity | RW | RPDO |  | Signed 32-bit | Target velocity for speed mode (command unit/s) |
| 6502h | Supported operating modes | R | NO |  | Unsigned 32-bit | Operating modes supported by the drive |

6 Parameter group

6.1 PA group parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Serial No. | Name | Function | Parameter range | Ex-factory value |
| 0 | Password | 1. The user password is 315. 2. The model code is 385. | 0-9999 | 315 |
| 1 | Model code | 1. Corresponding to the same series of drivers and motors of different power levels. 2. The default value of the parameter corresponding to the code of different models is different, and the correctness of this parameter must be guaranteed when using the function of restoring the default parameters. 3. When modifying this parameter, set the password PA0 to 385 before modifying this parameter. 4. Default 80-02430. | 40-180 |  |
| 2 | Software version | You can view the software version number, but you can't modify it. |  |  |
| 3 | Initial display status | 1. Display motor speed; 2. Display the current position 5 bits lower; 3. Display the current position 5 bits higher; 4. Display position command (instruction pulse accumulation) 5 bits lower; 5. Display position command (instruction pulse accumulation) 5 bits higher; 6. Display position deviation 5 digits lower; 7. The display position deviation 5 digits higher; 8. Display motor torque; 9. Display motor current; 10. Current control mode; 11. Display current temperature; 12. Display speed command; 13. Display torque command; 14. Show that the absolute position of the rotor in one turn is 5 bits lower; 15. Display 5 digits higher than the absolute position of the rotor in one revolution; 16. Display the status of the input terminal; 17. Display the status of the output terminal; 18. Display encoder input signal; 19. Display the main circuit bus voltage value; 20. Display the alarm code; 21. Displays the version number of the logic chip; 22. Display relay engagement status; 23. Display the running status; 24. Displays the external voltage status. | 0-23 | 0 |
| 4 | Control Mode Selection | Through this parameter, the control mode of the drive can be set:   1. Position control mode; 2. Speed control mode; 3. Torque control mode; 4. Position velocity mixed control mode; 5. Position torque hybrid control mode; 6. Mixed control mode of speed and torque. | 0-5 | 0 |
| 5 | Speed Proportional Gain | 1. Set the proportional gain of the speed loop adjuster. 2. The higher the set value, the higher the gain and the greater the stiffness. The parameter values are determined according to the specific servo drive system model and load situation. In general, the larger the load inertia, the greater the set value. 3. Under the condition that the system does not produce oscillation, try to set it as large as possible. | 5-2000 Hz | 200 |
| 6 | Velocity integral constant | 1. Set the integration time constant of the speed loop regulator. 2. The smaller the set value, the faster the integration speed, and the stronger the system resistance deviation, that is, the greater the stiffness, but too small is easy to produce overshoot. | 1-1000 ms | 75 |
| 7 | Torque filter | 1. Set the torque command filter characteristics. 2. It is used to suppress the resonance caused by torque. 3. The smaller the value, the lower the cut-off frequency, and the smaller the vibration and noise generated by the motor. If the load inertia is large, the setpoint can be reduced appropriately. If the value is too small, the strain will be slow and may cause oscillation. 4. The higher the value, the higher the cut-off frequency and the faster the response. If a higher torque response is required, the setpoint can be increased appropriately. | 20-500% | 100 |
| 8 | Speed detection filter | 1. Set the speed to detect the filter characteristics. 2. The smaller the value, the lower the cut-off frequency, and the less noise generated by the motor. If the load inertia is large, the setpoint can be reduced appropriately. If the value is too small, the response will change slow, may cause oscillations. 3. The higher the value, the higher the cut-off frequency, and the faster the speed feedback response. If a high-speed response is required, the setpoint can be increased appropriately. | 20-500% | 100 |
| 9 | Position proportional gain | 1. Set the proportional gain of the position ring adjuster. 2. The larger the set value, the higher the gain, the greater the stiffness, and the smaller the position lag under the same frequency command pulse condition, but too large a value may cause oscillation. 3. The parameter value is determined in terms of the specific servo drive model and load situation. | 1-1000 | 80 |
| 11 | Quantity of command pulse  per revolution of motor | 1. Set the quantity of command pulses equivalent to 1 revolution of the motor. 2. When this set value is 0, PA-12 (position command pulse divider numerator) and PA13 (position command pulse divider denominator) are valid. | 0-30000 | 10000 |
| 12 | The first numerator of the electronic gear of the position command pulse | 1. Set the split frequency of position command pulse (electronic gear). 2. In the position control mode, by the setting of PA12 and PA13 parameters, it can be easily matched with various pulse sources to achieve the user’s ideal control resolution (i.e., angle/pulse). 3. P×G=N×C×4.   P: the pulse number of input command; G: electronic gear ratio; G = Split frequency numerator/split frequency denominator N: number of motor rotations; C: Number of lines / revolution of photoelectric encoder, this system C=2500.   1. For example, when the input command pulse is 6000, for per revolution of the servo motor G= (N× C×4)/P= (1×2500×4)/6000=5/3   Then the parameter PA12 is set to 5 and PA13 is set to 3.   1. The command pulse electronic gear numerator is determined by Gear1 and Gear2. The denominator is set by the parameter PA13. The combinations are as follows:  |  |  |  |  | | --- | --- | --- | --- | | DI Signal {Note} | | Command pulse electronic gear denominator | Note: 0 means OFF, 1 means ON. | | Gear 2 | Gear 1 | | 0 | 0 | First numerator (parameter PA12) | | 0 | 1 | Second numerator (parameter PA 77) | | 1 | 0 | Third numerator (parameter PA 78 ) | | 1 | 1 | Fourth numerator (parameter PA 79 ) | | 0-32767 | 0 |
| 13 | Position command pulse electronic gear denominator | See parameter PA12. | 1-32767 | 10000 |
| 14 | Position command pulse input method | 1. Set the input form of the position command pulse. 2. Set the parameters to one of 3 input methods: 3. Pulse + direction; 4. CCW pulse/CW pulse; 5. A and B two-phase quadrature pulse input; 6. Internal location input.   Note: CCW is observed from the axial direction of the servo motor, rotating in the counterclockwise direction, and is defined as the positive direction; CW is an axial view from the servo motor, rotating in a clockwise direction,  Defined as reverse. | 0-3 | 0 |
| 15 | The direction of the command pulse is reversed | Set to:   1. Normal; 2. The direction of the position command pulse is reversed. | 0-1 | 0 |
| 16 | Positioning completion range | 1. Set the pulse range of position completion under position control. 2. This parameter provides the basis for the driver to judge whether to complete the positioning under the position control mode. When the quantity of remaining pulses in the position deviation counter is less than or equal to the set value of this parameter, the COIN (Positioning Complete) of the digital output DO is ON, otherwise is OFF. 3. The comparator has a function of return difference and is set by parameter PA84. | 0-30000 pulse | 10 |
| 17 | Position out-of-tolerance range detection | 1. Set the detection range of the location out-of-tolerance alarm. 2. In the position control mode, when the count value of the position deviation counter exceeds the value of this parameter, the driver gives the position out of tolerance alarm. | 0-30000× 100  pulse | 400 |
| 18 | Position out- of-tolerance error invalid | 1. The position out-of-tolerance alarm detection is valid; 2. The position deviation alarm detection is invalid, and the detection of position deviation error is stopped. | 0-1 | 0 |
| 19 | Position command smoothing filter | 1. Smooth filtering of command pulse, with exponential acceleration and deceleration, and the numerical value represents the time constant. 2. The filter does not lose the input pulse, but there is a command delay. 3. This filter is used: 4. The upper controller has no acceleration/ deceleration function; 5. The electronic gear has a large split frequency (>10); 6. The frequency of instructions is low. 7. When the motor is running, there is a phenomenon of stepping jump and unsteady. 8. When set to 0, the filter does not work. | 0-1000×  0.1ms | 100 |
| 20 | Drive prohibition input invalid | 0: CCW and CW input prohibition are valid. When the CCW drive prohibition switch (FSTP) is set ON, the CCW drive is allowed; When the CCW drive prohibition switch (FSTP) is set OFF, the torque in the CCW direction remains 0; The same goes for CW. If both CCW and CW driver prohibition switch are set OFF, a driver inhibition error alarm will be generated;  1: Cancel CCW and CW input prohibition. CCW and CW drivers are allowed regardless of the switch status (ON/OFF) of CCW and CW driver prohibition. Meanwhile, if CCW and CW driver prohibition is OFF, there will be no driver prohibition error alarm. | 0-1 | 1 |
| 21 | JOG run speed | Sets the run speed of JOG operation. | 0-6000 r/min | 100 |
| 22 | Speed command source | When the speed is controlled, set the source of the speed command, and the parameter meaning:   1. The analog speed command is input by the analog port AS+ and AS-; 2. Internal speed command, determined by SP1 and SP2 of the DI input  |  |  |  | | --- | --- | --- | | DI Signal {Note} | | Speed command | | SP2 | SP1 | | 0 | 0 | Internal speed 1 (parameter PA24) | | 0 | 1 | Internal speed 2 (parameter PA25) | | 1 | 0 | Internal speed 3 (parameter PA26) | | 1 | 1 | Internal speed 4 (parameter PA27) |  1. Analog speed command + Internal speed command:  |  |  |  | | --- | --- | --- | | DI Signal {Note} | | Speed command | | SP2 | SP1 | | 0 | 0 | Analog speed commands | | 0 | 1 | Internal speed 2 (parameter PA25) | | 1 | 0 | Internal speed 3 (parameter PA26) | | 1 | 1 | Internal speed 4 (parameter PA27) |   Note: 0 is OFF and 1 is ON.   1. JOG speed command, which needs to be set in JOG operation. 2. Keyboard speed command, which needs to be set in the keyboard speed regulation (Sr) operation. 3. IO terminal control jog operation. | 0-5 |  |
| 23 | Maximum speed limit | Set the maximum speed limit of servo motor.   1. Regardless of the direction of rotation. 2. If the set value exceeds the rated speed, the actual maximum speed limit is the rated speed. | 0-6000r/min | 5000 |
| 24 | Internal speed 1 | 1. Set the internal speed 1. 2. Speed control mode (PA22=0), when SP1 is OFF, SP2 is OFF, select internal velocity 1 as the speed command. | -6000- 6000 r/min | 100 |
| 25 | Internal speed 2 | * 1. Set the internal speed 2.   2. In speed control mode (PA22=0), when SP1 is ON and SP2 is OFF, select internal speed 2 as the speed command. | -6000-6000 r/min | 500 |
| 26 | Internal speed 3 | * 1. Set the internal speed 3.   2. In speed control mode (PA22=0), when SP1 is OFF and SP2 is ON, select internal speed 3 as the speed command | -6000-  6000  r/min | 1000 |
| 27 | Internal speed 4 | * 1. Set the internal speed 4.   2. In speed control mode (PA22=0), when SC1 is ON and SC2 is ON, select internal speed 4 as the speed command. | -6000- 6000 r/min | 2000 |
| 28 | Arrival Speed | * 1. When the motor speed exceeds this parameter, the ASP (arrived speed) of the digital output DO is ON, and otherwise OFF.   2. The comparator has a function of return difference, which is set by parameter PA87. It has a polarity setting function:  |  |  |  | | --- | --- | --- | | PA88 | PA28 | Comparators | | 0 | >0 | Speed without direction | | 1 | >0 | Only forward speed is detected | | <0 | Only reverse speed is detected | | 0-3000 r/min | 3000 |
| 29 | Analog torque command input gain | * 1. Set the proportional relationship between the analog torque input voltage and the actual operating torque of the motor.   2. The unit of the set value is 0.1V/100%.   3. The default value is 30, which corresponds to 3V/100%, i.e. the input 3V voltage produces 100% of the rated torque. | 10-100 (0.1v/ 100%) | 30 |
| 30 | User torque overload alarm value | * 1. Set the user’s torque overload value, which is the percentage of the rated torque, and the torque limit value is directionless, and the positive and reverse directions are protected.   2. In the case of PA31>9, when the motor torque > PA30 and the duration > PA31, the driver gives alarm Err-29, and the motor stops. After the alarm is given, the drive must be re-powered on to clear the alarm. | 1-300 | 300 |
| 31 | User torque, overload alarm detection time | * 1. User torque overload detection time, in milliseconds.   2. When set to zero, the user torque overload alarm does not work. | 0-32767 | 0 |
| 32 | Torque command source | * 1. In torque control, set the source of torque command.   2. Parameter indication: 0: analog torque command, input by analog port AS+, AS-.  1. Internal torque command, determined by TRQ1 and TRQ2 of DI input:  |  |  |  | | --- | --- | --- | | DI Signal {Note} | | Torque command | | TRQ2 | TRQ 1 | | 0 | 0 | Internal torque 1 (Parameter PA64) | | 0 | 1 | Internal torque 2 (Parameter PA65) | | 1 | 0 | Internal torque 3 (Parameter PA66) | | 1 | 1 | Internal torque 4 (parameter PA67) |  1. Analog torque command + internal torque command:  |  |  |  | | --- | --- | --- | | DI Signal {Note} | | Torque command | | TRQ2 | TRQ1 | | 0 | 0 | Analog torque command | | 0 | 1 | Internal torque 2 (Parameter PA65) | | 1 | 0 | Internal torque 3 (Parameter PA66) | | 1 | 1 | Internal torque 4 (parameter PA67) |   Note: 0 means OFF, 1 means ON. | 0-1 | 0 |
| 33 | The analog torque command is entered in the opposite direction | * 1. Reverse polarity of analog torque input.   2. Once the reference origin (ORGP raising edge or Z-phase pulse) is found as the mechanical origin, the deceleration stops. | 0-1 | 0 |
| 34 | Internal CCW torque limit | * 1. The set value is a percentage of the rated torque, e.g. set to 2 times the rated torque, then the set value is 200.   2. This limit is valid at all times.   3. If the set value exceeds the maximum allowable overload capacity of the system, the actual torque is limited to the maximum allowable overload capacity of the system. | 0-300% | 300% |
| 35 | Internal CW torque limit | * 1. The set value is a percentage of the rated torque, for example, if it is set to 2 times the rated torque, the set value is -200.   2. This limit is valid at all times.   3. If the set value exceeds the maximum allowable overload capacity of the system, the actual torque is limited to the maximum allowable overload capacity of the system. | -300-0% | -300% |
| 36 | External CCW torque limit | * 1. The set value is a percentage of the rated torque, e.g. set to 1 times the rated torque, then the set value is 100.   2. This limit is only valid when the CCW torque limit input terminal (CCWL) is ON.   When the limit is valid, the actual torque limit is lowest one among the maximum overload capacity energy of the system, internal CCW torque limit, and external CCW torque limit. | 0-300% | 100% |
| 37 | External CW moment limit | Sets the external torque limit value in the CW direction of the servo motor.   * 1. The set value is a percentage of the rated torque, for example, if it is set to 1 times the rated torque, the set value is -100.   2. This limit is only valid when the CW torque limit input terminal (CWL) is ON.   When the limit is in effect, the actual torque is the lowest of the absolute values of the maximum overload capacity of the system, internal CW torque limit, and external CW torque limit. | -300-0% | -100% |
| 39 | Analog torque command zero bias compensation | The amount of bias compensation for the analog torque input. | -2000-  2000 | 0 |
| 40 | Acceleration time constant | The set value indicates the acceleration time of the motor from 0-1000r/min.   * 1. Acceleration/deceleration characteristics are linear.   2. It is only used for speed control mode, and the position control mode is invalid.   3. If the drive is used in combination with the external position ring, this parameter is set to 0. | 1-10000ms | 100 |
| 41 | Deceleration time constant | The set value indicates the deceleration time of the motor from 1000-0r/min.   * 1. Acceleration/deceleration characteristics are linear.   2. It is only used for speed control mode, and the position control mode is invalid.   3. If the drive is used in combination with an external position ring, this parameter is set to 0. | 1-10000ms | 100 |
| 42 | S-type acceleration and deceleration time constants | Start and stop the motor smoothly, and set time of S-type acceleration and deceleration curve. | 0-1000ms | 0 |
| 43 | Analog speed command input gain | Set the proportional relationship between the analog speed input voltage and the actual operating speed of the motor | 10-3000 r/min/v | 300 |
| 44 | The direction of the analog velocity command is reversed | Polarity reversal of analog velocity inputs.   * 1. When set to 0, the analog velocity command is positive and the velocity direction is CCW.   2. When set to 1, the analog velocity command is positive and the velocity direction is CW. | 0-1 | 0 |
| 45 | Analog velocity command zero offset compensation amount | The zero offset compensation amount of analog velocity command | -5000-5000 | 0 |
| 46 | Analog velocity command filter | * 1. Low-pass filter for analog velocity inputs.   2. The larger the setting, the faster the response to the speed input analog, and the greater the impact of signal noise; the smaller the setting, the slower the response speed, and the smaller the impact of signal noise. | 1-1000 Hz | 300 |
| 47 | Mechanical brake action set when the motor is stopped | * 1. Define the delay time from the mechanical brake action (the output BRK changes from ON to OFF) to the motor current cut-off during the motor stoppage.   2. This parameter should not be less than the delay time (Tb) of mechanical braking to avoid small displacement of the motor or working drop. | 0-200× 10ms | 0 |
| 48 | Set when the motor is running | * 1. Define the delay time from the motor current cut-off to the mechanical braking action (the output BRK changes from ON to OFF) during the motor stop.   2. This parameter is to set mechanical brake action preventing from damaging the brake when the motor decelerates from high-speed rotation to low speed.   3. The actual operating time is the time required for PA48 or the motor to decelerate to PA49 value, whichever is the minimum. | 0-200× 10ms | 50 |
| 49 | The speed at which the mechanical brake moves when the motor is running | * 1. Define the speed value in the period from the motor current cut-off to the mechanical brake action (the output terminal BRK changes from ON to OFF) during motor operation.   2. The actual operating time is the time required for PA48 or the motor to decelerate to PA49 value, whichever is the minimum. | 0-3000 r/min | 100 |
| 50 | Speed limitation during torque control | * 1. In torque control, the motor operating speed is limited to this parameter.   2. It can prevent overspeeding phenomenon under light load. | 0-5000 r/min | 3000 |
| 53 | Servo force enabled | Set to:   1. The enable signal is controlled by the SON of the DI input; 2. The software is forced to enable. | 0-1 | 0 |
| 54 | Servo enable delay shutdown time | Define the time when the motor current is delayed to cut off after the servo enable signal is turned off. | 0~30000×  0.1ms | 0 |
| 55 | Active level control word of input terminal | * 1. Set the input terminal to be reversed. The terminal not reversed is valid when the switch is closed, and invalid when the switch is disconnected; The inverted terminal is invalid when the switch is closed, and it is valid when the switch is disconnected.   2. It is represented by a 4-bit binary number, “0” means that the output terminal is not reversed, and “1” means that the output terminal of the representative is reversed.   The input terminals represented by binary numbers are as follows:   |  |  |  |  | | --- | --- | --- | --- | | 3 | 2 | 1 | 0 | | DI4 | DI3 | DI2 | DI1 |  1. High level is active; 2. Low level is active. | 0000-1111 | 0000 |
| 57 | Active level control word of output terminal | * 1. Set the output terminal to be reversed. For inverted terminals, the definition of turn-on and cut-off is exactly the opposite of the standard definition.   2. It is represented by a 4-bit binary number, “0” means that the output terminal is not reversed, and “1” means that the output terminal is reversed.   The input terminals represented by binary numbers are as follows:   |  |  |  |  | | --- | --- | --- | --- | | 3 | 2 | 1 | 0 | | DO4 | DO3 | DO2 | DO1 |  1. High level is active; 2. Low level is invalid. | 0000-1111 | 0000 |
| 58 | IO input terminal de-jitter bounce time constant | * 1. De-jitter filter time to input terminals.   2. The smaller the value, the faster the terminal input response.   3. The higher the value, the better the anti-interference performance of the terminal input, but the slower the response. | 1-20ms | 2 |
| 59 | Command pulse valid edge | Set to:   1. The raising edge of the pulse is valid; 2. The falling edge of the pulse is valid | 0-1 | 0 |
| 60 | Soft reset | Set to:   1. Soft reset is invalid; 2. The soft reset is valid, and the system will restart. | 0-1 | 0 |
| 61 | System alarm Clear | Set to:   1. The system alarm is invalid. 2. The system alarm is cleared | 0-1 | 0 |
| 62 | Encoder selection | 1. Singleturn absolute encoder; 2. Multiturn absolute encoder. | 4-5 | Determined by the motor |
| 63 | Load inertia ratio | * 1. Set the load inertia ratio of the corresponding motor moment of inertia.   2. Setting value = ((load inertia + moment of inertia) / moment of inertia) ×100. | 1-500 | 100 |
| 64 | Internal torque 1 | In torque control mode (PA4=2), when TRQ1 OFF and TRQ2 OFF, select internal torque 1 as the torque command. | -300-300 | 0 |
| 65 | Internal torque 2 | In the torque control mode (PA4=2), when TRQ1 ON TRQ2 OFF, select internal torque 2 as the torque command. | -300-300 | 0 |
| 66 | Internal torque 3 | In torque control mode (PA4=2), when TRQ1 OFF TRQ2 ON, select internal torque 3 as the torque command. | -300-300 | 0 |
| 67 | Internal torque 4 | In torque control mode (PA4=2), when TRQ1 ON TRQ2 ON, select internal torque 3 as the torque command. | -300-300 | 0 |
| 71 | Fixed addressing and address | Slave address for fixed addressing | 1-10000 | 1 |
| 72 | High-speed IO port filter settings | Set the high-speed IO port filter time factor | 1-1000× 50us | 40 |
| 74 | Limit signal valid or not | 1. Limit signal is not enabled; 2. The motor does not continue to run in the corresponding direction when it reaches the positive/negative limit point. | 0-1 | 0 |
| 75 | Zero-speed detection point | * 1. When the motor speed is lower than this parameter, ZSP (zero speed) of the digital output DO is ON; otherwise, it is OFF.   2. If the speed command value is lower than this value when ZCLAMP of the digital input DI is ON, the speed command value is forced to zero. | 0-1000 r/min | 10 |
| 76 | Speed consistency set value | When the difference between the actual speed and the command speed is less than this set value, the UCO2N (same speed) of the digital output DO is ON, otherwise OFF. | 0-1000 r/min | 10 |
| 77 | The second numerator of the position command pulse electronic gear ratio | See parameter PA12 for details. | 0-32767 | 0 |
| 78 | The third numerator of the position command pulse electronic gear ratio | See parameter PA12 for details. | 0-32767 | 0 |
| 79 | The forth numerator of the position command pulse electronic gear ratio | See parameter PA12 for details. | 0-32767 | 0 |
| 80 | Command direction signal valid level | Set to:   1. High positive direction; 2. Low positive direction. | 0-1 | 0 |
| 81 | Command pulse PULS signal filter | * 1. Digital filter of pulse input PULS signals, the higher the value, the greater the filter time constant.   2. The maximum pulse input frequency is 500kHz (kpps) by default, and the higher the value, the higher the maximum pulse input frequency, the lower the maximum pulse input frequency.   3. It is used to filter out the noise on the signal line to avoid count errors. In case of inaccuracy due to inaccurate count, the parameter value can be increased appropriately.   4. The modified parameters must be saved and will take effect after the device is re-powered on. | 0-15 | 4 |
| 82 | Command pulse SIGN signal filter | * 1. Digital filter of the pulse input SIGN signal, the higher the value, the greater the filter time constant.   2. The maximum pulse input frequency is 500kHz (kpps) by default, and the higher the value, the higher the maximum pulse input frequency, the lower the maximum pulse input frequency.   3. It is used to filter out the noise on the signal line to avoid count errors. In case of inaccuracy due to inaccurate count, the parameter value can be increased appropriately.   4. The modified parameters must be saved and will take effect after the device is re-powered on. | 0-15 | 1 |
| 83 | CWL, CCWL direction prohibition methods | * 1. When the machine touches the mechanical limit switch and triggers CWL or CCWL limit, this parameter is used to select the prohibition mode.   Parameter indication:   1. Limit the torque in this direction to 0; 2. Disable pulse input in this direction | 0-1 | 0 |
| 84 | Positioning completed return difference | * 1. Set the pulse range of positioning completed under position control.   2. When the quantity of remaining pulses in the position deviation counter is less than or equal to the set value of this parameter, the COIN (Positioning Completed) of the digital output DO is ON, otherwise OFF.   3. The comparator has return difference function, which is set by parameter PA85. | 0-32767 pulse | 5 |
| 85 | Position the proximity range | * 1. Position the proximity pulse range under the set position control.   2. When the quantity of remaining pulses in the position deviation counter is less than or equal to the set value of this parameter, the NEAR of digital output DO (near positioning) is ON, and otherwise OFF.   3. The comparator has function of return difference, which is set by the parameter PA86.   4. It is used when the positioning is about to be completed, the host computer receives the NEAR signal to prepare for the next step. Generally, the value of the parameter is larger than the range of the positioning completion. | 0-32767 pulse | 500 |
| 86 | Positioning proximity return difference | See description of parameter PA85 for details. | 0-32767 pulse | 50 |
| 87 | Arrival speed return difference | * 1. When the motor speed exceeds this parameter, the ASP (arrival speed) of the digital output DO is ON and otherwise OFF.   2. The comparator has a function of return difference.   3. It has the function of polarity setting:  |  |  |  | | --- | --- | --- | | PA88 | PA28 | Comparators | | 0 | >0 | Directionless speed | | 1 | >0 | Only forward speed is detected | | <0 | Only the reverse speed is detected | | 0-5000 r/min | 30 |
| 88 | Arrival speed polarity | Refer to the description of parameter PA87. | 0-1 | 0 |
| 90 | Arrival torque return difference | * 1. When the motor torque exceeds this parameter, the ATRQ (arrival torque) of the digital output DO, is ON and otherwise OFF.   2. The comparator has a function of return difference, which is set by the parameter PA90.   3. It has the function of polarity setting:  |  |  |  | | --- | --- | --- | | PA91 | PA89 | Comparators | | 0 | >0 | Directionless torque | | 1 | >0 | Only forward torque is detected | | <0 | Only the reverse torque is detected | | 0-300% | 5% |
| 91 | Arrival torque polarity | * 1. When the motor torque exceeds this parameter, the ATRQ (arrival torque) of the digital output DO, is ON and otherwise OFF.   2. The comparator has a function of difference, which is set by the parameter PA90.   3. It has the function of polarity setting:  |  |  |  | | --- | --- | --- | | PA91 | PA89 | Comparators | | 0 | >0 | Directionless torque | | 1 | >0 | Only forward torque is detected | | <0 | Only the reverse torque is detected | | 0-1 | 0 |
| 92 | Zero speed detection return difference | * 1. When the motor speed is lower than this parameter, the ZSP (zero speed) of digital output DO is ON and otherwise is OFF.   2. The comparator has a function of return difference. | 0-1000 r/min | 5 |
| 94 | Delay time for turning on electromagnetic brake | * 1. Set the delay time for turning on the electromagnetic brake.   2. Define the delay time in the period from the powering-on of the motor to the release of the electromagnetic brake (BRK of DO output terminal is ON) when the system goes from the unenabled state to the enabled state. | 0-200 ms | 0 |
| 95 | Motor encoder wire number | This parameter value × 4 is the motor encoder resolution. Please modify it with caution, otherwise incorrect settings may cause overspeed. | 0-10000 | 2500 |
| 96 | Motor pole-pair number | This parameter indicates the number of motor pole-pair. Please modify it carefully, otherwise the wrong setting will cause overspeed. | 1-360 | 4 |
| 97 | Z zero offset angle | Z signal to the zero-offset angle of the motor. | 0-3600 | 216 |
| 99 | Maximum duty cycle during braking | Maximum duty cycle during braking adjustable parameter PA-99. | 5-90 | 50 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Name | Range | Factory value | |
| P3-0 | Digital input DI1 function | 0-99 | 3 | |
| P3-1 | Digital input DI2 function | 0-99 | 4 | |
| P3-2 | Digital input DI3 function | 0-99 | 34 | |
| P3-3 | Digital input DI4 function | 0-99 | 5 | |
| P3-4 | Digital input DI5 function | 0-99 | 6 | |
| P3-5 | Digital input DI6 function | 0-99 | 0 | |
| P3-13 | The lower 8 bits of the current position value | -32768 - 32767 | 0 | |
| P3-14 | The higher 8 bits of the current position value | -32768 - 32767 | 0 | |
| P3-15 | The digital input DI enforced effective 1 | 00000000-11111111 | 00000000 | |
| P3-16 | The digital input DI enforced effective 2 | 00000000-11111111 | 00000000 | |
| P3-17 | The digital input DI enforced effective 3 | 00000000-11111111 | 00000000 | |
| P3-18 | The digital input DI enforced effective 4 | 00000000-11111111 | 00000000 | |
| P3-19 | The digital input DI enforced effective 5 | 00000000-11111111 | 00000000 | |
| P3-20 | Digital output DO1 function | 0-99 | 18 | |
| P3-21 | Digital output DO2 function | 0-99 | 3 | |
| P3-22 | Digital output DO3 function | 0-99 | 5 | |
| P3-23 | Digital output DO4 function | 0-99 | 8 | |
| P3-30 | Virtual input terminal control | 0-2 | 0 | |
| P3-31 | Virtual input terminal status value | 00000000-11111111 | 00000000 | |
| P3-32 | Virtual output terminal control | 0-1 | 0 | |
| P3-33 | The status value of the virtual output terminal | 0000-1111 | 0000 | |
| P3-38 | Virtual IO input DI1 function | 0-99 | 5 | |
| P3-39 | Virtual IO input DI2 function | 0-99 | 6 | |
| P3-40 | Virtual IO input DI3 function | 0-99 | 7 | |
| P3-41 | Virtual IO input DI4 function | 0-99 | 8 | |
| P3-42 | Virtual IO input DI5 function | 0-99 | | 9 |
| P3-43 | Virtual IO input DI6 function | 0-99 | | 10 |
| P3-44 | Virtual IO input DI7 function | 0-99 | | 11 |
| P3-45 | Virtual IO input DI8 function | 0-99 | | 12 |
| Notes: 1. When P3-30=0, the number of IO inputs is determined by DI1 ~ DI4, and the corresponding parameters P3-0~P3-3 are 4.  2. When P3-30=1, the IO input is determined by the corresponding bits of virtual IOP3-31, and the number of input IOs is 8, corresponding to the parameters P3-38~P3-45;  3. When P3-30=2, the IO input is determined by DI1~DI4 and P3-31, and the number of input IOs is 12, corresponding to the parameters P3-0~P3-3 and P3-38~P3-45. | | | | |

6.2 P3 group parameters

6.3 DI function list

Define value of input terminals (the parameters of the 6 terminals corresponding to the P3 group are P3-0, P3-1, P3-2, P3-3, P3-4, and P3-5)

|  |  |  |  |
| --- | --- | --- | --- |
| Define Values | Symbol | Function | Functional analysis |
| 0 | NULL | Non-functional | The input status has no effect on the system. |
| 1 | SON | Servo enable | Servo enable input terminals.  OFF: The servo drive cannot be used, and the motor has no current flow;  ON: The servo drive is enabled, and the motor has current flow. |
| 2 | ARST | Alarm clear | Alarm clear input terminal:  In case there is an alarm allowed to be cleared, enter the raising edge (OFF to ON instantly) to clear the alarm.  Note: Only some alarms are allowed to be cleared. |
| 3 | CCWL | Forward drive disabled | 1. CCW drive prohibition input terminal:  OFF: Forward (CCW) rotation is prohibited;  ON: Forward (CCW) rotation is allowed.  2. Used for mechanical limit travel protection, the function is controlled by parameter PA-20. Note that the default value of PA-20 is to ignore this function. If you need to enable this function, modify PA-20:  (1) When PA-20 is 0, the input prohibition function is valid, and whether CCW is prohibited is controlled by PA-83;  (2) When PA-20 is 1, the input prohibition function is invalid, and whether CCW is prohibited is not controlled by PA-83.  3. When the prohibition function is valid (PA-20 is 0):  (1) When PA-83 is 0, the forward torque limit is 0, and the forward pulse input is not limited;  (2) When PA-83 is 1, the input of the forward pulse is prohibited. |
| 4 | CWL | Reverse drive prohibited | 1. CW drive prohibits input terminal:   OFF: prohibit forward rotation (CW);  ON: allow forward rotation (CW).  2. For mechanical limit stroke protection, the function is regulated by parameter PA-20 control. Note that the default value of PA-20 is to ignore this function, if you want to enable this function, you need to modify PA-20: |
| (1) When PA-20 is 0, the function of input prohibition is effective, and whether the CW is prohibited is controlled by PA-83;  (2) When PA-20 is 1, the function of input prohibition is invalid, and whether CW is prohibited is not controlled by PA-83.  3. When the inhibition function is active (0 for PA-20):  (1) When PA-83 is 0, the reverse torque is limited to 0, and the reverse pulse input is not restricted;  (2) When PA-83 is 1, the input of the reverse pulse is disabled. |
| 5 | TCCW | Forward torque limit | OFF: CCW direction torque is not limited by the PA-36 parameter;  ON: CCW direction torque is limited by the PA-36 parameter.  Note: Regardless of whether the TCCW is valid or invalid, the CCW direction torque is still limited by parameter PA-34. |
| 6 | TCW | Reverse torque limit | OFF: The torque in the CW direction is not limited by the PA-37 parameter;  ON: The torque in the CW direction is limited by the PA-37 parameter.  Note: Regardless of whether the TCW is valid or invalid, the CW direction torque is still limited by parameter PA-35. |
| 7 | ZCLAMP | Zero speed clamp | The zero-speed clamping function is enabled when the following conditions are met (speed force is zero):  Condition 1: in speed control mode (PA4=1), when external speed is selected (PA22=0);  Condition 2: ZCLAMP ON;  Condition 3: The speed command is lower than the parameter PA-75.  If any of the above conditions are not met, normal speed control is performed. |
| 8 | CZERO | Zero instruction | Under speed or torque control, the speed or torque commands are:  OFF: normal command;  ON: zero instruction. |
| 9 | CINV | Reverse instruction | Under speed or torque control, the speed or torque commands are:  OFF: normal command;  ON: command is reversed. |
| 10 | SP1 | Speed Select 1 | In speed control mode (PA4=1), when the internal speed is selected (PA22=1), SP1 and SP2 are combined to select different internal speeds:  SP2=OFF SP1=OF: Internal velocity 1 (parameter PA-24)  SP2=OFF SP1=ON: Internal velocity 2 (parameter PA-25)  SP2=ON SP1=OFF: Internal velocity 3 (parameter PA-26)  SP2=ON SP1=ON: Internal velocity 4 (parameter PA- 27) |
| 11 | SP2 | Speed Select 2 |
| 13 | TRQ1 | Torque selection 1 | In torque control mode (PA4=2), when internal torque is selected (PA32=1), TRQ1 and TRQ2 are combined to select different internal torques:  TRQ2=OFF TRQ1=OFF: Internal torque 1 (parameter PA- 64)  TRQ2=OFF TRQ1=ON: Internal torque 2 (parameter PA- 65)  TRQ2=ON TRQ1=OFF: Internal torque 3 (parameter PA- 66)  TRQ2=ON TRQ1=ON: Internal torque 4 (parameter PA- 67) |
| 14 | TRQ2 | Torque selection 2 |
| 16 | CMODE | Composite mode control mode setting | When the PA-4 is set to 3,4 and 5, it is in mixed control mode, and the control mode can be switched through this input terminal:  (1) When PA-4 is 3, CMODE OFF implies the position mode; CMODE ON implies the speed mode;  (2) When PA-4 is 4, CMODE OFF implies the position mode; CMODE ON implies is the torque mode;  (3) When PA-4 is 5, CMODE OFF implies the speed mode; CMODE ON implies torque mode. |
| 18 | GEAR1 | Electronic gear selection 1 | When PA-11 is 0, the combination of GEAR1 and GEAR2 is used to select numerators with different electronic gear ratios:  GEAR2=OFF GEAR1=OFF: Numerator 1 (parameter PA- 12)  GEAR2=OFF GEAR1=ON: Numerator 2 (parameter PA-77)  GEAR2=OFF GEAR1=ON: Numerator 2 (parameter PA-77)  GEAR2=ON GEAR1= OFF: Numerator 3 (Parameter PA-78)  PA-78)  GEAR2=ON GEAR1=ON: Numerator 4 (Parameter PA-79) |
| 19 | GEAR2 | Electronic gear selection 2 |
| 20 | CLR | Position deviation clear | In position control mode, position deviation counter clears input terminal. |
| 21 | INH | Pulse input inhibit | In the position control mode, the position command pulse inhibits terminal:  OFF: the command pulse input is valid;  ON: Command pulse input is disabled. |
| 22 | JOGP | Positive inching | In speed mode, when PA22=5, this signal is turned on, the motor is in positive inching, and the speed is set by PA21.  Note: This signal is turned on at the same time as the reverse inching, and the inching function is ineffective. |
| 23 | JOGN | Reverse inching | In speed mode, when PA22=5; this signal is connected, the motor jogs in the reverse direction, and the speed is set by PA21.  Note: If this signal is connected at the same time as the forward jog, the jog function is invalid. |
| 27 | HOLD | Internal position control orders to stop | In internal position register mode, this signal is switched on and the motor will stop (can only be used in internal position mode PA-14=3). |
| 28 | CTRG | Internal location command trigger | In internal position register mode, when the internal position register control command (POS0-2) is selected, this signal is triggered, and the motor runs according to the internal position register command. The next trigger internal position command will not be accepted unless the digital output a zero-speed signal (ZSPD=1). |
| 29 | POS0 | Internal position command selection 0 | The relationship corresponding to the internal location selection:   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Location  command | P OS2 | P OS1 | P OS0 | | CT RG | Corresponding parameters | | P1 | 0 | 0 | 0 | ↑ | | P4-2 | | P4-3 | | P2 | 0 | 0 | 1 | ↑ | | P4-5 | | P4-6 | | P3 | 0 | 1 | 0 | ↑ | | P4-8 | | P4-9 | | P4 | 0 | 1 | 1 | ↑ | | P4- 11 | | | P4- 12 | | P5 | 1 | 0 | 0 | ↑ | | P4- 14 | | P4- 15 | | P6 | 1 | 0 | 1 | ↑ | | P4- 17 | | P4- 18 | | P7 | 1 | 1 | 0 | ↑ | | P4- 20 | | P4- 21 | | P8 | 1 | 1 | ↑ |  | | P4- 23 | | P4- 24 | |
| 30 | POS1 | Internal position command selection 1 |
| 31 | POS2 | Internal position command selection 2 |
| 33 | SHOM | Initiate origin regression | In the internal position register mode, the origin search is required, and the search for origin function is activated when this signal is turned on (please refer to the settings of P4-34). |
| 34 | ORGP | Return to the origin | In the internal position register mode, when searching for the origin, the servo will take the position of this point as the origin when the signal is turned on (please refer to the parameters P4-32). |

6.4 DO function list

Output terminal (the parameters of group P3 corresponding to four terminals are P3-20, P3-21, P3-22, and P3-23) definition value:

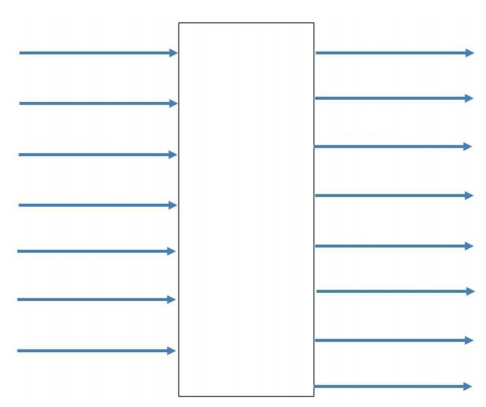
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Define Values | Symbol | Function | Functional analysis | |
| 1 | ON | Always valid | Forced output ON. | |
| 2 | RDY | Servo ready | OFF: The servo main power supply is abnormal or there is an alarm;  ON: The main power supply of the servo is normal, and there is no alarm. | |
| 3 | ALM | Alarm | OFF: There is an alarm;  ON: No alarm. | |
| 4 | ZSP | Zero speed | In speed and torque control,  OFF: Motor speed is higher than parameter PA-75 (directionless);  ON: Motor speed is lower than the parameter PA-75 (directionless). | |
| 5 | COIN | Positioning completed | In position control,  OFF: Position deviation is higher than parameter PA-16;  ON: Position deviation is less than parameter PA-16. | |
| 6 | ASP | Arrival speed | In speed and torque control,  OFF: motor speed is lower than parameter PA-28;  ON: Motor speed is higher than the parameter PA-28.  It has a polarity setting function, and the reference parameter PA-28 is described. | |
| 7 | ATRQ | Arrival torque | OFF: Motor torque is lower than parameter PA-89; ON: The motor torque is higher than the parameter PA-89.  It has a polarity setting function, and the reference parameter PA-89 is specified. | |
| 8 | BRK | Electromagnetic brake | OFF: electromagnetic brake works;  ON: electromagnetic brake releases. | |
| 9 | RUN | Servo running | OFF: The servo motor is not energized to run;  ON: The servo motor is running. | |
| 10 | NEAR | Positioning proximity | In position control,  OFF: Position deviation is greater than parameter PA-85;  ON: Position deviation is less than parameter PA-85. | |
| 11 | TRQL | Torque limit Medium | OFF: The motor torque does not reach the limit value;  ON: The motor torque reaches the limit value.  Torque limiting method by parameters PA-34, PA-35, PA-36, PA-370 | |
| 12 | SPL | Speed Limit Medium | In torque control  OFF: Motor speed does not reach the limit value;  ON: Motor speed reaches the limit value.  The speed limit method is set with parameter PA-50. | |
| 13 | VCOIN | Consistent speed | In torque control  OFF: The speed of the motor does not reach the limit value;  ON: The speed of the motor reaches the limit value.  The speed limitation method is set by parameter PA-50. | |
| 15 | HOME | Return to origin completed | | OFF: When the origin regression is not completed, the signal is not output;  ON: The signal output when the origin regression is completed. |
| 16 | CMDOK | Internal location Command completed | OFF: When the internal position command is not completed or the internal position command is not stopped, the signal is not output;  ON: When the internal position command is completed or the internal position command is stopped, the signal is output after the P4-1 set time has passed. | |
| 18 | ZOUT | Z signal output | | OFF: When the Z signal is invalid, there is no signal output;  ON: When the Z signal is valid, there is signal output. |

7 Control mode

7.1 Periodic Synchronization Position Mode CSP

**7.1.1 Control block diagram**

In the periodic synchronous position mode, the upper controller completes the position command planning, and then send the planned target position 607Ah to the servo drive in a periodic synchronous manner, and the position, speed and torque control are completed by the servo drive internally.



Control functions

Control mode 6060h

Control word 6040h

Target position 607Ah

The position reaches the threshold of 6067h

Gear ratio 6091h

Mode displays 6061h

Status word 6041h

Position deviation 60F4h

Position command 60FCh

Actual location 6064h

Actual speed 606Ch

Forward soft limit 607Dh-1

Reverse soft limit 607Dh-2

Actual torque 6077h

Error code 603Fh

Figure 7.1.1 Periodic position mode input and output objects

**7.1.2 Related objects**

|  |  |  |
| --- | --- | --- |
| Control word 6040h | | |
| Bit | Name | Description |
| 0 | Servo ready | Bit0-Bit3 are both 1, which means that the operation is started |
| 1 | Main circuit on |
| 2 | Quick shutdown |
| 3 | Servo running |
| CSP mode only supports absolute position instructions | | |
| Status word 6041h | | |
| Bit | Name | Description |
| 10 | Target reached | 0: Target position not reached  1: Target position reached |
| 11 | Software internal position exceeded | 0: Position command is within the limit  1: Position command is beyond the limit |
| 12 | Slave following command | 0: The slave does not follow the command  1: The slave follows the command |
| 13 | Following error | 0: There is no fault with excessive position deviation  1: There is fault with excessively large position deviation. |

**7.1.3 Recommended configuration**

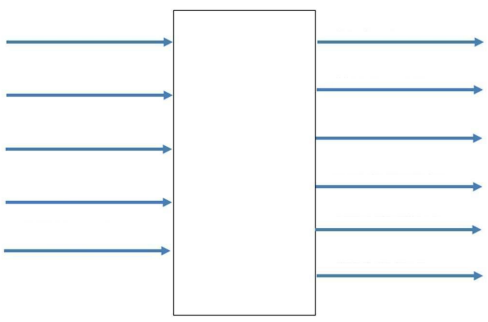
**Cyclic position mode with the following basic configuration:**

|  |  |  |
| --- | --- | --- |
| **RPDO** | **TPDO** | **Remarks** |
| 6040: Control word | 6041: Status word | Required |
| 607A: Target position | 6064: Position feedback | Required |
| 6060: Mode selection | 6061: Operation mode display | Optional |

**7.2 Periodic synchronization velocity mode CSV**

**7.2.1 Control block diagram**

**In the cyclic synchronization speed mode, the upper controller will send the calculated target speed 60FF to the servo driver periodically and synchronously, and the speed and torque adjustment are performed by the servo internally.**



Control functions

Gear ratio 6091h

Maximum speed 607Fh

Target speed 607Fh

Control word 6040h

Control mode 6060h

Mode display 6061h

Status word 6041h

Actual location 6064h

Actual speed 606Ch

Actual torque 6077h

Error code 603Fh

Figure 5.2 Cycle speed mode input and output objects

**7.2.2 Basic configuration**

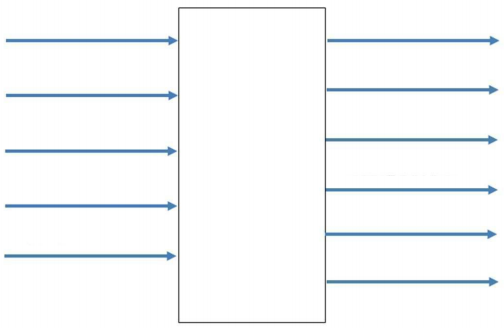
Cycle speed mode, the basic configuration is as follows:

|  |  |  |
| --- | --- | --- |
| RPDO | TPDO | Remarks |
| 6040: Control word | 6041: Status word | Required |
| 60FF: Target speed |  | Required |
|  | 6064: Location feedback  606C: Speed feedback | Optional |
| 6060: Mode selection | 6061: Operation mode display | Optional |

7.3 Periodic Synchronous Torque Mode CST

**7.3.1 Control block diagram**

In this mode, the upper controller sends the calculated target torque of 6071h to the servo drive periodically and synchronously, and the torque adjustment is performed by the servo internally. When the speed reaches the limit, it will enter the speed regulation stage.



Control functions

Control mode 6060h

Control word 6040h

Target torque 6071h

Maximum speed 607Fh

Maximum torque 6072h

The mode shows 6061h

Status word 6041h

Torque command 6074h

Actual speed 606Ch

Actual torque 6077h

Error code 603Fh

Figure 7.3.1 Periodic Torque Mode Input-Output Object

**7.3.2 Basic configuration**

Cyclic torque mode, the basic configuration is as follows:

|  |  |  |
| --- | --- | --- |
| RPDO | TPDO | Remarks |
| 6040: Control word | 6041: status word | Required |
| 6071: Target torque |  | Required |
|  | 6064: Position feedback  606C: Speed feedback  6077: Torque feedback | Optional |
| 6060: Mode selection | 6061: Operation mode display | Optional |

7.4 Profile Position Mode PP

**7.4.1 Related objects**

This mode is primarily used for point-to-point positioning applications. In this mode, the host computer gives the target position (absolute or relative), the velocity, acceleration and deceleration of the position curve, and the trajectory generator inside the servo will generate the target position curve command according to the setting, and the position control, speed control and torque control are completed inside the driver.

|  |  |  |
| --- | --- | --- |
| Control word 6040 | | |
| Bit | Name | Description |
| 0 | Servo ready | All 4 bits are 1, which means that the servo is currently charged and is enabled |
| 1 | Main circuit on |
| 2 | Quick shutdown |
| 3 | Servo running |
| 4 | New target position | From 0->1 indicates that there is a new position |
| 5 | Update immediately | 1. Not immediate 2. Immediately |
| 6 | Absolute/relative position | 1. The target position is absolute 2. The target position is relative |
| Status word 6041 | | |
| Bit | Name | Description |
| 10 | Target reached | 1. The target location was not reached 2. The target location has been reached |
| 12 | Target location update | 1. The target location can be updated 2. The destination cannot be updated |
| 13 | Following error | 1. There is no fault with excessive position deviation 2. There is fault with excessive position deviation |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Sub-index | Name | Visit | Data type | Unit | Setting range | Default value |
| 603F | 00 | Error code | RO | UINT16 | - | 0-65535 | 0 |
| 6040 | 00 | Control word | RW | UINT16 | - | 0-65535 | 0 |
| 6041 | 00 | Status word | RO | UINT16 | - | 0-65535 | 0 |
| 6060 | 00 | Mode of operation | RW | INT8 | - | 0-10 | 8 |
| 6061 | 00 | Mode display | RO | INT8 | - | 0-10 | 0 |
| 6062 | 00 | Location directives | RO | INT32 | Command unit | - | - |
| 6063 | 00 | Positional feedback | RO | INT32 | Encoder unit | - | - |
| 6064 | 00 | Positional feedback | RO | INT32 | Command unit | - | - |
| 6067 | 00 | The location reaches the threshold | RW | UINT32 | Encoder unit | 0-65535 | 130 |
| 606C | 00 | Actual speed | RO | INT32 | Command unit/s | - | 0 |
| 6077 | 00 | Actual torque | RO | INT16 | 0.1% | -3000~3000 | 0 |
| 607A | 00 | Target location | RW | INT32 | Command unit | -231~231-1 | 0 |
| 607F | 00 | Maximum speed | RW | UINT32 | Command unit/s | 0-232-1 | 600000 |
| 6081 | 00 | Profile velocity | RW | UINT32 | Command unit/s | 0~232-1 | 250000 |
| 6083 | 00 | Profile acceleration | RW | UINT32 | Command unit/s2 | 0~232-1 | 250000 |
| 6091 | 02 | Axis resolution | RW | UINT32 | - | 1~232-1 | 10000 |
| 60FC | 00 | Location directives | RO | INT32 | Encoder unit | - | - |
| 60E0 | 00 | Forward torque limiting | RW | UINT16 | 0.1% | 0-3000 | 3000 |
| 60E1 | 00 | Negative torque limit | RW | UINT16 | 0.1% | 0-3000 | 3000 |

7.4.2 Position curve generator

Control instruction timing --- not immediately updated

a) The host computer first updates and modifies other properties of the displacement command as needed (acceleration time 6083, deceleration time 6084, maximum running speed 6081, and target displacement 607A).

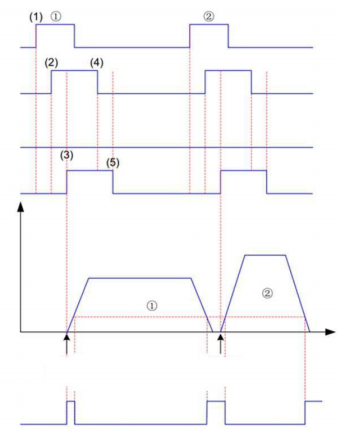
b) The host computer sets the bit4 of 6040 from 0 to 1, indicating that the slave has a new displacement command to be enabled.

c) After receiving the raising edge of bit4 of 6040, the slave station makes a judgment on whether the new displacement command can be received:

If the initial state of bit5 of 6040 is 0, and bit12 of 6041 is 0 at this moment, it indicates that the slave can receive a new displacement instruction ①; After the slave receives a new displacement instruction, the bit12 of 6041 is set from 0 to 1, indicating that the new displacement instruction ①has been received, and the current slave is in the state that it cannot continue to receive the new displacement instruction.

d) After receiving bit12 of status word 6041 becomes 1, the host computer can release the displacement instruction data, and set the bit4 of control word 6040 from 1 to 0, indicating that there is no new position instruction at present. Since the bit4 of the 6040 is valid, this operation does not interrupt the displacement command that is being executed.

e) The slave detects that the bit4 of the control word 6040 changes from 1 to 0, and after the positioning of the current segment is completed, the bit12 bit of 6041 is released, indicating that the slave is ready to receive a new displacement instruction. In the non-immediate update mode, the servo can not receive a new displacement instruction while the current segment is running, and the servo can receive a new displacement instruction once the positioning of the current segment is completed. And once receiving new displacement instruction (bit12 of 6041 changes from 0 to 1), the servo executes the displacement instruction immediately.



Displacement command data

6040bit4: enables new commands

6040bit5: is updated immediately

6041bit12: can accept the instruction

Location directives

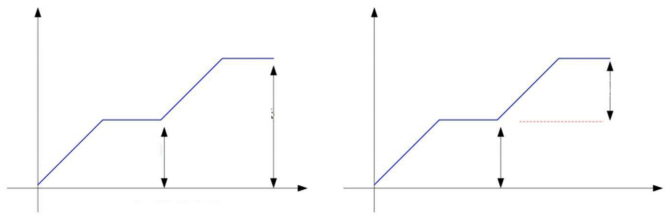
Trigger signal

Absolute position, non-immediate update 6040h: 0F→1F

Relative position, not immediately update 6040h: 4F→5F

6041bit10: location arrived

Figure 7.4.2.1 Non-immediate update timing diagram and motor operation curve



Relative position

Absolute position

Target position

Target position 1

Target position 2

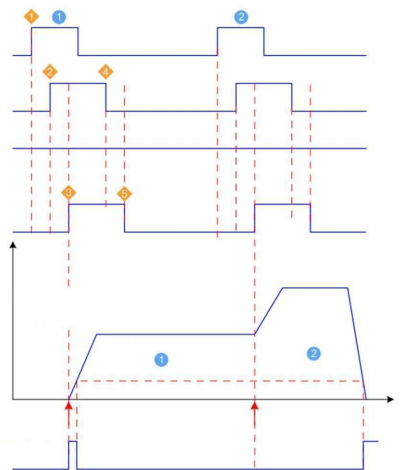
Target position

Target position 1

Target position 2

Figure 7.4.2.2 Difference between absolute position instructions and relative position instructions

Control instruction timing---immediate update type



6041bit12: can accept the instruction

6040bit5: is updated immediately

6040bit4: enables new commands

Absolute position, immediately update 6040h: 2F→3F

Relative position, immediately update 6040h: 6F→7F

Time

6041bit10: location arrived

XXX

XXX

Displacement command data

(a) The host computer first updates the other attributes of the displacement instruction (acceleration time 6083, deceleration time 6084, maximum operating speed 6081, and target displacement 607A) as necessary.

(b) The host computer sets bit4 of the 6040 from 0 to 1, indicating that the slave has a new displacement instruction that needs to be enabled.

(c) When the slave station receives the raising edge of bit4 of 6040, it will make a judgment on whether the slave station can receive the new displacement instruction or not:

If the initial state of bit5 of 6040 is 0, and bit12 of 6041 is 0 at this time, it indicates that the slave station can receive the new displacement instruction①; after the slave station receives the new displacement instruction, it will set bit12 of 6041 from 0 to 1, and when the bit4 of 6040 is set to 0, bit12 of 6041 will be set to 0, and then the motor will still be able to respond to the control instruction when it is running.

**7.4.3 Recommended configuration**

**The basic configuration of the profile position mode is as follows:**

|  |  |  |
| --- | --- | --- |
| RPDO | TPDO | Remarks |
| 6040: Control word | 6041: Status word | Required |
| 607A: Target location | 6064: Position feedback | Required |
| 6081: Profile velocity |  | Optional |
| 6083: Profile acceleration |  | Optional |
| 6060: Mode selection | 6061: Operating mode display | Optional |

7.5 Profile velocity mode PV

**7.5.1 Related objects**

In this mode, the host computer sends the target speed and acceleration to the servo drive, and the speed and torque adjustment are carried out by the servo internally.

|  |  |  |
| --- | --- | --- |
| Control word 6040 | | |
| Bit | Name | Description |
| 0 | Servo ready | All 4 bits are 1, which means that the servo is currently charging the main circuit and is enabled. |
| 1 | Main circuit on |
| 2 | Quick shutdown |
| 3 | Servo running |
| Status word 6041 | | |
| Bit | Name | Description |
| 10 | Goal Achieved | 0: The target velocity is not reached  1: The target velocity has been reached |
| 11 | Software internal limits | 0: The soft limit has not been reached  1: Reach the soft limit |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Sub-index | Name | Visit | Data type | Unit | Setting range | Default value |
| 603F | 00 | Error code | RO | UINT16 | - | 0-65535 | 0 |
| 6040 | 00 | Control word | RW | UINT16 | - | 0-65535 | 0 |
| 6041 | 00 | Status word | RO | UINT16 | - | 0-65535 | 0 |
| 6060 | 00 | Operation mode | RW | INT8 | - | 0-10 | 8 |
| 6061 | 00 | Mode display | RO | INT8 | - | 0-10 | 0 |
| 607F | 00 | Maximum speed | RW | UINT32 | /s | 0-232-1 | 600000 |
| 6083 | 00 | Profile acceleration | RW | UINT32 | Command unit/s | 0-232-1 | 250000 |
| 6063 | 00 | Position feedback | RO | INT32 | Encoder unit | - | - |
| 6064 | 00 | Position feedback | RO | INT32 | Command unit | - | - |
| 60FF | 00 | Target speed | RW | INT32 | Command unit | -231~231-1 | 0 |
| 60E0 | 00 | Positive torque limit | RW | UINT16 | 0.1% | 0-3000 | 3000 |
| 60E1 | 00 | Negative torque limit | RW | UINT16 | 0.1% | 0-3000 | 3000 |
| 606C | 00 | Actual speed | RO | INT32 | Command unit/s | - | 0 |
| 6077 | 00 | Actual torque | RO | INT16 | 0.1% | -3000~3000 | 0 |

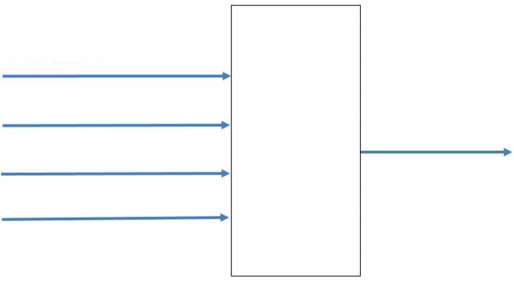
**7.5.2 Recommended configuration**

The basic configuration of the profile velocity mode is as follows:

|  |  |  |
| --- | --- | --- |
| RPDO | TPDO | Remarks |
| 6040: Control Word | 6041: Status word | Required |
| 607A: Target location |  | Optional |
|  | 6064: Location feedback  606C: Speed feedback | Optional |
| 60FF: Target speed |  | Required |
| 6083: Profile acceleration |  | Optional |
| 6060: Mode selection | 6061: Running mode display | Optional |

7.6 Profile torque mode PT

In this mode, the upper controller sends the target torque of 6071h and the torque ramp constant of 6087h to the servo drive, and the torque adjustment is performed by the servo internally. When the speed reaches the limit, it will enter the speed regulation stage.



Torque ramp 6087h

Target torque 6071h

Forward and reverse torque limit 60E0h/60E1h

Maximum torque 6072h

Torque command 6074h

Control functions

Figure 7.6 Profile torque mode input and output block diagram

**7.6.1 Related objects**

|  |  |  |
| --- | --- | --- |
| Profile word 6040 | | |
| Bit | Name | Description |
| 0 | Servo ready | All 4 bits are 1, which means that the servo is currently charging the main circuit and is enabled |
| 1 | Main circuit on |
| 2 | Quick shutdown |
| 3 | Servo running |

|  |  |  |
| --- | --- | --- |
| Status word 6041 | | |
| Bit | Name | Description |
| 10 | Goal Achieved | 0: The target torque has not been reached  1: The target torque has been reached |
| 11 | Software internal limit | 0: The soft limit has not been reached  1: Reach the soft limit |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Sub-index | Name | Visit | Data type | Unit | Setting range | Default value |
| 603F | 00 | Error code | RO | UINT16 | - | 0-65535 | 0 |
| 6040 | 00 | Control word | RW | UINT16 | - | 0-65535 | 0 |
| 6041 | 00 | Status word | RO | UINT16 | - | 0-65535 | 0 |
| 6060 | 00 | Operating mode | RW | INT8 | - | 0-10 | 8 |
| 6061 | 00 | Mode display | RO | INT8 | - | 0-10 | 0 |
| 606C | 00 | Actual speed | RO | INT32 | /s | - | - |
| 6071 | 00 | Target torque | RW | INT16 | 0.1% | -3000~3000 | 0 |
| 6072 | 00 | Maximum torque | RW | UINT16 | 0.1% | 0-3000 | 3000 |
| 6074 | 00 | Torque command | RO | INT16 | 0.1% | - | - |
| 6077 | 00 | Actual torque | RO | INT16 | 0.1% | - | - |
| 6087 | 00 | Torque ramp | RW | UINT32 | 0.1%/ms | 0-232-1 | 1 |

**7.6.2 Recommended configuration**

Profile Torque Mode (PT), the basic configuration is as follows:

|  |  |  |
| --- | --- | --- |
| RPDO | TPDO | Remarks |
| 6040: Control word | 6041: Status word | Required |
| 6071: Target torque |  | Required |
| 6087: Torque ramp |  |  |
|  | 6064: Location feedback  606C: Speed feedback  6077: Torque feedback | Optional |
| 6060: Mode selection | 6061: Operation mode display | Required |

7.7 Origin homing mode HM

The origin homing mode is used to find the mechanical origin and locate the position relationship between the mechanical origin and the mechanical zero point.

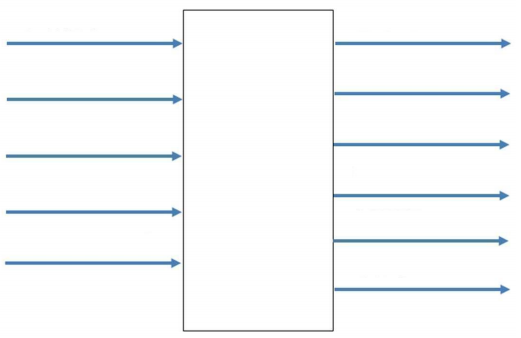
Mechanical origin: a fixed position on the machine, which can correspond to a certain origin switch and the Z signal of the motor.

Mechanical zero: Absolute 0 position on the machine.

After the origin homing, the motor stops at the mechanical origin, and the 607Ch is automatically set to the relationship between the mechanical origin and the mechanical zero point:

Mechanical origin = Mechanical Zero + 607Ch (Origin Offset)

When 607Ch=0, the mechanical origin coincides with the mechanical zero.



Control mode 6060h

Control word 6040h

Homing speed 6099h

Homing acceleration 609Ah

Original offset 607Ch

Mode display 6061h

Status word 6041h

Actual position 6064h

Actual speed 606Ch

Actual torque 6077h

Error code 603Fh

Control function

Figure 7.7 Input and output objects of origin homing mode

|  |  |  |
| --- | --- | --- |
| Control word 6040 | | |
| Bit | Name | Description |
| 0 | Servo ready | All 4 bits are 1, which means that the servo is currently charging the main circuit and is enabled |
| 1 | Main circuit on |
| 2 | Quick shutdown |
| 3 | Servo running |
| 4 | Start homing | 0-->1: Initiate homing  1-->0: The driver receives a homing signal |

|  |  |  |
| --- | --- | --- |
| Status word 6041 | | |
| Bit | Name | Description |
| 10 | Goal Achieved | 0: The target location was not reached  1: The target location has been reached |
| 12 | Homing | 0: Homing is completed, and a homing signal can be received  1: Homing is in progress, and the homing signal cannot be received |
| 13 | Homing error | 0: There is no homing error  1: There is timeout or excessively large deviation error in homing |

**The basic configuration is as follows:**

|  |  |  |
| --- | --- | --- |
| RPDO | TPDO | Remarks |
| 6040: Control word | 6041: Status word | Required |
| 6098: Zero-back mode |  | Optional |
| 6099-01: Search limit switch signal speed |  | Optional |
| 6099-02: Search zero signal speed |  | Optional |
| 609A: Homing acceleration |  | Optional |
|  | 6064: Position feedback  606C: Speed feedback  6077: Torque feedback | Optional |
| 6060: Mode selection | 6061: Operation mode display | Required |

Note: When homing acceleration is calculated, it shall be converted to r/min/ms, and the homing velocity can be changed only if the converted value is higher than 1.

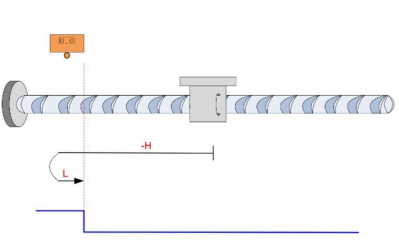
Introduction to homing modes supported by PX00E series servos currently:

1) 6098h=17

Mechanical origin: reverse overtravel switch

Deceleration point: reverse overtravel switch

a) The deceleration point signal is invalid when homing starts.



Reverse limit

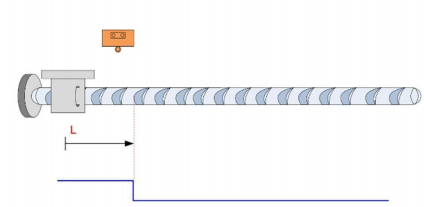
Motion trajectory

Reverse limit signal

Note: The “H” in the figure represents the high-speed 6099-1h, and the “L” represents the low-speed 6099-2h.

When homing starts, N-OT=0, homing at reverse high speed, and after encountering the raising edge of N-OT, it decelerates, reverses, runs at low speed in the forward direction, and stops after encountering the falling edge of N-OT.

b) The deceleration point signal is valid when homing starts.



Reverse limit

Motion trajectory

Reverse limit signal

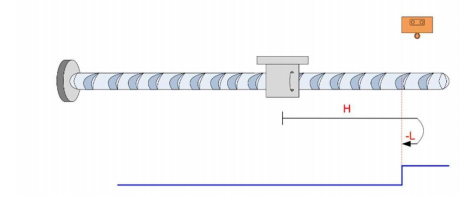
When homing starts, N-OT=1, homing directly forward at low speed, and stop when the N-OT falling edge is encountered.

2) 6098h=18

Origin: Forward overtravel switch

Deceleration point: Forward overtravel switch

a) The deceleration point signal is invalid when homing starts.



Forward Limit

Motion trajectory

Forward limit signal

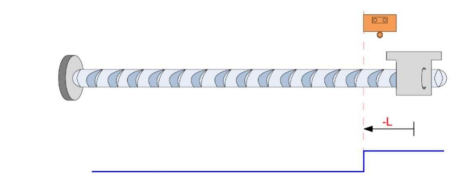
When homing starts, P-OT=0, homing forward at high speed, and decelerates, reverses, and runs reversely at low speed after encountering the raising edge of P-OT, and stop after encountering the falling edge of P-OT.

b) The deceleration point signal is valid when homing starts

Forward Limit

Motion trajectory

Forward limit signal



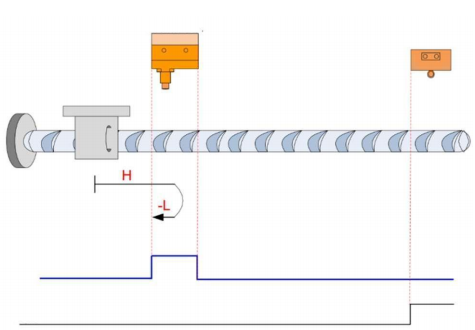
When homing starts, P-OT=1, homing reversely at low speed and stop when encountering P-OT falling edge.

3) 6098h=23

Origin: origin switch

Deceleration Point: Origin switch

a) The deceleration point signal is invalid when homing starts, and the forward limit switch is not encountered.



Origin switch

Forward limit

Movement tracks

Origin switch signal

Forward limit switch

When homing starts, HW=0, homing forward at high speed, without encountering the limit switch, decelerates, and homing reversely at low speed after encountering the raising edge of HW, and stop when encountering the falling edge of HW.

b) The deceleration point signal is invalid when homing starts, and the forward limit switch is encountered.

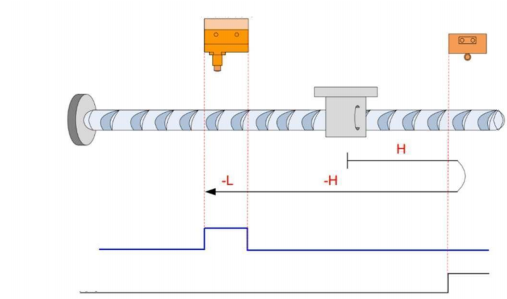
Origin switch

Forward limit

Movement track

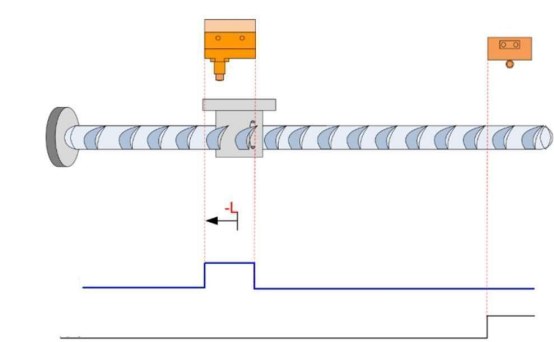
Origin switch signal

Forward limit switch



When homing starts, HW=0, homing forward at high speed, automatically reverse and homing reverse at high speed after encountering a limit switch, decelerate, homing reverse at low speed after encountering the raising edge of HW, and stop when encountering the falling edge of HW.

c) The deceleration point signal is valid when homing starts.



Origin switch

Forward limit

Movement track

Origin switch signal

Forward limit switch

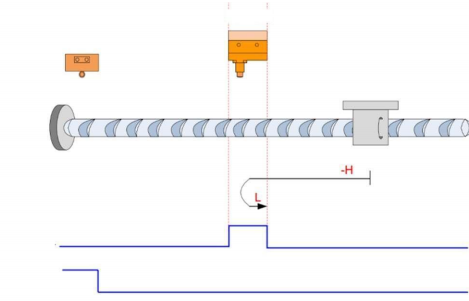
When homing starts, HW=1, homing direct reverse at low speed and stop encountering HW falling edge.

1. 6098h=27

Origin: Origin switch

Deceleration point: Origin switch

a) The deceleration point signal is invalid when homing starts, and the reverse limit switch is not encountered.



Origin switch

Reverse limit

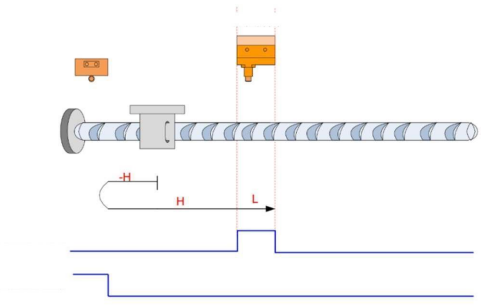
Movement track

Origin switch signal

Reverse limit switch

When homing starts, HW=0, homing reverse at high speed, not encounter the limit switch, and decelerate, reverse and homing forward at low speed after encountering the raising edge of HW, and stop when encountering the falling edge of HW.

b) The deceleration point signal is invalid when homing starts, and the reverse limit switch is encountered.



Origin switch

Reverse limit

Movement track

Origin switch signal

Reverse limit switch

When homing starts, HW=0, homing reverse at high speed, and autocratically revers, homing forward at high speed after encountering the limit switch, decelerate and homing forward at low speed after encountering the raising edge of HW, and stop when encountering the falling edge of HW.

c) The deceleration point signal is valid when homing starts.

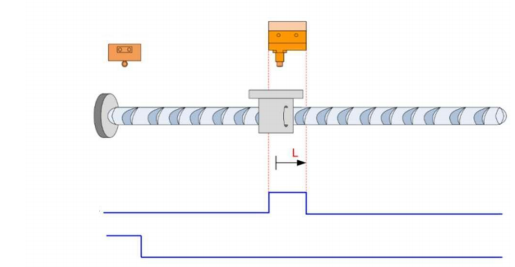
Origin switch

Reverse limit

Movement track

Origin switch signal

Reverse limit switch



When homing starts, HW=1, homing directly forward at low speed, and stop when encountering the falling edge of HW.

5) 6098h=35

The current location is cleared to 0.

7.8 Probe function

The probe function is the position latch function. It latches the position information (command unit) when the external DI signal changes.

Support 2 probes are enabled at the same time, which can record the position information corresponding to the raising and falling edges of each probe signal at the same time, that is, 4 position information can be latched at the same time. Probe 1 selects the pulse port as the probe signal, and probe 2 selects the direction port as the probe signal.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0x60B8 | 00 | Probe function | RW | Uint16 | - | **0~65535** | 0 |
| 0x60B9 | 00 | Probe status | RO | Uint16 | - | - | 0 |
| 0x60BA | 00 | Probe 1 raising edge latch position | RO | int32 | Command unit | - | 0 |
| 0x60BB | 00 | Probe 1 falling edge latch position | RO | int32 | Command unit | - | 0 |
| 0x60BC | 00 | Probe 2 raising edge latch position | RO | int32 | Command unit | - | 0 |
| 0x60BD | 00 | Probe 2 falling edge latch position | RO | int32 | Command unit | - | 0 |

7.8.1 Set the probe function 0x60B8

|  |  |
| --- | --- |
| Bit | Description |
| 0 | Probe 1 Enable:  0--Probe 1 Disabled  1--Probe 1 Enabled |
| 1 | Probe 1 trigger mode  0 — single trigger, trigger only when the trigger signal is valid for the first time  1 - repeated trigger |
| 2 | Probe 1 trigger signal selection  0—Pulse port input signal  1—Reserved, not currently supported |
| 3 | NA |
| 4 | Probe 1 Raising edge enable  0 -- Raising edge does bot latch  1 -- Raising edge latch |
| 5 | Probe 1 falling edge enable  0 -- Falling edge does not latch  1 -- Falling edge latch |
| 6 | NA |
| 7 | NA |
| 8 | Probe 2 enable:  0-- Probe 2 is not enabled  1-- Probe 2 is enabled |
| 9 | Probe 2 trigger mode  0—Single trigger, trigger only when the trigger signal is valid for the first time  1—Repeated trigger |
|  |  |
| 10 | Probe 2 Trigger signal selection  0—Pulse port input signal  1—Reserved, not currently supported |
| 11 | NA |
| 12 | Probe 2 Raising edge enable   1. - Raising edge not latch   -- Raising edge latch |
| 13 | Probe 2 Falling edge enable   1. - Falling edge not latch   1-- Falling edge latch |
| 14 | NA |
| 15 | NA |

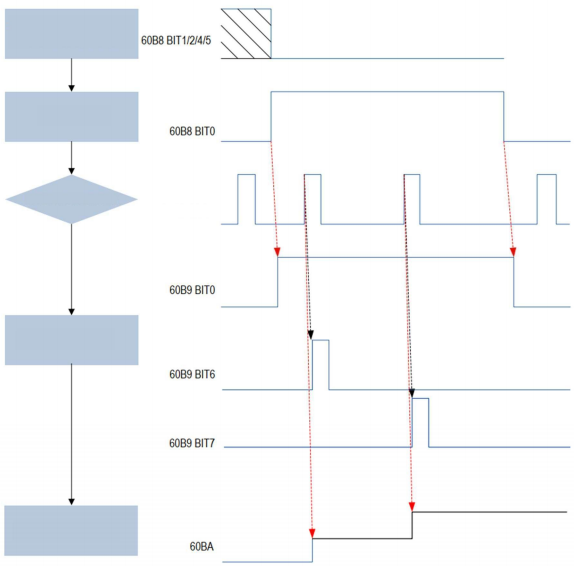
7.8.2 Read probe status 0x60B9

|  |  |
| --- | --- |
| Bit | Description |
| 0 | Probe 1 Enable:  0--Probe 1 is disabled  1--Probe 1 is enabled |
| 1 | Probe 1 Raising edge latch execution  0--Raising edge latch not executed  1--Raising edge latch executed |
| 2 | Probe 1 Falling edge latch execution  0-- Falling edge latch not executed  1-- Falling edge latch executed |
| 3 | NA |
| 4 | NA |
| 5 | NA |
| 6 | NA |
| 7 | Probe 1 trigger signal monitoring  0-Pulse input port is low level  1-pulse input port is high level |
| 8 | Probe 2 Enable:  0--Probe 1 is disabled  1--Probe 1 is enabled |
| 9 | Probe 2 Raising edge latch execution  0--Raising edge latch not executed  1--Raising edge latch executed |
| 10 | Probe 2 Falling edge latch execution  0-- Falling edge latch not executed  1-- Falling edge latch executed |
| 11 | NA |
| 12 | NA |
| 13 | NA |
| 14 | NA |
| 15 | Probe 2 Trigger signal monitoring  0—Direction input port is low level  1—Direction input port is high level |

**7.8.3 Probe latch position**

The 4 position information of the probe is recorded separately in object 0x60BA~0x60BD. In this example, if it is judged that the latching function of the raising edge position of probe 1 has been executed, the position information can be read by reading 0x60BA (the latch value of the raising edge position of probe 1 is feedback, and command unit).

For example, the trigger signal is triggered by pulse port input probe 1, the raising edge is latched, repeated trigger, and the function setting and status feedback timing of the probe are shown in the figure below.



Set probe 1 trigger mode /signal source /valid latch edge

Enable probe 1

Detect valid latch edge

Probe 1 signal

Read probe 1 status

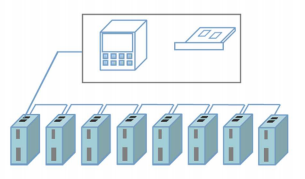
Read latch position information

**8 Fault codes**

|  |  |  |  |
| --- | --- | --- | --- |
| **Fault symbol** | **Fault name** | **Error code 603Fh** | **Reset or not** |
| 1 | Overspeed | 0x8400 | Yes |
| 2 | Bus overvoltage failure | 0x3210 | Yes |
| 3 | Bus undervoltage failure | 0x3220 | Yes |
| 4 | Too large position deviation fault | 0x8611 | Yes |
| 5 | Drive overheating | 0x4210 | Yes |
| 6 | Speed amplifier saturation | 0x1000 | Yes |
| 7 | Driver disable exception | 0x1000 | Yes |
| 8 | Position deviation counter overflow | 0x1000 | Yes |
| 9 | Encoder signal error differential signal detection error | 0x7305 | Yes |
| 11 | Hardware (short circuit) protection IPM intelligent module failure | 0x5400 | No |
| 12 | Overcurrent | 0x2220 | No |
| 13 | Motor overload | 0x3230 | Yes |
| 14 | Brake circuit failure | 0x1000 | Yes |
| 15 | Abnormal encoder count | 0x7305 | Yes |
| 18 | Relay failure | 0x1000 | Yes |
| 19 | Pulse coming when holding brake delay is open | 0x7110 | Yes |
| 20 | Abnormal parameter storage | 0x6320 | No |
| 21 | FPGA module fault | 0x7500 | No |
| 23 | Ad sampling module fault | 0x0FFF | No |
| 29 | User-defined overload alarm | 0x3230 | Yes |
| 30 | Encoder Z signal error | 0x7305 | No |
| 31 | Encoder UVW signal error | 0x0FFF | No |
| 32 | UVW signal has a full high or low level. | 0x0FFF | No |
| 33 | Wire-saving encoder signal error | 0x7305 | No |
| 34 | Encoder signal error | 0x7305 | No |
| 36 | Time too long for full high level when encoder is powered on | 0x7305 | No |
| 42 | AC undervoltage fault | 0x3220 | No |
| 44 | AC phase loss | 0x3130 | No |
| 47 | Overvoltage at power-on | 0x3210 | No |
| 50 | Communication link not established | 0x7305 | No |
| 51 | Communication interruption | 0x7305 | No |
| 52 | Battery voltage alarm but still usable, need to be replaced | 0x7305 | Yes |
| 53 | Battery voltage error, unusable, must be replaced | 0x7305 | Yes |
| 54 | Non-battery error and need to reset multiple turns | 0x7305 | Yes |
| 55 | CRC verification error for 3 consecutive times | 0x7305 | No |
| 56 | MODBUS frame data received is too long | 0x7305 | No |
| 57 | Serial communication abnormal error | 0x7305 | Yes |
| 58 | Single-turn encoder power-on count error, need to be powered on and restarted | 0x7305 | No |
| 59 | CF domain verification error | 0x7305 | No |
| 60 | 50us interrupt timeout | 0x1000 | No |
| 61 | Slave communication abnormality | 0x7500 | Yes |
| 62 | Exceeding Soft Limit | 0x5443(Positive)/0x 5444(negative) | Yes |
| 63 | Midway operation ESC failure | 0x3F | Yes |
| 64 | Power-on operation ESC failure | 0x40 | Yes |

9 SV2 Application Note

9.1 Drive wiring



**Figure 9.1 Driver node wiring diagram**

Note:

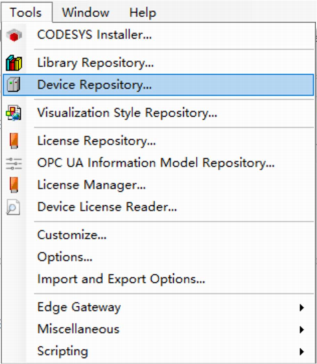
1) When the EtherCAT interface is connected to other drivers, it is one in and one out, pay attention not to make a mistake;

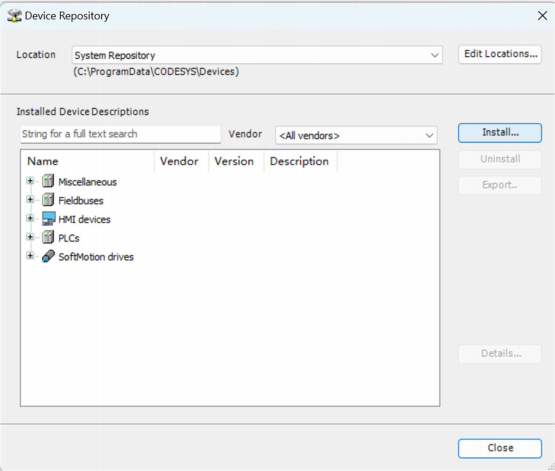
2) Cables and wires should be fixed to avoid being close to the driver, radiator and motor, so as to avoid thermal degradation of insulation performance.

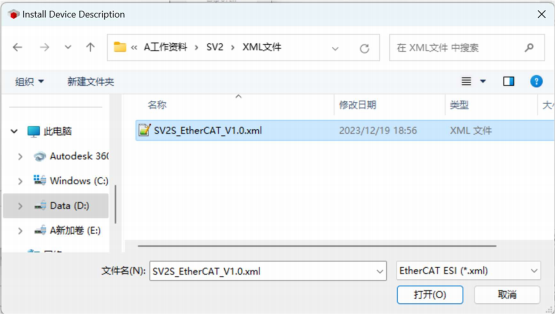
9.2 Application cases with Codesys master

1) Install XML file

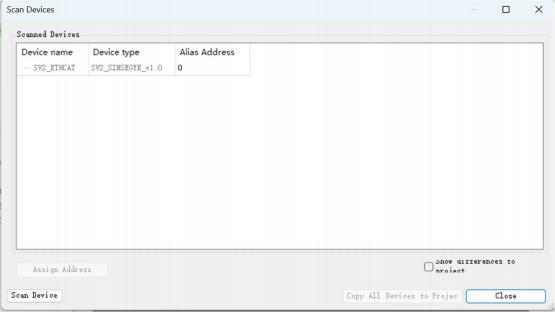
Click the Tools drop-down menu Device Repository, click the Install XML file SV2S\_EtherCAT\_V1.0.XML.



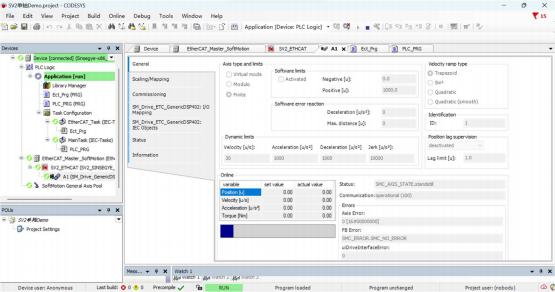




Once installed, scan the EtherCat master with the correct physical wiring, and the slave information will be scanned.



After the configuration is complete, SV2 can be enabled normally.



10 Product warranty terms

1. One-year warranty

SINSEGYE (Shenzhen) Computer System Co., Ltd. provides a one-year warranty on the raw materials and workmanship defects of its products from the date of shipment. During the warranty period, the company provides free repair services for defective products.

1. Not covered by the warranty

* Improper wiring, such as reverse connection of the positive and negative poles of the power supply and live plugging and unplugging
* Unauthorized alteration of internal components
* Use beyond electrical and environmental requirements
* The environmental heat dissipation is too poor

3. Repair Process

If you need to repair the product, please comply with the following process:

(1) Before shipment, you need to call the customer service personnel of SINSEGYE (Shenzhen) Computer System Co., Ltd. to get the repair license number;

(2) Send a written description with goods, describing the failure phenomenon of the repaired drive, the voltage, current and the environment when the failure occurs, the name of the contact person, telephone number and mailing address and other information.

(3) Prepaid postage, mailed to SINSEGYE (Shenzhen) Computer System Co., Ltd. Shanghai Branch Shanghai Multinational Purchasing Center - Building 3 1704 Putuo District, Shanghai.

4. Warranty Limitations

* Warranty coverage for SINSEGYE products is limited to the device and workmanship (conformance) of the product.
* SINSEGYE does not warrant that its products will be suitable for the customer’s specific application, as suitability is also related to the technical specifications required for the application and the conditions and environment under which it will be used.

5. Maintenance Requirements

When returning for repair, please fill in the “Maintenance Report” truthfully, indicating the fault phenomenon, so as to facilitate the maintenance analysis.